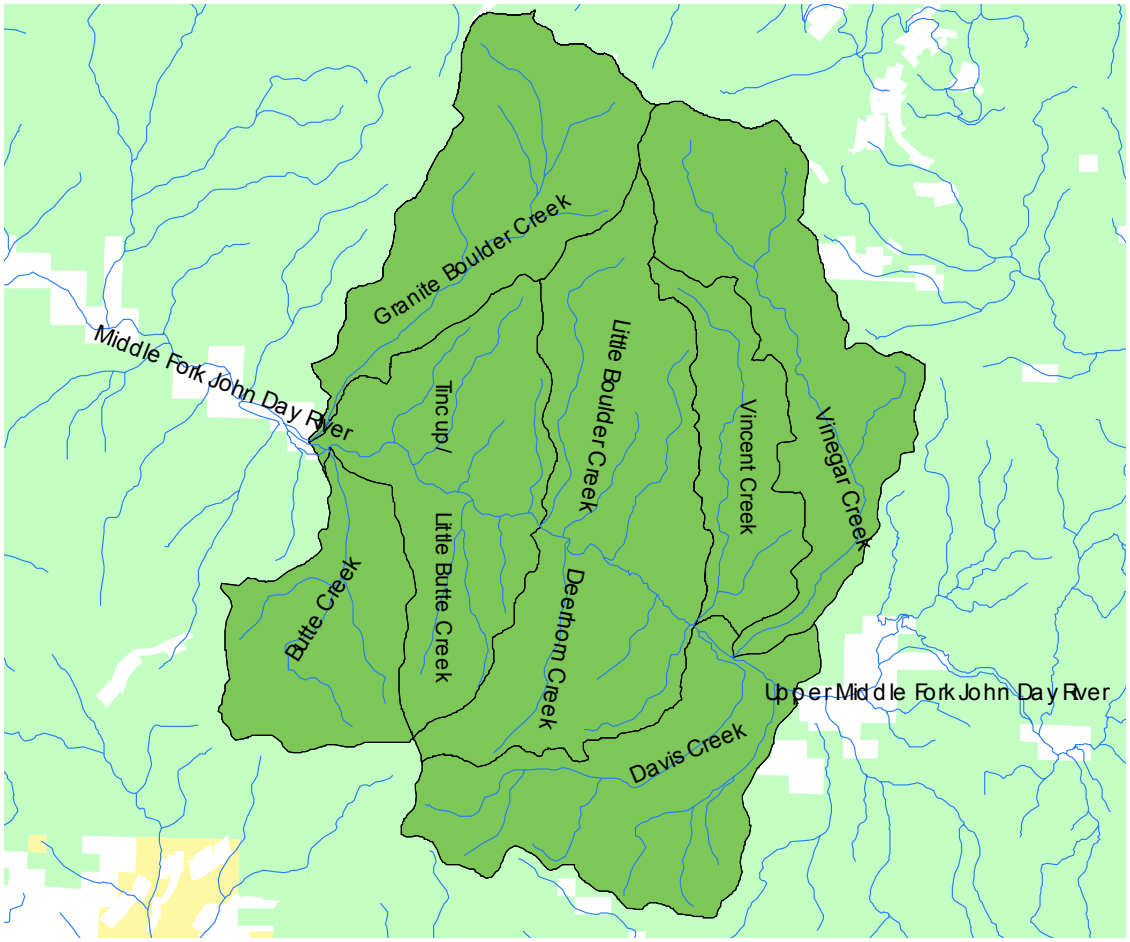
United States
Department of
Agriculture
Forest Service
Pacific Northwest Region PNW R/6
Malheur National Forest

Galena Watershed Analysis—Supplement 2002

Ecosystem Analysis:

mid-scale review of seven subwatersheds in the Middle Fork of the John Day River subasin in supplement to Ecosystem analysis at the Watershed scale



Some of the Acronyms and abbreviations used in this Document

Ac.	**Acres**
ALT.	**Alternative**
BMDA	**Blue Mountains Demonstration Area**
BMP	**Best Management Practice**
CCF	**Hundred Cubic Feet**
Cf.	**compare**
ERA	**Equivalent Roaded Area**
DEIS	**Draft Environmental Impact Statement**
DEMO	**Blue Mountains Demonstration Area**
DBH	**Diameter at Breast Height (the diameter of a tree measured at breast height, approx 4.5 ft.)**
e.g.,	**for example**
ERA	**Equivalent Roaded Acres**
ESA	**Endangered Species Act of 1973**
FEIS	**Final Environmental Impact Statement**
HEI	**Habitat Effectiveness Index**
HUC	**Hydrologic Unit Code**
IDT	**Interdisciplinary Team**
LAU	**Lynx Analysis Unit**
LRMP	**Land and Resource Management Plan (Forest Plan)**
MA	**Management Area**
MA 1	**General Forest**
MA 2	**Rangeland (commonly accounted for with MA 1)**
MA 3B	**Anadromous Riparian Areas**
MA4A	**Big-Game Winter Range Maintenance**
MA 7	**Scenic Area**
MA 13	**Old Growth**
MA 14	**Visual Corridors**
MA 21	**Wildlife Emphasis Area (with nonscheduled timber harvest)**
mi.	**miles**
NEPA	**National Environmental Policy Act of 1969**
NFMA	**National Forest Management Act of 1976**
NRHP	**National Register of Historic Places**
NOEL	**No Observable Effect Level**
OFMS	**Old Forest Multi-Story**
OFSS	**Old Forest Single Story**
ODFW	**Oregon Department of Fish and Wildlife**
PACFISH	**Pacific Fisheries (a strategy for improving salmonid fish numbers)**
RMO	**Riparian Management Objective** (also Road Management Objective in Appendix"G")
RHCA	**Riparian Habitat Conservation Area**
ROD	**Record of Decision**
SECC	**Stem Exclusion-Closed Canopy**
SEOC	**Stem Exclusion-Open Canopy**
SWS	**Subwatershed**
TOC	**Threshold Of Concern**
TPA	**Trees Per Acre**
UR	**Understory Reinitiation**
YFMS	**Young Forest Multi-Story**

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Date: January 3, 2003

Dear Forest User:

A watershed analysis was prepared in 1999 by direction of the District Ranger, Blue Mountain Ranger District (formerly Long Creek/Bear Valley Ranger District), with the intention of using the analysis to assist in preparing the Southeast Galena Restoration Project, an Environmental Impact Statement. This project was canceled on May 31, 2002.

The information gathered for the Southeast Galena Restoration Project consisted of two years of in-depth analysis across seven subwatersheds of the greater Galena Watershed. This analysis has been used to supplement the Galena Watershed Analysis. The supplement can be found on the agency's internet site, FSWEB (http://www.fs.fed.us/r6/malheur) as the Galena Watershed Analysis - Supplement 2002.

If you have any question, please contact IDT Leader Eric Wunz at this office. Thank you for your continued interest in the Malheur National Forest.

Sincerely,

ROGER W. WILLIAMS
Acting Forest Supervisor

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Galena Watershed Analysis--Supplement 2002

Ecosystem Analysis : Mid-scale review of seven Subwatersheds in the Middle Fork of the John Day River in Supplement to Ecosystem Analysis at the Watershed Scale—Galena Watershed Analysis

Lead Agency: USDA Forest Service
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Abstract: *This is mid-scale review of 7 subwatersheds in the Middle Fork of the John Day River in supplement to Ecosystem Analysis at the Watershed Scale—Galena Watershed Analysis (1999). This analysis documents the five alternatives of recommended action, including a no action alternative* ***(Alternative 1)****, for the Southeast Galena Restoration on the Blue Mountain Ranger District of the Malheur National Forest.* ***Alternative 2,*** *would initiate restoration management reversing adverse hydrologic and vegetation trends. In this alternative, projects may include: heavy equipment within stream channels to create a meandering nature to affected streams; riparian planting to create shade and bank stability; removal of a dispersed campsites from riparian area; and improvement of trail crossings over drainages are recommended to improve hydrologic function and fisheries habitat; prescribed harvest and fire could take place to reduce risk of uncharacteristically severe fires, insect infestations, and disease infections due to forest stand density and composition. Recommended prescriptions include areas within designated roadless areas, (i.e., Land and Resource Management Plan "Appendix C," Dixie Butte and Greenhorn Mountain Roadless Areas). Additional actions include: relocation or roads located in riparian conservation areas (RHCAs); road decommissioning; reconstruction of roads; and closing of roads; aspen enhancement; and noxious weed treatment. Chemicals could be used to: reduce competing vegetation within the reforested area; reduce competition of native vegetation with noxious weeds; and reduce seedling mortality due to pocket gophers.* ***Alternative 3*** *was developed to reduce potential short-term impacts to the analysis area from the direct impacts of the recommended restoration projects. For instance, where practical hand labor, rather than heavy equipment could be used to improve stream channel function dispersed campsites and trail projects could be included. Prescribed harvest and fire is recommended , however no harvest could occur in roadless areas. No chemicals could be used to reduce competition with competing vegetation, noxious weeds, or pocket gophers. A variety of roadwork and aspen enhancement could occur.* ***Alternative 4*** *is similar to Alternative 3 in that it could improve hydrologic function by implementing stream channel enhancement (with instream work accomplished by hand crews where practical), plantings, dispersed campground, and trails projects. This alternative takes a departure from the other action alternatives in that it strives to enhance and improve vegetative character through the use of prescribed fire and pre-commercial thinning, without harvest. Where practical and appropriate, prescribed fire and pre-commercial thinning, could still be applied within designated roadless areas as in Alternative 3. No chemicals would be used in combating competing vegetation noxious, weeds, or pocket gophers. Road projects and aspen enhancement would be included.* ***Alternative 5*** *treatment duplicates Alternative 2. However, forest stand treatment could take place on a larger scale. Hydrologic projects emulate that of Alternative 2, including the use of heavy equipment. Vegetation projects include additional tractor skidding and less helicopter yarding. To accomplish this additional new roads are recommended with the majority of these roads remaining open upon completion of the restoration projects. Under Alternative 5, the Roadless Area could receive management as described in Alternative 2. A variety of road relocations, decommissions, and closures could occur and aspen stands could be enhanced.*

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GALENA WATERSHED ANALYSIS—SUPPLEMENT 2002

EXECUTIVE SUMMARY OF THE SOUTHEAST GALENA DEIS AND WATERSHED ANALYSIS INDEX OR CROSSWALK

This document is intended to serve as a supplement to the Galena Watershed Ecosystem Analysis at the Watershed Scale (EAWS[2]) *1999 (and is to be referenced as* ***Galena Watershed Analysis—Supplement 2002****). Extensive effort went into the development of the Southeast Galena Restoration Draft Environmental Impact Statement (DEIS) which analyzed the National Forest system land described herein, the DEIS was canceled in the Federal Register, May 31, 2002. A determination was made to evaluate individual restoration projects in this area on a more site-specific basis. Therefore, the DEIS was not followed through to a decision. The Draft Environmental Impact Statement had all the elements of a Watershed Analysis, however as the Galena Watershed Analysis—Supplement 2002 it will reflect the design of a National Environmental Policy Act (NEPA) document to a large extent. This following summary will show the development of the analysis and a crosswalk, or index of how the steps of Federal Guide to watershed analysis provides recommendations for projects which will restore watershed function and direction for proceeding in this manner.*

INTRODUCTION

Analysis was performed on 49,473[3] acres of the Davis, Placer, Vinegar, Tincup, Little Butte, Butte, Vincent, Little Boulder, Deerhorn and Granite Boulder subwatersheds and the tributaries to the Middle-Fork of the John Day River (Chapters 1-4 this document, see also Map A page 1 and Appendix E, Maps 1-31). The Middle Fork of the John Day River originates south of the North Fork of the John Day River in the Blue Mountains, and flows westerly for approximately 75 miles, then merges with the North Fork about 18 miles above Monument, Oregon. The analysis area is located about 25 air miles northeast of John Day, Oregon. These subwatersheds share a common road system. Access from John Day is east on Highway 26 to the junction of Highway 7, north on Highway 7 to the junction of County Road 20, then west on County Road 20 along the Middle Fork John Day River. Major developed Forest Service roads that access the analysis area include the 2010, 2045, 2050, 2055, 2610, 2612, 2614, 4550, 4557, and 4559 roads.

Located in northeastern Oregon, the John Day River is the second longest free-flowing river in the continental United States after the Yellowstone River. Populations of summer steelhead trout (a threatened species) and spring Chinook salmon (a sensitive species) in the John Day River are two of the last remaining intact wild populations of anadromous fish in the Columbia River basin. Bull Trout (also a threatened species), were historically found throughout much of the Upper John Day Basin, including the Middle Fork of the John Day River(see Appendix E, Map 5 TES species and Essential Fish Habitat for fish) and are present in the Analysis Area.

The Forest Service has focused on the southeast portion of the Galena Watershed in the Middle Fork of the John Day River for a supplement to watershed analysis completed in 1999. The seven subwatersheds, within the greater Galena watershed, have become the subject matter of recommended restoration acres that lay north and south (both sides) of the Middle Fork of the John Day River. There are about 35 perennial tributaries and numerous smaller drainages within the analysis area that support anadromous and resident fish. The conclusion of this analysis is a recommendation of restoration throughout these seven subwatersheds (see Summary Table 1 Recommended, or a Possible Program of Work by Subwatersheds, page xiii).

[2] Following a federal procedure of *Ecosystem Analysis at the Watershed Scale*, as revised in Version 2.2 August, 1995

[3] All numbers are approximate

There are about 1,200 acres of private holdings within the analysis area boundaries with potential private and forest National Forest system land interface concerns. Also, each of the small communities of Bates, Austin, and Greenhorn are located outside the analysis area's eastern boundary. The rest of the analysis area, is National Forest system land and includes two of the inventoried roadless areas, in the Malheur *Land and Resource Management Plan* (LRMP), i.e., the Dixie Butte Roadless Area, and the Greenhorn Mountain Roadless Area. Additionally, the North Fork John Day River Wilderness on the Umatilla National Forest borders the northeast boundary of the analysis area.

The Galena Watershed is in the Middle Fork John Day River subbasin and is comprised of mostly National Forest system land with an estimated combined area of 127,456 acres. The analysis area covers approximately 38% of the watershed. Originally another five subwatersheds of the Galena watershed were considered for this analysis, but were reduced to these seven in order to accomplish analysis in a timely manner. Approximately 33% of the Galena watershed was analyzed and treated in the Summit Fire Recovery project (1999). The *Galena Watershed Analysis* 1999 made recommendations of management actions in the remaining portions of the Galena watershed that were outside the Summit Fire (1996) area. This analysis is an intermediate scale to the broader scale of the 1999 analysis. Site specific NEPA project will follow with fine scale analysis prior to project implementation.

This present analysis began as a Draft Environmental Impact Statement from a Notice of Intent (NOI), on August 16, 1999 which went through the Draft stage and then was canceled in the Federal Register, May 31, 2002. In August 1999, the Long Creek/Bear Valley Ranger District (now the Blue Mountain Ranger District) of the Malheur National Forest mailed a scoping package to over 1,000 members of the public. The scoping package asked for comments and provided information on the Southeast Galena Restoration Project's recommended action and its purpose and need. A number of comments were received and each were evaluated to identify preliminary key issues for developing draft alternatives (see 1.3.4—Relevant Planning and Scoping Dates, page 29; 1.4 Issues Studied in Detail, page 30 and 1.4.13—Other Items Tracked but not Considered to be a "Key" or "Significant" Issue, page 34).

It is important to note that this supplement to watershed analysis is not a decision document for implementing projects. However, landscape scale analysis from this effort may be utilized to supplement the Galena Watershed Analysis, completed in 1999. From this analysis effort projects may now be implemented through, and in accordance with the National Environmental Policy Act. This analysis is, (just as the 1999 Galena Watershed Analysis was, but on a broader scale) a document that identifies a need for activity in site-specific locations. The 1999 Galena Watershed Analysis was intended to be updated in this manner (cf. File letter 1900 June 30, 1999 by District Ranger). By using the important analysis from the DEIS, a large amount of the work can be planned and implemented, after appropriate National Environmental Policy Act (NEPA) documents are complete and regulatory consultation takes place (see Summary Table 1 page xiii).

By using the Steps in the *Ecosystem Analysis At The Watershed Scale: A Federal Guide to Watershed Analysis* 1995 as an index to this document which was originally an unpublished Draft Environmental Impact Statement, this analysis will capture important information which can be vital in selecting or foregoing future decisions made in the Galena watershed. The Federal guide gives the following directions, "Federal agencies will conduct multiple analysis iterations of watersheds as new information becomes available, or as ecological conditions, management needs, or social issues change," and further, "Teams can interpret existing analyses as they relate to a particular watershed to speed their analyses without sacrificing scientific credibility." In this manner this analysis is intended to supplement the existing *Galena Watershed Ecosystem Analysis at the Watershed Scale* (EAWS) 1999.

Relation to Other Laws, Regulations, and Processes

This in-depth analysis is the result of detailed work by a dedicated interdisciplinary team to establish a watershed and a subbasin context for restorative efforts to ecosystems that have been degraded over the

past century. This analysis details the potential future cumulative effects of foreseeable management or restorative efforts in these subwatersheds. Recommendations for future projects in this document are placed in context of, and consistency with, the existing objectives from the Malheur National Forest *Land and Resource Management Plan* (LRMP), PACFISH/INFISH guidelines, and current science. This analysis will establish a logical watershed wide context for setting priorities, making decisions and implementing projects in these subwatersheds in accordance with laws, regulations and resource processes as well as public input.

National Forest Management Act (NFMA)

Ecologically sustainable restoration projects implemented from recommendations in this analysis can assist in the improvement of current conditions and habitat for threatened fish species, habitat for threatened terrestrial species of wildlife, the improvement of current degraded hydrological conditions to the proper functioning condition, the improvement of degrading forest stand conditions, the improvement of degrading forage for wildlife, the improvement of declining aspen stands, the decommissioning and relocation of roads currently in Riparian Habitat Conservation Areas (RHCAs), improvement of trails, trail heads, campgrounds and dispersed recreation sites. This analysis thoroughly considers ecosystem capability, the sensitivity to disturbance regimes and examines the suitability of these watersheds to sustain an array of public use. Projects recommended herein, are in a logical sequence to facilitate the display of effects on existing and possible future conditions, to both desired conditions and undesired conditions. Recommended project design, including location and timing were made under applicable LRMP standards and guidelines. Additionally, a detailed assessment of habitat is presented with population trends (eg.,3.2.4.1 Dry Forest Type, page 140 and 3.2.6.1 Threatened, Endangered, and Sensitive Species, page 165). Further, this analysis, can assist in establishing a context for identifying and prioritizing watershed restoration needs. Further still, this analysis will be instrumental in adhering to NFMA guidelines in supporting planning processes, including LRMP amendments as it has identified conflicts between LRMP features and ecosystem capabilities. Current science has established additional protection needs since LRMP implementation in 1990, and this analysis identifies these additional protection needs, and recommends a number of non-significant amendments to the *Land and Resource Management Plan* (see 2.4.2 Alternative 2—Recommended Action, page xxi).

National Environmental Policy Act (NEPA)

The results of Galena Watershed Analysis of 1999 (Galena WA, 1999) established a consistent watershed-wide context for project-level NEPA documents. Information from this analysis, referenced as Galena Watershed Analysis—Supplement 2002(Galena WA, Supplement—2002), since it originated as a NEPA document and maintains the format required in 40 CFR 1500-1508, may be used to enhance the quality of projects and action-specific NEPA documents, from categorical exclusions, to Environmental Assessments and if significant effects are found, another Environmental Impact Statement. Therefore, Galena WA, Supplement—2002, when used as a supplement to Watershed Analyses forms a strong basis for NEPA cumulative effects analysis for future projects as it describes the current environment at the watershed level, past and present management activities and the influence of these activities on the watershed, and the likely historical conditions (e.g.,1.2.1.4 Undesired Condition: Vegetation outside of a Historical Range of Activity, page14 and 1.2.1.5 Undesired Condition: High Wildfire Hazards, page 17 and 3.2.5 High Wildfire Hazard, page 159; Wildfire Risk at the Watershed Scale, page 271). In turn, future project-level NEPA documents will augment watershed analysis with site-specific data. In this manner, when reaching subsequent decisions through the NEPA process, responsible officials will be able to document a consistency of logic with watershed analysis results.

Endangered Species Act (ESA)

Two Federal Agencies with different executive branch department heads(USDI/USFWS and the DOC/NMFS), that are separate from the USDA Forest Service are responsible for consultation concerning threatened species of fish and wildlife in the analysis area. Results of this supplement to watershed analyses and appended documents establishes a consistent, watershed-wide context for Section 7, conferencing and consulting pursuant to the Endangered Species Act (ESA). Analysis contained herein, includes information applicable to many projects and activities within the seven subwatersheds in the Galena Watershed. Information on existing population status, species distribution, and habitat conditions are presented in this analyses and can subsequently be used as a lead document to evaluate the effects and cumulative effects of recommended actions, as well as assisting in determining measures to avoid jeopardy and adverse modifications of critical habitat. The Galena WA, Supplement—2002, presents recommendations that would reverse declining habitat and population trends of threatened and sensitive fish and wildlife species. Information in this analysis is presented in a manner that enables project level consultation on documents to directly reference or incorporate pertinent sections of analysis reports. This may facilitate consultation in advance of NEPA public scoping efforts, the timing of which often conflicts with consulting agency analysis. This supplement to watershed analysis may also contribute information to support Section 4 and 7, (listing, recovery and consultation) and Section 10 (permits and habitat conservation planning) activities, in a manner that can get restorative projects into implementation in a timely manner.

PACFISH/INFISH Guidelines and other Regional Direction

In the Columbia River Basin, the Forest Service and the Bureau of Land Management have a duty to manage salmonid habitat under the direction of PACFISH[4] (USDA AND USDI 1994) and INFISH Inland Native Fish Strategy; USDA 1995). These interim management strategies endeavor to protect areas that add to salmonid recovery and improve riparian habitat and water quality throughout the basin, which includes the John Day subbasin. These strategies have also facilitated the ability of the federal land mangers to meet requirements of the ESA (see above) and avoid jeopardy to threatened species. Under PACFISH/INFISH the seven subwatersheds have been denoted "key watersheds," to protect and restore important fish habitats. PACFISH guidelines have been used in recommendations for restoration in the analysis area, for the protection of habitat and threatened populations anadromous fish. These guidelines have been used in all design of recommended restoration for Aquatic, Vegetation and Infrastructure projects (see 2.2 Process and Design Used to Formulate the Alternatives, page 38). INFISH guidelines have been used in recommendations for restoration in the analysis area for the protection of habitat and threatened populations of bull trout.

To meet recovery objectives, these strategies have been key in establishing watershed and riparian goals to maintain or restore fish habitat. Under PACFISH/INFISH watershed analyses such as this present Galena Watershed Analysis—Supplement 2002), will be for site-specific watershed restoration recommendations and provide guidance on priorities for watershed restoration.

Recovery objectives for forest stands would move toward the Historical Range of Variability (HRV) as directed by the Regional Forester's Eastside Forest Plan Amendment #2[5] (June 1995) which simultaneously amended the Malheur National Forest *Land and Resource Management Plan*. Forest stand sustainability and resiliency would be the overall goal for stewardship of the natural resources

[4] *Interim Strategies for Managing Anadromous Fish-Producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California* USDA Forest Service and USDI Bureau of Land Management (February 1995).This is an interim strategy for managing anadromous fish-producing watersheds in eastern Oregon and Washington, Idaho, and portions of California.

[5] *LRMP (Forest Plan) Amendment No. 2*: Interim Management Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales, Also referred to as *Regional Forester's Eastside Forest Plan Amendment No. 2.*

under this direction, and guidelines establishing a trend toward a Historical Range of Variability(HRV) would guide recommendations. These guidelines are more restrictive than PACFISH/INFISH restrictions regarding Ripariean Habitat Conservation Areas(RHCAs).

Federal Clean Water Act(CWA).

Results of watershed analysis establishes a consistent watershed-wide context for watershed quality efforts mandated by the State of Oregon and for the protection of beneficial use identified by the State (in the case of these subwatersheds with water temperature problems that are on the State of Oregon 303 d list). Additionally, any concerns that the tribes may have in their water quality standards under the Federal Clean Water Act, in the same manner establishes a consistent watershed-wide context for watershed quality for tribal concerns. Results of this supplement to watershed analyses may subsequently be used to develop or update State management plans. Watershed analysis establishes a context for identifying resource protection and monitoring needs and restoration opportunities that are responsive to water quality issues described in this supplement to watershed analysis.

Federal Trust Responsibilities to Indian Tribes

This analysis establishes a watershed context for early identification of issues covered by treaty rights, resources protected by treaty, and other tribal concerns. The results of this analyses will assist the Forest Service in complying with policies and laws relating to tribal trust resources. This analysis identifies tribal trust resources that occur in the watershed (e.g., 3.2.6.4.6—Culturally Significant Plants, page 202 and 4.4.11 American Indian Tribes, page 452; see also 1.0 Introduction, page 1, and 1.5.1—Applicable Laws and Treaties, page 35).

ECOSYSTEM ANALYSIS AT WATERSHED SCALE

The Galena watershed has long been a center of human activity due to the richness of the area's natural resources. Over one hundred years of land and resource use in the form of placer mining for gold, railroad logging, and livestock grazing, has caused a number of undesirable conditions, which have put important resources at risk. Land and resource use during the past century has arranged the re-configuration of streams and hydrologic processes in a manner, which allows water to leave the landscape in the uplands too rapidly (see 1.2.1.1 Undesired Condition: Early Season Peak Flows, page 8). This existing condition is now worse because of previous wildfire adjacent to the analysis area has removed large areas of vegetation in the watershed as whole. These conditions have contributed to a trend of elevated stream temperatures in streams during dry months when threatened species of fish depend upon cool water, for spawning and other life cycles of their existence. At the same time that fire danger has increased in the unburned portions of the Galena Watershed, the habitat for wildlife has been deteriorating because overstocked, dense stands of trees have inhibited vegetation in the understory that once provided high quality forage for deer and elk. These conditions no longer allow sunlight to reach the forest floor in a manner that provides acceptable forage, which was always available under historic conditions.

While the watershed analysis of 1999 was targeted at a broader scale, this effort, (originally intended as an Environmental Impact Statement) is targeted at a determination of a potential effects from a range of possible management activities that have been compared to the effects of no action in the same area (beginning in section 4.2—Predicted Attainment of Project Objectives, page 239). The 1999 *Galena Watershed, Ecosystem Analysis at the Watershed Scale* (EAWS[6]) was an explanation of the process and function of ecosystems in the entire watershed and made general recommendations. This document, now referenced as the Galena Watershed Analysis—Supplement 2002(Galena WA—Supplement 2002),

[6] Following a federal procedure of *Ecosystem Analysis at the Watershed Scale*, as revised in Version 2.2 August, 1995

makes site specific recommendations and tracks the environmental consequences of these recommendations as well as tracking the environmental consequences a range of alternatives to these recommendations.

Known data gaps will be applied to future analysis (such as updated stand exams) and will apply to further analysis and may differ slightly from this document when applied to future NEPA projects.

Important habitat losses have occurred in the Galena watershed. In the watershed analysis area, the Middle Fork of the John Day River, combined with the Creeks of the seven subwatersheds contain approximately 140 river miles of anadromous fish habitat. Historic hydraulic placer mining for gold, grazing, railroad logging and wildfire suppression that has allowed the accumulation of fuels in the past century has contributed to the alteration of the proper functioning condition of elements of the ecosystems in this area. All of these subwatersheds support various life stages of the threatened mid-Columbia steelhead trout, and one subwatershed supports spawning populations of bull trout (however, recent surveys have found bull trout presence in another subwatershed in this area). Both of these species are listed as threatened under the Endangered Species Act. Additionally, Chinook salmon, a sensitive species is also present and spawn in the analysis area. Additionally, habitat for Canada lynx (a species listed as threatened) is present in a number of the higher elevation portions of this area. In 2001, the Oregon Department of Fish and Wildlife (John Day Subbasin Summary Draft 2001) identified the John Day River as containing what may be the largest wild run of steelhead in the Columbia Basin. Additionally, all of the area has been designated as "key watersheds," by the Blue Mountain Demonstration Project, due to their important role in the recovery of at-risk fish stocks within the Columbia basin. This portion of the Middle Fork of the John Day River is also designated as a State of (Oregon) Scenic Waterway.

Bull trout populations in the Middle Fork are found in only four tributaries Clear Creek (Upper Middle Fork Watershed), Granite Boulder Creek, Big Creek (Galena Watershed), in a ODFW population assessment in 1999. Additional surveys in the summer of 2000 found a single bull trout in Vinegar Creek (ODFW 2001) which is also in the Galena watershed and is covered in this analysis. The Oregon Department of Fish and wildlife has stated that the bull trout population on the Middle Fork is considered to be, "the most vulnerable and at the highest risk of extinction because they are found in only four tributaries that are relatively far apart and separated by apparently unsuitable habitat."[7]

One third of the Galena watershed, recently burned (1996) in an uncharacteristically severe manner. This type of fire occurred because forest stand structure, and species composition has changed from a historic range of conditions that once withstood natural disturbance regimes such as disease, insects and fire (see Recent Uncharacteristically Severe Wildfire—Summit Fire, page159). Now, overstocked stands contribute to the likely scenario of large uncharacteristically severe wildfires burning through entire subwatersheds and larger. In the Analysis area forest stands, understory, and riparian vegetation now exist in a manner that is no longer compatible with natural disturbance regimes such as insects, disease and fire. A serious consequence of these conditions has been an increase in the size and severity of wildfires in the Galena watershed that was mentioned previously (see Appendix E, Map 2—Large Fire History). This analysis has shown that: formerly mostly small, low intensity fires burned the understory of forests every year in a beneficial manner in small patches across the landscape. Now, dense stands of small diameter overstocked forests allow fire to enter the crowns of forest stands of trees where they are likely to become uncontrollable high intensity fire. Fire of this type burns in an uncharacteristically severe manner and damages soil and detrimentally affects all resources in subwatersheds. This detrimental change in structure and species composition of tree stands has allowed a trend toward thousands of acres being burned in single event, high-intensity fire that now has a tendency toward engulfing whole subwatersheds (e.g. Summit Fire 1996) or even larger areas of the landscape.

With the threatened fisheries concerns as well as the potential for subwatershed and watershed scale losses of multiple resources due to uncharacteristically severe wildfire as a background, the following

[7] John Day Subbasin Summary Draft 2001 page 40

analysis can be placed in a watershed-wide context for project level National Environmental Policy Act (NEPA) analysis which must precede recommended restorative action. The Blue Vegetative Management Environmental Assessment (EA) is currently in this process in the Vincent and Vinegar Creek subwatersheds utilizing this analysis and will be complete by Summer of 2003, followed by and Aquatics environemental documents, and roads environmental documents. Projects in other subwatersheds may follow as management establishes a priority.

Infrastructure projects needed to effectively accomplish some of these treatments, as well as to restore and rehabilitate existing road systems, trails and campsites that are causing sediment problems are also considered with in-depth analysis of potential effects in this document. In some cases, a need exists to move roads out of Riparian Habitat Conservation Areas (RHCAs) by decommissioning the roads and then moving the location of these roads to upland areas. By moving the location of some segments of roads in this manner, streams with fish habitat would no longer receive detrimental effects from roads (see Appendix E, Map 8—Stream and Riparian Rehabilitation for Action Alternatives;). Decisions made in the near future to implement restoration projects recommended the Galena Watershed Analysis—Supplement 2002 (this document) will begin the course for the next one hundred years toward a balanced recovery of ecosystems, with trends similar to historic conditions, or set trends that point landscape conditions toward a historic range that will once again become resilient and sustainable.

The National Marine Fisheries Service (NMFS) issued a Biological Opinion on the federal Columbia River hydropower system, which recognizes the importance of the John Day subbasin to fish and wildlife restoration efforts (NMFS 2000). NMFS has specifically identified the upper John Day (meaning North Fork, Middle Fork and the Upper John Day as defined by DEQ above Service Creek) as a priority subbasin to receive immediate attention for habitat and species recovery for the Mid-Columbia steelhead ESU (NMFS 2000). NMFS assigned priority status to the upper John Day subbasin because this portion of the subbasin has an important potential for improvement in productive capacity.

Review and assessment of this present analysis as a supplement to ecosystem analysis at the watershed scale (*Galena Watershed Analysis* June 1999) provides key information for the Middle Fork of the John Day River subbasin and discloses the biological potential and potential environmental effects of prospective restorative projects in the Southeast Galena Analysis Area on resources and human uses within and around this analysis area on the Blue Mountain Ranger District of the Malheur National Forest. Additionally, many of the goals and objectives of the National Wildland Fire Management Policy (1998) are included in these recommended projects. This area was selected for restoration due to many concerns outlined in both the *Galena Watershed Analysis* (June 1999) and due to this area being part of the Blue Mountains Demonstration Area, an inter-governmental partnership including the Oregon Governor, USDA Under Secretary, and USDA Forest Service Chief. The Galena Watershed Analysis—Supplement 2002 is meant to update 1999 analysis and facilitate ongoing site-specific projects that would be implemented in accordance with the National Environmental Policy Act.

INDEX TO ECOSYSTEM ANALYSIS AT WATERSHED SCALE BY STEPS

Step 1. Characterization of the Watershed:

The dominant physical, biological, and human processes or features of the watershed that affect ecosystem functions or conditions are identified in the sections of Chapter 3, beginning on page 111. This chapter also explains the relationship between these ecosystem elements and those occurring in the John Day River subbasin. Additionally, the Interdisciplinary Team has identified undesired conditions beginning on page 8. The most important land allocations are found in Chapter 1 page 36, plan objectives are found in Chapter 1 page 21, and regulatory constraints that influence resource management in the watershed can be found in Chapter 1 Section 1.5 Applicable Legal and Regulatory Requirements and other Planning Documents page 35. This analysis is a mid-scale effort to delineate a configuration of key watersheds to protect and restore important elements of forest stand structure and

fish and wildlife habitat in accordance with PACFISH/INFISH standards and guidelines. Additionally, this analysis will create on a landscape scale, site-specific projects in key subwatersheds, with the appropriate NEPA documentation to provide guidance and priorities for watershed restoration on a subwatershed by subwatershed basis (see Summary Table 1 Recommended, or a Possible Program of Work by Subwatersheds, page xiii).

Step 2. Issues and Key Questions

In Chapter 1 the Interdisciplinary Team emphasized their center of attention on seven undesired conditions (see 1.2.1 Undesired Conditions, page 8) in the analysis area which are key elements most relevant to the management questions, human values, or resource conditions—these were contrasted to desired conditions (see 1.2.2 Desired Conditions page 21) in a manner that provided management objectives which are assessed further in Chapter 4 (see 4.2—Predicted Attainment of Project Objectives, page 239). Twelve key issues were also developed in Chapter 1 (see 1.4 Issues Studied in Detail page 30) which varied from the five issues developed in the 1999 effort of watershed analysis (Galena WA page 2-1). These issues were compiled from public scoping efforts, (see 1.3.4—Relevant Planning and Scoping Dates, page 29) and agency resource concerns. The issues studied in detail (1.4 Issues Studied in Detail, page 30) provide a measurement method for further analysis and a range of comparative treatment by numbered alternatives to recommended action that are analyzed in depth in Chapter 4. The core questions from the Federal Guide to Watershed Analysis that were applicable are discussed in the 1999 document and are not revisited here. These issues and their subsequent measures drove the formulation of alternatives for restoration in the watershed and were based on indicators commonly used to measure the key ecosystem elements.

Step 3: Description of Current Conditions

The purpose of this step is to develop information (more detailed than the characterization in Step 1) the Interdisciplinary Team has identified undesired conditions,1.2.1 Undesired Conditions, beginning on page 8 which are relevant to the desired conditions in 1.2.2 Desired Conditions which begin on page 21. Chapter 3, page 111 gives the current range, distribution, and conditions of the relevant ecosystem elements in the Analysis Area and include:

3.1.0—Overview of Existing Conditions, page 111;Existing Scenic and Ecological Integrity, page 112; 3.2.0—Existing Conditions, page 113; 3.2.1—Early Season Peak Flows, page 113;Overview of Soils in the Analysis Area, page 114;Erosion Processes—Overview, page 118;Hydrologic System, Water Quantity, and Water Timing—Departure from Potential, page 123; 3.2.2—Stream Temperatures, page 124; 3.2.3 Aquatic Habitat, page 125; Fish Habitat; 126; Summer-run Steelhead Oncorhynchus mykiss, page 128; Bull Trout Salvelinus confluentus, page 127, page 128;Spring Chinook Oncorhynchus tshawytsha, page 129;Blue Mountain Cryptochian Caddisfly Cryptochia neosa, page 130;Riparian Habitat, page 130;Analysis Area Stream Overview, page 131;Level II Stream Survey Results, page 132;Disturbance Regimes In Aquatic Habitat, page 136; Recreation Affects in RHCAs, page 136; Grazing; page 137;Access Travel Management, page 137;3.2.4 Vegetation by Forest Type, page 139; 3.2.4.1 Dry Forest Type, page 140; 3.2.4.2 Moist Forest Type, page 147; 3.2.4.3 Lodgepole Pine Forest Type, page 151; 3.2.4.4 Cold Forest Type, page 154; 3.2.4.5 Woodland Forest Type, page 157;Sub-Alpine Meadows, page 158Hardwoods(including Aspen) , page 158Riparian Meadows158Rock Outcrops, page 158;Threatened Endangered and Sensitive Plant Species, page 159; 3.2.5 High Wildfire Hazard, page 159; Recent Uncharacteristically Severe Wildfire—Summit Fire, page 159;Wildfire Hazard and Risk, page 162;Wind Event in Vincent and Vinegar subwatersheds, page 163; Private Land Interface, page 163, Air Quality, page 163; 3.2.6 Wildlife Habitat, page 165; 3.2.6.1—Threatened, Endangered, and Sensitive (TES) Species, page 165; Species Compositions and Successional Relationships—Cold Forest, page 167, 173; 3.2.6.2.1—MIS for Old Growth, page 173; Pileated Woodpecker Drycopus pileatus, page 173;Pine Marten Martes americana, page 175; White-headed woodpecker Picoides albolarvatus, page 177;Dedicated Old Growth and Connectivity, page

178;3.2.6.2.2—MIS—Primary Cavity Excavators (PCE) , page 180;3.2.6.2.3—MIS—Rocky Mountain Elk, page 183;3.2.6.3—Species of Interest (SOI) , page 191;3.2.6.4—Habitat Summary Tables3.2.6.4.1—Dry Forests and Associated Wildlife Species, page 193; 3.2.6.4.2—Moist Forests and Associated Wildlife Species, page 195;3.2.6.4.3—Lodgepole Forests and Associated Wildlife Species, page 197;3.2.6.4.4—Cold Forests and Associated Wildlife Species, page 198;3.2.6.4.5—Unique and Sensitive Habitats: Non-Forested Areas, Hardwoods, and Juniper Woodlands, page 200;3.2.6.4.6—Culturally Significant Plants, page 202;3.2.7—Noxious Weeds, page 203;3.3.0 Roadless Character, page 204;3.3.1—Dixie Butte Roadless Area, page 204;3.3.2—Greenhorn Mountain Roadless Area, page 207; 3.4.0—Human Use, page 209; 3.4.1 History of the Analysis Area, page 209;Fire Exclusion Policies and Fire regimes, page 211; 3.4.2 Austin, Bates and Greenhorn, page 212;3.4.3 Social and Economic Factors, page 212; Restoration Opportunities For Local Communities, page 216; Population Changes, page 218; Wildfire Hazards at the Watershed Scale, page 266;Public Safety and Property, page 266;Air Quality, page 266.

Chapter 4 beginning on page 237, details the scientific and analytic basis for the summary comparison of effects presented in Chapter 2 beginning on page 38 and summarized in Table 68, page 103. Chapter 4 presents the predicted effects of all alternatives, in this Chapter the predicted attainment or non-attainment of the recommended project objectives and the predicted effects on the quality of the human environment. The no action alternative analysis shows the current conditions in the following manner:

4.2.1.1—Alternative 1—Early Season Near and peak flows—No Action, page 239;4.2.2.1—High Stream Temperatures—Alternative 1—No Action, page 253; 4.2.3 Treatment Objectives for Aquatic Habitat, page 255; 4.2.3.1—Alternative 1, page 256; 4.2.4.1 & 4.2.5.1—Treatment objectives for HRV and High Wildfire Hazards—Alternative 1, page 263;4.2.6.1—TES Species, MIS and SOI, page 284;4.2.6.1.1—Alternative 1, page 284;4.2.6.2.1.1—Alternative 1, page 297;4.2.6.2.2 Timber Harvest/Prescribed Fire within Old Growth Habitat and Connectivity Corridors, page 300; 4.2.6.2.2.1—Alternative 1, page 300;4.2.6.2.2 Timber Harvest/Prescribed Fire within Old Growth Habitat and Connectivity Corridors, page 300;4.2.6.3—Big Game, page 303; 4.2.6.3.1—Alternative 1, page 303;4.2.6.4—Effects to Goshawks—Treatment in Post-Fledging Areas (PFAs) , page 319;4.2.7 Treatment Objectives for Noxious Weeds, page 320;4.2.7.1—Alternative 1, page 320; 4.3.1—ISSUE 1.4.1—Restricted Access, ALTERNATIVE 1—Restricted Access, page 327; 4.3.2—ISSUE 1.4.2—Effects of All Terrain Vehicle (ATV) use, ALTERNATIVE 1—Effects of ATV use, page 330; 4.3.3—ISSUE 1.4.3—Effects of Ground Based Systems, ALTERNATIVE 1—Ground Based Systems; page 334; 4.3.4—ISSUE 1.4.4—Effects of Heavy Equipment in RHCAs, page 347; 4.3.5—ISSUE 1.4.5—Effects of Prescribed Fire in RHCAs, ALTERNATIVE 1—Prescribed Fire in RHCAs, page 354; 4.3.6—ISSUE 1.4.6—Inadequate RHCA Size, ALTERNATIVE 1—Inadequate RHCA Size, page 358;4.3.7—ISSUE 1.4.7—Blow down in Vincent/Vinegar RHCAs, ALTERNATIVE 1 and ALTERNATIVE 4—Blow down in Vincent/Vinegar RHCAs, page 362; 4.3.8.1—Competing Vegetation, ALTERNATIVE 1—Toxic Chemicals—Competing Vegetation, page 367; 4.3.8.2—Animal Damage, ALTERNATIVE 1—Toxic Chemicals—Animal Damage, page 380; 4.3.8.3—Noxious Weeds, ALTERNATIVE 1—Toxic Chemicals—Noxious Weeds, page 393; 4.3.9— ISSUE 1.4.9—Inadequate Amount of Treatment—Forest Sustainability and Resiliency, Alternative 1—Forest Sustainability and Resiliency, page 400; 4.3.10—ISSUE 1.4.10—Insufficient Pileated Woodpecker Habitat, ALTERNATIVE 1—Insufficient Pileated Woodpecker Habitat, page 409;ALTERNATIVE 1—Retaining Additional Wildlife Snags, page 412; 4.3.11—Issue 1.3.11–Effects on Connectivity for Wildlife, ALTERNATIVE1—Connectivity for Wildlife, page 415; 4.3.12—ISSUE 1.4.12—Effects of Managing Roadless Areas, ALTERNATIVE 1—Roadless Areas, , page 421; 4.4.1 TIMBER-HARVEST RELATED EMPLOYMENT, ALTERNATIVE 1—Timber-Harvest Related Employment, page 429 4.4.2 Restoration Opportunities for Local Communities, ALTERNATIVE 1—Restoration Opportunities for Local Communities, page 431; 4.4.3 POPULATION CHANGES, ALTERNATIVE 1—Population Changes, page 434; 4.4.4 RECREATION USEALTERNATIVE 1—Recreation use , page 435; 4.4.5—Heritage Resources, ALTERNATIVE 1—Commercial Thinning, page 440; Alternative 1—Prescribed Fire, page 441; ALTERNATIVE 1—In-Stream Hydrological Projects, page 442; 4.4.6 Non-timber Forest Products, ALTERNATIVE 1—Non-Timber Forest Products, page

442; 4.4.8 Rangeland, ALTERNATIVE 1—Rangeland, page 445; 4.4.9 Attitudes, Beliefs And Values, ALTERNATIVE 1—Attitudes, Beliefs and Values, page 447; 4.4.10 Human Health and Safety, ALTERNATIVE 1—Human Health and Safety, page 449; 4.4.11 American Indian Tribes, ALTERNATIVE 1—American Indian Tribes, page 452;4.4.12 Environmental Justice, ALTERNATIVE 1—Environmental Justice, page 454;4.4.13 Financial Viability Of Timber Harvesting, page 455;4.5 Synergistic Effects, page 460.

Step 4: Description of Reference Conditions

The purpose of Step 4 is to explain how ecological conditions have changed overtime as a result of human influence and natural disturbances. The Interdisciplinary Team has identified seven undesired conditions,(see 1.2.1 Undesired Conditions, beginning on page 8) which are relevant to the desired conditions (see 1.2.2 Desired Conditions which begin on page 21). Each of the undesired conditions explain how historical conditions have changed and the desired conditions have a reference of how conditions could be restored to reflect referenced historical conditions, or how restoration could be accomplished so that over time conditions would move in a direction toward these reference conditions (see Summary Table 2—Undesired/Desired Conditions Matrix., page xvii). Chapter 3, page 111 gives an analysis of how current conditions developed over the period that the system evolved. Section 3.2.0—Existing Conditions, page 113 are broken in to the following sections:3.1.0—Overview of Existing Conditions, 3.2.0—Existing Conditions, page 113; 3.2.1—Early Season Peak Flows, 3.2.2—Stream Temperatures, page 124; 3.2.3 Aquatic Habitat, page 125; 3.2.4 Vegetation by Forest Type, page 139; 3.2.5 High Wildfire Hazard, page 159; Recent Uncharacteristically Severe Wildfire—Summit Fire, page 159; 3.2.6 Wildlife Habitat, page 165; 3.2.7—Noxious Weeds, page 203; 3.3.0 Roadless Character, page 204; 3.3.1—Dixie Butte Roadless Area, page 204; 3.3.2—Greenhorn Mountain Roadless Area, page 207; 3.4.0—HUMAN USE, page 209; 3.4.1 History of the Analysis Area, page 209; 3.4.2 Austin, Bates and Greenhorn, page 212; 3.4.3 Social and Economic Factors, page 212; 3.4.4—Heritage Resources, page 231; 3.4.5—Roads, page 232; 3.4.6—Local Communities, page 233, 3.4.7—Social Values and Beliefs; 3.4.7—Social Values and Beliefs, page 234; 3.4.8—American Indian Tribes, page 235; 3.4.9—Environmental Justice, page 235. Key management plan objectives can be found in Section 1.5.2 Planning Documents, page 36.

Step 5: Synthesis and Interpretation of Information

With this analysis the Forest Service has considered the intermediate or mid- scale cumulative effects of implementing aquatic and vegetation treatments to bring conditions back within a range of sustainability. This is a step beyond normal watershed analysis and provides in-depth analysis, particularly the analysis of environmental consequences (see Chapter 4.0—Environmental Consequences, beginning on page 237). Analysis of the No Action Alternative provides a rationale for implementing future action in these seven subwatersheds. By examining the effects of undesired conditions that remain untreated and comparing the existing conditions of Alternative 1, the No Action alternative, (e.g., 4.2.1.1—Alternative 1—Early Season Near and peak flows—No Action, page 239) with the reference conditions described in Chapter 3 (e.g., 3.2.1—Early Season Peak Flows, page 113)of specific ecosystem elements will show the significant differences, similarities, and trends and their causes. The capabilities of achieving management plan objectives can also be evaluated. By comparing further analysis of recommended action in Alternative 2, will show how the implementation of projects which address these conditions would begin to establish a level of resiliency across the landscape of the analysis area (e.g., 4.2.1.2—Early Season Near and peak flows—Alternative 2, page 240, through, 4.2.7.2—Alternative 2, page 323). Other action alternatives to recommended action (Alternative 3, 4, 5) when considered in a comparative manner will demonstrate a range of response to treatment that will allow future projects to gauge recommended implementation and to judge the cumulative effects of treatment. Future projects may then propose a narrower range of alternatives that come closer to the purpose and need of management activity.

Interdisciplinary Team has identified undesired conditions,1.2.1 Undesired Conditions, beginning on page 8, which are relevant to the Desired Conditions in 1.2.2 Desired Conditions which begin on page 21. By comparing the existing and reference conditions of specific ecosystem elements found in Chapter 3, and looking at the analysis of trends and their causes from the following portions of analysis in the no action alternative, with reference conditions found in Chapter 3, and their counter-part in Alternative 2, the capability of the system to achieve key management objectives can then be succinctly evaluated by a comparison with treatment objectives of Alternative 2. What follows is an index of Alternative 1 No action alternative with an analysis of trends, cause and effect relationships, examined next to treatment objectives in Alternative 2, the Recommended Action.

4.2.1.1—Alternative 1—Early Season Near and peak flows—No Action, page 239; cf., 4.2.1.2—Early Season Near and peak flows—Alternative 2, page 240; 4.2.2.1—High Stream Temperatures—Alternative 1—No Action, page 253; cf., 4.2.2.2—High Stream Temperatures-Alternative 2, page 253; 4.2.3 Treatment Objectives for Aquatic Habitat, page 255; 4.2.3.1—Alternative 1, page 256; cf.,4.2.3.2—Alternative 2, page 256 ; 4.2.4.1 & 4.2.5.1—Treatment objectives for HRV and High Wildfire Hazards—Alternative 1, page 263; cf., 4.2.4.2 & 4.2.5.2—Treatment objectives for HRV and High Wildfire Risk—Alternative 2, page 267; 4.2.6.1—TES Species, MIS and SOI, page 284; cf Old Growth Habitat and Connectivity—Alternatives 2, 3, 4 and 5, page 297;4.2.6.2.1.1—Alternative 1, page 297; cf,, 4.2.6.2.2.2—Alternative 2, page 301; 4.2.6.2.2 Timber Harvest/Prescribed Fire within Old Growth Habitat and Connectivity Corridors, page 300; 4.2.6.2.2.1—Alternative 1, page 300; 4.2.6.2.2 Timber Harvest/Prescribed Fire within Old Growth Habitat and Connectivity Corridors, page 300; 4.2.6.3—Big Game, page 303; 4.2.6.3.1—Alternative 1, page 303; cf.,4.2.6.3.2—Alternative 2 (HEI), page 313; 4.2.6.4—Effects to Goshawks—Treatment in Post-Fledging Areas (PFAs), page 319;cf., Alternatives 2, 3 and 5, page 319;4.2.7 Treatment Objectives for Noxious Weeds, page 320;4.2.7.1—Alternative 1, page 320;cf., 4.2.7.2—Alternative 2, page 323; 4.3.1—ISSUE 1.4.1—Restricted Access, ALTERNATIVE 1—Restricted Access, page 327; cf., 4.3.1—ISSUE 1.4.1—Restricted Access, page 327; 4.3.2—ISSUE 1.4.2—Effects of All Terrain Vehicle (ATV) use, ALTERNATIVE 1—Effects of ATV use, page 330; cf., Alternatives 2 and 3— Effects of ATV use, page 330; 4.3.3—ISSUE 1.4.3—Effects of Ground Based Systems, ALTERNATIVE 1—Ground Based Systems; page 334; ALTERNATIVE 2—Ground Based Systems, page 337;4.3.4—ISSUE 1.4.4—Effects of Heavy Equipment in RHCAs, page 347;ALTERNATIVE 1—Heavy Equipment in RHCAs, page 347; cf., ALTERNATIVE 2 and 5—Heavy Equipment in RHCAs, page 348; 4.3.5—ISSUE 1.4.5—Effects of Prescribed Fire in RHCAs, ALTERNATIVE 1—Prescribed Fire in RHCAs, page 354; cf., ALTERNATIVES 2 & 5—Prescribed Fire in RHCAs, page 356; 4.3.6—ISSUE 1.4.6—Inadequate RHCA Size, ALTERNATIVE 1—Inadequate RHCA Size, page 358; cf., ALTERNATIVE 2—Inadequate RHCA Size, page 359; 4.3.7—ISSUE 1.4.7—Blow down in Vincent/Vinegar RHCAs, ALTERNATIVE 1 and ALTERNATIVE 4—Blow down in Vincent/Vinegar RHCAs, page 362;cf., ALTERNATIVE 2—Blow down in Vincent/Vinegar RHCAs, page 363; 4.3.8.1—Competing Vegetation, ALTERNATIVE 1—Toxic Chemicals—Competing Vegetation, page 367; cf., ALTERNATIVE 2—Toxic Chemicals—Competing Vegetation, page 368; 4.3.8.2—Animal Damage, ALTERNATIVE 1—Toxic Chemicals—Animal Damage, page 380; cf., ALTERNATIVE 2—Toxic Chemicals—Animal Damage, page 380; 4.3.8.3—Noxious Weeds, ALTERNATIVE 1—Toxic Chemicals—Noxious Weeds, page 393; cf., ALTERNATIVE 2—Toxic Chemicals—Noxious Weeds, page 394; 4.3.9— ISSUE 1.4.9—Inadequate Amount of Treatment—Forest Sustainability and Resiliency, Alternative 1—Forest Sustainability and Resiliency, page 400;cf., Alternative 2—Recommended Action—Forest Sustainability and Resiliency, page 402; 4.3.10—ISSUE 1.4.10—Insufficient Pileated Woodpecker Habitat, ALTERNATIVE 1—Insufficient Pileated Woodpecker Habitat, page 409;cf., ALTERNATIVES 2, 4 and 5—Insufficient Pileated Woodpecker Habitat, page 409;ALTERNATIVE 1—Retaining Additional Wildlife Snags, page 412;cf., ALTERNATIVES 2, 4 and 5—Retaining Additional Wildlife Snags412; 4.3.11—Issue 1.3.11–Effects on Connectivity for Wildlife, ALTERNATIVE1—Connectivity for Wildlife, page 415; cf., ALTERNATIVE 2—Connectivity for Wildlife, page 416; 4.3.12—ISSUE 1.4.12—Effects of Managing Roadless Areas, ALTERNATIVE 1—Roadless Areas, , page 421;cf., ALTERNATIVE 2—Roadless Areas, page 423 4.4.1 TIMBER-HARVEST RELATED EMPLOYMENT,

ALTERNATIVE 1—Timber-Harvest Related Employment, page 429; cf., ALTERNATIVE 2—Timber-Harvest Related Employment, page 429; 4.4.2 Restoration Opportunities for Local Communities, ALTERNATIVE 1—Restoration Opportunities for Local Communities, page 431; cf., ALTERNATIVE 2—Restoration Opportunities for Local Communities, page 431 ; 4.4.3 POPULATION CHANGES, ALTERNATIVE 1—Population Changes, page 434; cf., ALTERNATIVES 2, 3, 4 and 5—Population Changes, page 434; 4.4.4 RECREATION USE ALTERNATIVE 1—Recreation use , page 435;.cf., ALTERNATIVE 2—Recreation use, page 436; 4.4.5—Heritage Resources, ALTERNATIVE 1—Commercial Thinning, page 440;cf., ALTERNATIVES 2, 3, 4, & 5—Commercial Thinning, page 441 Alternative 1—Prescribed Fire, page 441;cf., Alternatives 2, 3, 4, and 5—Prescribed Fire, page 441; ALTERNATIVE 1—In-Stream Hydrological Projects, page 442; cf., ALTERNATIVES 2 and 5—In-Stream Hydrological Projects, page 442 ;4.4.6 Non-timber Forest Products, ALTERNATIVE 1—Non-Timber Forest Products, page 442;; cf., ALTERNATIVES 2, 3, 4, and 5—Non-Timber Forest Products, page 443; 4.4.8 Rangeland, ALTERNATIVE 1—Rangeland, page 445;cf., ALTERNATIVES 2, 3, 4 & 5—Rangeland, page 445; 4.4.9 Attitudes, Beliefs And Values, ALTERNATIVE 1—Attitudes, Beliefs and Values, page 447; cf., ALTERNATIVES 2, 3, 4, and 5—Attitudes, Beliefs and Values, page 448; 4.4.10 Human Health and Safety, ALTERNATIVE 1—Human Health and Safety, page 449; cf., ALTERNATIVE 2—Human Health and Safety, page 449; 4.4.11 American Indian Tribes, ALTERNATIVE 1—American Indian Tribes, page 452; cf., ALTERNATIVES 2 and 3—American Indian Tribes, page 453; 4.4.12 Environmental Justice, ALTERNATIVE 1—Environmental Justice, page 454;cf., ALTERNATIVES 2, 3, 4 and 5—Environmental Justice, page 454;4.4.13 Financial Viability Of Timber Harvesting, page 455;4.5 Synergistic Effects, page 460.

Reference conditions can be found in Chapter 3 section, 3.2.0—Existing Conditions, page 113 and are broken in to the following sections:3.1.0—Overview of Existing Conditions, 3.2.0—Existing Conditions, page 113; 3.2.1—Early Season Peak Flows, 3.2.2—Stream Temperatures, page 124; 3.2.3 Aquatic Habitat, page 125; 3.2.4 Vegetation by Forest Type, page 139; 3.2.6 Wildlife Habitat, page 165; 3.2.7—Noxious Weeds, page 203; 3.3.0 Roadless Character, page 204; 3.3.1—Dixie Butte Roadless Area, page 204; 3.3.2—Greenhorn Mountain Roadless Area, page 207; 3.4.0—HUMAN USE, page 209; 3.4.1 History of the Analysis Area, page 209; 3.4.2 Austin, Bates and Greenhorn, page 212; 3.4.3 Social and Economic Factors, page 212; 3.4.4—Heritage Resources, page 231; 3.4.5—Roads, page 232; 3.4.6—Local Communities, page 233, 3.4.7—Social Values and Beliefs; 3.4.7—Social Values and Beliefs, page 234; 3.4.8—American Indian Tribes, page 235; 3.4.9—Environmental Justice, page 235.

Essentially the identified undesired conditions of early peak water flows, elevated stream temperatures, damaged stream segments, deteriorated forest stands, high risk of uncharacteristically severe wildfire, degraded wildlife habitat, and displaced native ground cover due to noxious weed invasions, would all continue as adverse trends if recommended management activities do not occur. Additionally, section 4.5 Synergistic Effects, page 460 provides a synthesis or, "synergistic interaction of different effects,"[8] disclosed under the resource sections that quantitatively and, where necessary, qualitatively interact with each other, using benchmark dates of approximately 5, 10, 50, and 125 years from project completion.

Step 6: Recommendations

Restoration activities are recommended to improve aquatic and vegetative conditions by establishing a trend toward resilient vegetation and properly functioning condition of subwatersheds and streams (ICBEMP 2000). While this analysis is a fine scale compared to other efforts of subbasin review, it is intended as a broad scale analysis to focus on the immediate and perceived problems and make site specific recommendations for considered action. While site specific projects may be considered and implemented at a finer scale, subwatershed by subwatershed. This analysis can facilitate consideration and is subject to change as the finer scale is applied to recommended actions, throughout these watersheds. This analysis originated as a National Environmental Policy Act process from a Notice of

[8] Footnote to CEQ 1997 "Considering Cumulative Effects Under the National Environmental Policy Act" p.8.

Intent to prepare an Environmental Impact Statement (see page 1). The document will follow the format of a Draft Environment Impact Statement to allow more site specific planning in each subwatershed to apply analysis from a general template to potential projects.

Summary Table 1 Recommended, or a Possible Program of Work by Subwatersheds

Restoration Project	Davis/Placer	Vinegar	Vincent	Little Boulder/ Deerhorn	Tin cup/ Little Butte	Butte	Granite Boulder	Totals	Projected Implementation
SWS Number	**30201**	**30203**	**30205**	**30207**	**30209**	**30211**	**30213**		
R_x Fire (acres)	2,033	2,787	3,356	6,679	4,354	1,363	1,077	21,649	2002-2010
Pre-commercial Thinning/with Wildlife and silviculture objectives (acres)	625	725	452	827	171	307	0	3,107	
Mechanical Treatment (acres logged)	1818	1717	1597	1902	2008	686	0	9,728	
Placement of LWD in Bull Trout streams(acres)	1.99	3.37	0	0	0	9.94	12.77	28.07	
Culvert Replacements/ Improvements (fish bearing streams)	1	6	5	3	8	2	4	29	
Spot planting of Riparian conifers along bull trout Streams(acres)	0	5.84	0	0	0	0	0.99	6.83	
Caging and Fencing Hardwoods(acres)	1.99	1.99	0	5.83	0	2.16	0	11.97	
Planting Riparian Hardwoods(acres)	.99	3.18	1.93	1.99	2.51	0	0	10.6	
Watershed Improvement Projects(acres)	0	834.93	188.38	20.74	25.82	9.98	134.4	1,214.25	
Modification of in-stream structures(acres)	0	0	0	16.81	0	0	0	16.81	
Aspen Enhancement(acres)	2.89	9.07	6.28	4.93	85.38	0	0	108.55	
Noxious Weed Treatment (acres) *Does not include MNF Weed EA Rx treatment which overlaps all these SWS.*	2.02	8.52	8.7	8.33	2.35	0.57	1.59	32.08	
Recommended Decommission of Trails(miles)	0.0	0.0	0.0	0.0	0.0	0.95	0.74	1.69	
Recommended Improvement of Trails(miles)	3	0.42	0.0	1.8	1.65	1.76	0.0	8.63	

Restoration Project	Davis/Placer	Vinegar	Vincent	Little Boulder/ Deerhorn	Tin cup/ Little Butte	Butte	Granite Boulder	Totals	Projected Implementation
SWS Number	**30201**	**30203**	**30205**	**30207**	**30209**	**30211**	**30213**		
Recommended New Trail Construction(miles)	0.0	0.0	0.0	0.03	0.0	0.5	1.26	1.76	
Trailhead Decommission(sites)	0.0	0.0	0.0	1	0.0	1	1	2	
New Trailhead(sites)	0.0	1	0	0.0	0.0	1	0.0	2	
Deerhorn campground(acres)	0.0	0.0	0.0	2.53	0.0	0.0	0.0	2.53	
Dispersed Recreation site improvements(acres)	0.0	0.0	3.54	2.79	4.64	0.0	0.0	10.97	
Dispersed Recreation site relocation (acres)	0.0	0.0	14.04	0.0	2.49	0.0	0.0	16.53	
ATM▲									
Constructed Miles	2.7	5.4	4.8	5.8	3.3	0.3	0.1	22.4	
Minor Reconstructed Miles	14.9	4.1	1.2	7.7	5.5	2.9	4.7	41	
Major Reconstructed Miles	14.4	26.2	23.1	19.4	17.1	13.9	16.2	130.3	
Decommissioned Miles	9.2	11.4	5.9	10.6	7.9	8.0	8.9	61.9	
▲ Figures for roads represent Alternative 5 data (ATM-A see Appendix E, Map 30), however the recently completed *Southeast Galena Roads Analysis* 2002, *Appendix G* reflects more recent data, and new agency definitions for roads numbers from Appendix G will differ slightly from these figures.									

ANALYSIS IN SUMMARY—RECOMMENDED ACTION IN SUMMARY

The following is a summary of the almost 500 pages of analysis, and another 400 pages of specialist reports and Appendices. The Southeast Galena DEIS was written designed with 4 action alternatives which specifically addressed aquatics, vegetation and infrastructure projects. This analysis is no longer being considered, as a decision document and now is an analysis tool for future projects in these "key subwatersheds."

Aquatics Projects

Past land management has changed disturbance regimes, leading to simplified aquatic habitats and declines in water quality in the analysis area (see Sections 1.2.1.1 Undesired Condition: Early Season Peak Flows, page 8,1.2.1.2 Undesired Condition: High Stream Temperatures, page 10, and1.2.1.3 Undesired Condition: Damaged Aquatic Habitat, page 11). Geologic and climatic setting and changes in disturbance regimes present both opportunity and risk in attempting to restore aquatic habitats and change hydrologic processes. This analysis presents a range of action (see Chapter 2 beginning on page 38) and expected consequences of restoration activity (see Chapter 4 beginning on page 237). A finer scale analysis in implementation of recommended action will clarify risks for a decision maker and regulatory agencies on a site specific basis. The alternatives presented in this document (Galena WA, Supplement—2002) or another reasonable range of alternatives may be recommended for future efforts. Currently, in the subwatersheds of the analysis area, upland, riparian, and stream channel conditions cause peak stream flows in early spring which allows water to leave the landscape early in the season. These peak stream flows in early spring has the consequence of low water flow and high water temperatures during late summer months. This analysis clearly shows that aquatic restoration projects, if implemented could improve hydrologic/fisheries conditions such as: stream-channel stability, and riparian shade. Additionally, some restoration projects that have been considered could restore the disengagement between stream channel and floodplain, and restore the meandering nature of streams. To improve hydrologic function and fisheries habitat, projects within certain stream channels could be implemented by the use of heavy equipment. By recommending project actions implementation could move hydrologic/fisheries conditions toward a Properly Functioning Condition (ICBEMP 2000).

While some riparian areas are slowly improving naturally, the implementation of aquatic projects similar to those in this assessment could begin an acceleration of improvement in a manner that threatened fish populations would begin to benefit from an improved riparian environment soon after implementation. Such actions may be vital to threatened species as these areas have the viability of being restored to historic conditions or establish trend that move aquatic areas in a direction similar to historic conditions.

Vegetation Projects

Current vegetation conditions are not within the Historic Range of Variability (HRV), with smaller trees than existed in historic unaltered forests and a higher proportion of small fire prone fir trees rather than the more fire resistant Ponderosa pine and western larch (see 1.2.1.4 Undesired Condition: Vegetation Outside Historical Range of Variability, page 14). The consequence of this change is an increase in insect damage to trees, and an increase in disease damage to trees which has resulted in an increase in tree mortality compared to historic levels of mortality. With the consequent increase in tree mortality, added fuels and a tendency toward crown fires, the increase in the size and severity of wildfires when compared to historical conditions has been prevalent (see 1.2.1.5 Undesired Condition: High Wildfire Hazard, page 17). The recommended action could initiate restoration across the landscape by thinning the crowded stands of trees and shifting the species composition back to a more resilient mix. Approximately 20% of the analysis area could be mechanically treated by commercial harvest (commercial thinning, understory removal, salvage, and shelterwood treatments), 6% could be precommercial thinned, and 23% of the analysis area could have prescribed fire introduced outside of the

prescribed mechanical treatment areas (most areas mechanically treated could also be prescription burned). These treatments are designed to move vegetative conditions such as forest stand structure and tree species mix toward an historic range. Prescribed fire and mechanical methods are a means to accomplish this transition. This includes intermediate treatments (thinning of mostly small-diameter trees), within the Malheur National Forest *Land and Resource Management Plan*[9] (LRMP) designated Roadless Areas (*Land and Resource Management Plan* Appendix C).

The harvesting of commercial wood products could be accomplished by tractor, skyline, and helicopter yarding systems. A number of wood products including commercial timber, post and poles, pulp wood, fire wood, and other wood products such as biomass could be an outcome of these treatments.

Some restorative activities such as riparian shrub planting described above could begin in 2002 and the Vincent Vinegar Creek would begin in 2003, while most actions could be completed within the next five years. However, some of the restorative measures, such as prescribed fire and road work may take longer than five years due to timing opportunities, funding, and safety factors. Because safety and other factors must be applied on a project-by-project basis, it is estimated that fire prescriptions may take up to ten years to complete. In 3 to 5 years, projects such as prescribed fire will be evaluated to ensure management direction and intent is being met at that time.

A *Land and Resource Management Plan* non-significant amendment may be needed to reduce big game cover below standards in summer range in the Little Boulder/Deerhorn subwatershed for summer range and to modify existing Dedicated Old Growth (DOG) and Replacement Old Growth (ROG) boundaries other *Land and Resource Management Plan* non-significant amendments may be needed as well. As the Galena Watershed Analysis recommended projects analyzed in this document (Galena WA, 1999) and adhered to the Federal Guide to Guide for watershed analysis, this supplementary document (Galena WA, Supplement—2002) maintains a format as per CEQ regulations to facilitate future NEPA project work in the subwatershed of the analysis area.

Infrastructure Projects

Some roads or road segments that are currently located in Riparian Habitat Conservation Areas (RHCAs) and reducing shade or increasing sediment to streams, could be relocated to reduce these adverse aquatic impacts. The relocated roads or road segments could be constructed outside of the RHCA, and the old locations could be decommissioned. In some areas planned for vegetation management, new roads could need to be constructed to provide for access. Many of the new roads could be closed upon completion of project activities. Existing roads that are still needed to provide access for management or recreation could receive reconstruction or maintenance work to improve user safety and reduce road related impacts to other resources. Roads no longer needed for management or recreation access could be decommissioned and removed from the transportation system.

9 Malheur National Forest *Land and Resource Management Plan* 1990 (also referred to as the LRMP or LRMP)

PURPOSE OF RECOMMENDED RESTORATION AND THE NEED FOR ACTION

- Improve riparian conditions in reaches of streams which do not presently have the ability to meet Riparian Management Objectives. Considered activities with this purpose will fall under the category of **Aquatic Projects** and relate to the needs of hydrology and fisheries.
- Improve the health, vigor, and resiliency of forest vegetation by actively managing forest stands toward the historic range of variability. Considered activities with this purpose could fall under the category of **Vegetation Projects** and relate to the needs of forest stands, understory vegetation, aspen, and noxious weeds.
- Reduce impacts from roads, trails, and camping facilities, specifically impacts to water quality, fish habitat, and wildlife habitat. Considered activities with this purpose will fall under the category of **Infrastructure Projects**. While these activities benefit fisheries needs, as do the Aquatic Projects—they are related to road and trail system administrated by the Forest Service and are tracked separately.

Undesired/Desired Conditions

The following table displays the identified undesired conditions and the desired condition with a statement of need. The difference between the undesired and desired conditions are the basis and foundation of the preceding underlying purpose and need to which the agency is responding in recommending the above action. A complete discussion of these conditions can be found on the appropriate page numbers.

Summary Table 2—Undesired/Desired Conditions Matrix.

UNDESIRED CONDITONS	DESIRED CONDITIONS	STATEMENT OF NEED
1.2.1.1-Across the landscape, peak stream flows in early spring are intensified, reducing water availability for late season flows.(see page 8)	1.2.2.1-By implementing aquatic, vegetation and infrastructure projects, cool water is held for longer periods across the landscape of the analysis area and available in late summer/early fall for fish and wildlife species. (see page 21)	A need exists to capture and hold water into the summer/fall season making water available for fish and wildlife species during this critical time of year.
1.2.1.2-A number of streams do not meet Federal Clean Water Act standards and are on the State 303(d) List of Water Quality Limited Waterbodies (1998). (see page 10)	1.2.2.2-With aquatic and infrastructure projects, improved habitat conditions and lowered temperatures for streams within the analysis area are in a manner that sustains viable populations of threatened fish species. (see page 22)	A need exists to lower stream temperatures that are on the 303(d) List of Water Quality Limited Waterbodies (1998) toward Federal Clean Water Act standards.
1.2.1.3-Some stream segment habitat conditions are outside an expected range for fish species. (see page 11)	1.2.2.3-By implementing aquatic projects damaged stream segments within the analysis area are repaired and habitat is created that improves and sustains viable fish populations. (see page22)	A need exists to correct damaged stream segments in a manner that demonstrates aquatic habitat conditions that are capable of sustaining viable populations of fish species.
1.2.1.4-Vegetation conditions are outside the historic range of variability for the current climatic period.(see page 14)	1.2.2.4-By implementing vegetation and infrastructure projects, resilient plant life dominates the landscape of the analysis area that now has the ability to withstand endemic disturbance regimes of insect infestation, disease infections, and wildfire. (see page 24)	A need exists to alter deteriorating forest stands across the landscape, moving conditions toward historic forest stand structure, composition, and density in a resilient manner and range that withstands endemic, natural disturbance factors such as disease infection, insect infestation and low intensity wildfire.
1.2.1.5-Uncharacteristically severe wildfires are likely to occur. (see page 17)	1.2.2.5-By implementing vegetation and infrastructure projects, fire adapted forest stands once again dominate the landscape	A need exists to change stand structure, landscape vegetation patterns, and species composition across the landscape in order

UNDESIRED CONDITONS	DESIRED CONDITIONS	STATEMENT OF NEED
	in a mosaic pattern where wildfires normally burn with low intensity over most of the area. (see page 25)	to construct a reasonable replica of historic conditions and reduce the likelihood of uncharacteristically severe wildfire, destroying multiple resources and human values.
1.2.1.6-Terrestrial Wildlife habitat is currently degraded or missing essential components because of past activities. (See page 18)	1.2.2.6-By implementing vegetation and infrastructure projects, resilient patterns, corridors, linkages, and forest stands once again dominate the landscape and are resilient to endemic disturbances and provide proper structure and cover for wildlife. (see page 27)	A need exists to restore deteriorating wildlife habitats.
1.2.1.7-Noxious weeds are invading the ecosystem and displacing native species. (see page 20)	1.2.2.7-By implementing aquatic, vegetation, and infrastructure projects, the landscape is free of noxious weeds and supports native ground cover. (see page 28)	A need exists to remove populations of noxious weeds in the analysis area and replace these affected areas with a healthy native vegetation ground cover that can resist the further spread of noxious weeds.

SCOPING

The Forest Service requested information and comments from Federal, State, and local agencies; tribes; and other groups or non-governmental agencies as well as individuals interested in or affected by the recommended action. The responses received during this scoping process were grouped into the following issue statements.

Issues Studied in Detail

The following issues statements derived from the scoping process, were used in formulating the range of alternatives.

ISSUE #1—Restricted Access

Issue Statement: *The Agency's recommended action to decommission and close a number of roads will reduce motorized access within the analysis area.*

ISSUE #2—Effects of All Terrain Vehicle (ATV) use

Issue Statement: *The Agency's proposal is inadequate in addressing ATV use that is causing resource damage, especially within RHCAs.*

ISSUE #3—Effects of Ground Based Systems

Issue Statement: *The Agency's recommended action of tree harvest with associated activities could cause unnecessary damage to the hydrologic function of the area's soils and streams.*

ISSUE #4—Effects of Heavy Equipment in RHCAs

Issue Statement: *The Agency's proposal of using heavy equipment within RHCAs to create a meandering nature to stream channels, enhance aspen stands, and to place in-stream structures may damage stream channel functioning.*

ISSUE #5—Effects of Prescribed fire in RHCAs

Issue Statement: *The Agency's proposal to allow prescribed fire to burn within some Riparian Habitat Conservation Areas (RHCAs) will reduce riparian vegetation, and may decrease shade and soil holding capacity.*

ISSUE #6—Inadequate RHCA Size

Issue Statement: *The Agency's design to apply Pac Fish buffers may be inadequate in size to protect fish and their habitat.*

ISSUE #7—Impacts from Activities within RHCAs

Issue Statement: *The Agency's recommended action to remove material from within RHCAs may adversely impact the riparian resource and harvest associated activities with new stream crossings may reduce riparian functioning.*

ISSUE #8—Effects of Toxic Chemicals

Issue Statement: *The Agency's proposal to use chemicals to control competing vegetation, noxious weeds, and pocket gophers may pose harmful risks to aquatic and terrestrial wildlife and to humans during use of the area.*

ISSUE #9—Inadequate Amount of Treatment

Issue Statement: *Current forest stand composition and structure predispose stands toward a risk of uncharacteristically large, severe fire, insect infestations, and disease infections. The Agency's recommended action does not manage enough forest stands to adequately meet the purpose of this action of returning this area to a historic range of variability for stand composition and structure.*

ISSUE #10—Insufficient Pileated Woodpecker Habitat

Issue Statement: *The proposal does not adequately address needed habitat for pileated woodpeckers according to current scientific literature (i.e., 1993 study by Bull and Hothausen).*

ISSUE #11—Effects on Connectivity for Wildlife

Issue Statement: *The Agency's proposal needs to manage wildlife corridors for old growth dependent species (LRMP Amendment #2 connectivity) and the Key Linkage Areas (KLA)s for wide-ranging carnivores more aggressively to reach the forest stand HRV.*

ISSUE #12—Effects of Managing Roadless Areas

Issue Statement: *Roadless areas provide large, relatively undisturbed landscapes, which are important to biological diversity and the survival of species dependent upon the "undisturbed character," of these areas. Management could alter this character as well as the quality of dispersed outdoor recreation for undisturbed open space and natural settings.*

DECISION FRAMEWORK

After project specific NEPA is complete the Responsible Official may decide whether or not to:

Select the Recommended Action,

Select an alternative to the Recommended Action, or

Select portions from the developed range of alternatives and combine them in a logical package as long as the combined effects are fully disclosed and understood.

In selecting one of the above options, the terms and conditions of the selection will by fully displayed and understood. Within the parameters of this decision space, it will also be determined if a *Land and Resource Management Plan* amendment could be necessary.

This analysis documents the results of the anticipated effects of the alternative of no action and range of action alternatives. From these results, the responsible official will have considered appropriate options in making sound environmental decisions and the responsible official will have been as well, properly informed of the disclosure of anticipated environmental effects.

ALTERNATIVE FRAMEWORK

For a better understanding of specific components of alternatives, refer to the alternative comparison table after the alternative descriptions.

Alternative 1—No Action

This alternative provides a baseline for comparison with the action alternatives and is required under 40 CFR 1502.14(d) when completing an Environmental Impact Statement or an Environmental Assessment.

No new management actions would occur, however present management projects could continue at current levels. The identified undesired conditions of early peak water flows, elevated stream temperatures, damaged stream segments, deteriorated forest stands, high risk of uncharacteristically severe wildfire, degraded wildlife habitat, and displaced native ground cover due to noxious weed invasions would all continue at there current condition with adverse trends expected to continue. Disturbance risks of uncharacteristically severe wildfire, higher than normal levels of insect infestation, and debris slides are expected to continue.

Alternative 2—Recommended Action

This alternative would initiate restoration management across the landscape: this includes 20% mechanical treatment by commercial harvest; 6% mechanical treatment by pre-commercial thinning; and prescribed burning on 47% of the Analysis Area (Galena WA, Supplement—2002) . The total Analysis Area (Galena WA, Supplement—2002) includes National Forest land and other ownerships encompassing seven subwatersheds totaling 49,473 acres of the greater Galena Watershed (see Map A Vicinity Map page i). Restoration projects are designed to begin reversing adverse hydrologic/fisheries and vegetation trends while accelerating other slowly improving riparian trends. Project activities would improve hydrologic/fisheries conditions such as stream-channel stability, riparian shade, stream meander, and peak stream flows in early spring toward their properly functioning condition. Heavy equipment would be used within stream channels to improve hydrologic function and fisheries habitat.

Vegetation projects are designed to move forest stands and associated vegetation such as stand structure and tree species mix toward their historic range. New roads would be included in this proposal to access areas for management as well as relocate other roads currently located in RHCAs. Most new roads would be closed upon completion of these projects and a number of roads no longer needed for management, recreation access, or are causing resource damage would be decommissioned and removed from the transportation system. Prescribed fire and mechanical methods, including commercial harvest using tractor, skyline, and helicopter systems and precommercial thinning would be used to implement vegetation prescriptions in order to improve and enhance the growth, quality, vigor, and resiliency of forest stands across the landscape. This includes intermediate treatments (thinning), within the Malheur National Forest *Land and Resource Management Plan* designated Roadless Areas (LRMP Appendix C). A number of wood products including commercial timber, post and poles, pulp wood, fire wood, and biomass for power generation would be realized with this treatment. Aspen stands would also be enhanced through a number of restoration projects including felling or girdling of encroaching conifer, hand piling and burning of slash, planting of aspen, and fencing to discourage ungulate pressure. Trees felled within conifer treatment in aspen sites, which occur in RHCAs may be removed as long as down and in stream LWD standards are met.

Aquatics Projects

While some riparian areas are slowly improving naturally, implementation of aquatic projects now, would begin accelerating conditions in a manner that threatened fish populations begin to benefit from an improved riparian environment at the time of implementation. Aquatic project activities would improve hydrologic/fisheries conditions such as: stream-channel stability; riparian shade; and the lack of a meandering nature the streams currently exhibit. These conditions collectively cause peak stream flows in early spring to allow too much water to leave the landscape too soon, with the consequence of low water flow and high water temperatures during late summer months. To improve hydrologic function and fisheries habitat, some projects within certain stream channels would be implemented by the use of heavy equipment. Project actions would improve hydrologic/fisheries conditions toward a properly functioning condition.

Vegetation Projects

This recommended action would initiate restoration management across the landscape: this includes 20% mechanical treatment by commercial harvest; 6% mechanical treatment by pre-commercial thinning; and prescribed burning on 47% of the Analysis Area (Galena WA, Supplement—2002) . A

number of projects are designed to move vegetative conditions such as forest stand structure and tree species mix toward an historic range. Prescribed fire and mechanical methods accomplish this transition. Mechanical methods include: commercial harvest implemented by tractor; skyline; and helicopter systems. Additionally, pre-commercial thinning would be used to implement vegetation prescriptions in order to improve and enhance the growth, quality, vigor, and resiliency of forest stands across the landscape. This includes intermediate treatments (generally small-diameter trees), within the Malheur National Forest *Land and Resource Management Plan*[10] designated Roadless Areas (LRMP Appendix C). A number of wood products including commercial timber, post and poles, pulp wood, fire wood, and other wood products such as biomass would be an outcome of these treatments.

Infrastructure Projects

Some roads or road segments that are currently located in Riparian Habitat Conservation Areas (RHCAs) would be relocated. For the location of Riparian Habitat Conservation Areas see Appendix E, Map 3—Management Areas and Roadless Areas and Map 29—Access Travel Management Plan Alternatives 2, 3, and 4. The relocated roads or road segments would be constructed outside of the RHCA area, and then the old locations would be decommissioned. New roads would be constructed to access areas for prescribed vegetation management where necessary. Many of the new roads would be closed upon completion of project activities. Existing roads that are still needed to provide access for management or recreation would receive reconstruction or maintenance work needed to improve user safety and reduce road related impacts to other resources. Roads no longer needed for management or recreation access would be decommissioned and removed from the transportation system.

To see specific project intensity for all projects, refer to Table 68, page 103. See also Appendix E, Map 8—Stream and Riparian Rehabilitation for Action Alternatives; Map 13—Recommended Logging Systems Alternative 2; Map16—Prescribed Fire Opportunities Alternative2 and 5; Map 20—Wildlife Connectivity—For Action Alternatives; Map 29—Access Travel Management Plan Alternatives 2, 3, and 4; Map 31—Recommended Trails, Trailheads, and Campsite Projects—For Action Alternatives; Map 28—Noxious Weed Sites—Existing Condition; and Map 9—Recommended Mechanical Treatments Alternative 2.

A non-significant Land and Resource Management Plan amendment would be required to :

- Reduce big game cover below *Land and Resource Management Plan* standards (in summer range) in the Little Boulder/Deerhorn subwatershed.

Modify existing DOG/ROG boundaries to match logical topographical features such as stream and roads and/or existing stand boundaries, and to meet minimum *Land and Resource Management Plan* standards.

Alternative 3—Reduced Short-Term Impacts

This alternative strives to reduce potential short-term impacts to the analysis area from direct impacts from the long-term restoration treatments. For instance, only hand crews would be used to implement instream projects and heavy equipment would not be used. Approximately 15% of the analysis area would be mechanically treated by commercial harvest (commercial thinning, understory removal, salvage, and shelterwood treatments), 5% would be precommercial thinned, and 22% of the analysis area would be prescribed burned outside mechanical treatment areas (most areas mechanically treated would also be prescribed burned). There would be no use of chemical herbicides or rodenticides for seedling protection. There would not be any commercial harvesting in *Land and Resource Management Plan* inventoried roadless areas. The same access management plan would be implemented as for Alternative 2, with a few minor differences due to the reduced harvesting. Products such as commercial timber, post & poles, pulpwood, biomass, and firewood would still be realized.

10 Malheur National Forest *Land and Resource Management Plan* 1990 (also referred to as the Forest Plan or LRMP)

A *Land and Resource Management Plan* non-significant amendment would be needed to modify existing DOG and ROG boundaries and to expand pileated woodpecker feeding areas.

Alternative 4—No Harvest Restoration

Alternative 4 strives to enhance and improve the area's vegetative processes with out the use of commercial harvest. The area's vegetation will be treated by use of prescribed fire on 39% and precommercial thinning on 6% of the analysis area (2/3 of the thinning would be prescribed burned, 1/3 would not). Trees would not be removed as a timber sale product. Some relocation of roads out of RHCAs would occur and no heavy equipment would be used within stream channel restoration projects. Prescribed fire and pre-commercial thinning would occur within the *Land and Resource Management Plan* inventoried roadless areas. See the comparison table below for more detail.

A *Land and Resource Management Plan* non-significant amendment would be needed to modify dedicated old growth areas to logical boundaries and to reduce big game cover below standards in Little Boulder/Deerhorn Subwatershed for summer Range. A significant amendment would be needed to change the Davis Creek Trail from motorized to non-motorized use.

Alternative 5—Reduced Helicopter Logging; Increased Access

This Alternative was designed to address ISSUE #1—Restricted Access(see page 30) and ISSUE #9—Inadequate Amount of Treatment (see page 33). Alternative 5 is more aggressive in treating vegetation to increase sustainability and resiliency. Approximately 23% of the analysis area would be mechanically treated by commercial harvest (commercial thinning, understory removal, salvage, and shelterwood treatments), 6% would be precommercial thinned, and 22% of the analysis area would be prescribed burned outside mechanical treatment areas (most areas mechanically treated would also be prescribed burned).

This alternative reduces harvesting costs by incorporating more tractor skidding and less helicopter yarding. This alternative would require additional new roads and would leave more roads open than recommended in Alternatives 2 or 3. Identified roads no longer needed for management, recreation access, or are causing resource damage would be decommissioned and removed from the transportation system. Hydrologic/fisheries projects are similar to Alternative 2 in that heavy equipment would be used within stream channels. The *Land and Resource Management Plan* inventoried roadless areas would also receive more treatment than in Alternative 2. Various wood products would be realized as in Alternative 2.

A *Land and Resource Management Plan* non-significant amendment would be needed to reduce big game cover below standards in Little Boulder/Deerhorn, Vincent, and Vinegar Subwatersheds for summer range; reduce big game cover below standards in Tincup/Little Butte Subwatershed for winter range; increase open road densities beyond standards in Vincent Subwatershed for summer range and Little Boulder/Deerhorn and Butte Subwatersheds for winter range; and to modify existing DOG and ROG boundaries.

Design Summary of Action Alternatives

The following tables summarize features of the aquatic, vegetation, and infrastructure projects per alternative in a side-by-side comparison.

Summary Table 3—Aquatic Project Design

PROJECT	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Hydrology				
Streamside/Riparian Hardwood Protection	4 Miles 12 Acres	4 Miles 12 Acres	4 Miles 12 Acres	4 Miles 12 Acres
Streamside/Riparian Hardwood Planting and Protection	16 Miles 16 Acres	16 Miles 16 Acres	16 Miles 16 Acres	16 Miles 16 Acres
Channel/Streamside Projects	90 Miles	90 Miles	90 Miles	90 Miles
Area Projects	1,450 Acres	1,450 Acres	1,450 Acres	1,450 Acres
Channel/Floodplain Rehabilitation	3 Miles 14 Acres	0 Miles 0 Acres	0 Miles 0 Acres	3 Miles 14 Acres
Fisheries				
New Instream Structures	79 Structures	0 Structures	0 Structures	79 Structures
Improve Existing Instream Structures	36 Structures	36 Structures ▲	36 Structures ▲	36 Structures
Riparian Planting ◊	5.5 Miles	5.5 Miles	5.5 Miles	5.5 Miles
Culvert Removal or Replacement	2 Removal 22 Improve or Replace	2 Removal 22 Improve or Replace	2 Removal 22 Improve or Replace	2 Removal 22 Improve or Replace

NOTES: ALT. = Alternative ▲ **=** Would not be implemented if heavy equipment is needed ◊ **=** Work associated with instream structure projects

Summary Table 4—Vegetation Project Design

PROJECT	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Conifer and Associated Vegetation				
Commercial Thin	5,720 Acres	4,390 Acres	0 Acres	7,060 Acres
Commercial Thin 1	1,230 Acres	900 Acres	0 Acres	220 Acres
Shelterwood/Commercial Thin	1,690 Acres	1,200 Acres	0 Acres	2,600 Acres
Salvage	250 Acres	250 Acres	0 Acres	250 Acres
Understory Removal	880 Acres	550 Acres	0 Acres	1,230 Acres
Total Harvest Prescriptions	**9,770 Acres**	**7,330 Acres**	**0 Acres**	**11,350 Acres**
Precommercial Thin	2,160 Acres	1,840 Acres	2,100 Acres	3,080 Acres
Precommercial Thin Within Wildlife Corridors	950 Acres	820 Acres	640 Acres	40 Acres
Tractor Skid	5,090 Acres	4,580 Acres	0 Acres	6,320 Acres
Skyline Skid	2,110 Acres	1,720 Acres	0 Acres	2,610 Acres
Helicopter Yard	2,670 Acres	1,090 Acres	0 Acres	2,570 Acres
Total Harvest Systems				
Roadless Mechanically Treated Acres	930 Harvest	0	203 SPC Only	1,370 Harvest
New Roads	17.7 Miles	17.0 Miles	2.2 Miles	22.2 Miles
Removal of Silviculturally Undesirable Trees	2,570 Acres	1,790 Acres	0 Acres	3,810 Acres
Hand Line needed for Prescribed Burn	37.6 Miles	28 Miles	0 Miles	57.1 Miles
Machine Line needed for Prescribed Burn	11.6 Miles	8.5 Miles	0 Miles	20.6 Miles
Prescribed Burn Associated with Timber Sale	2,550 Acres	1,800 Acres	0 Acres	3,830 Acres
Hand Pile and Burn Associated with Timber Sale	1,250 Acres	940 Acres	0 Acres	1,320 Acres

PROJECT	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Sub-Soil	190 Acres	190 Acres	0 Acres	270 Acres
Competing Vegetation Control	900 Acres	740 Acres !!	0 Acres	1,320 Acres
Conifer Plant	1,930 Acres	1,440 Acres	0 Acres	2,840 Acres
Pocket Gopher Control	1,690 Acres	1,200 Acres !!	0 Acres	2,600 Acres
Ungulate Browse Control	1,690 Acres	1,200 Acres	0 Acres	2,600 Acres
Yard Tops	5,370 Acres	4,730 Acres	0 Acres	5,640 Acres
Reserve Tree Protection ♠	20,230 Trees	15,520 Trees	0 Trees	29,540 Trees
Prescribed Fire ♣	23,750 Acres	19,190 Acres	19,160 Acres	24,770 Acres
Roadless Prescribed Fire	1,500 Acres	720 Acres	720 Acres	1,500 Acres
Total Upland Acres Treated @	**22,010 Acres**	**18,850 Acres**	**19,950 Acres**	**23,000 Acres**
Dedicated Old Growth				
Add Dedicated Old Growth Areas	115 acres	115 acres	115 acres	115 acres
Add Replacement Old Growth Areas	1,592 Acres	1,592 Acres	1,592 Acres	1,592 Acres
Add Pileated Woodpecker Feeding Areas	747 Acres	1,505 Acres	747 Acres	747 Acres
Aspen Stand				
Conifer Treatment	25 Sites	25 Sites	25 Sites	25 Sites
Hand Pile and Burn	25 Sites	25 Sites	25 Sites	25 Sites
Buck & Pole Fence	13 Sites @ 19 Acres	13 Sites @ 19 Acres	13 Sites @ 19 Acres	13 Sites @ 19 Acres
Plastic Fence	12 Sites @ 11 Acres	12 Sites @ 11 Acres	12 Sites @ 11 Acres	12 Sites @ 11 Acres
Noxious Weeds				
Manual Treatment	4 Sites @ 0.4 Acres	10 Sites @ 1.9 Acres	10 Sites @ 1.9 Acres	4 Sites @ 0.4 Acres
Chemical Treatment	6 Sites @ 1.5 Acres	0 Sites	0 Sites	6 Sites @ 1.5 Acres
Treat Quarry Sites	Treat 15 Sites Chemically @ 42 Acres	Treat 15 Sites Manually @ 42 Acres	Treat 15 Sites Manually @ 42 Acres	Treat 15 Sites Chemically @ 42 Acres

NOTES: ALT. = Alternative ♠ **=** Is an average and doesn't include all reserved wildlife trees ♣ **=** Does not include harvest acres already incorporating a burn prescription

Summary Table 5—Infrastructure Project Design

PROJECT	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Roads				
Total Road Miles	**219 Miles**	**218 Miles**	**202 Miles**	**228 Miles**
Total Road Density	2.8 mi/sq. mi.	2.8 mi/sq. mi	2.6 mi/sq. mi	2.9 mi/sq. mi
Reconstructed Roads	165 Miles	165 Miles	165 Miles	171 Miles
Decommissioned Roads	67 Miles	67 Miles	67 Miles	62 Miles
RHCA Decommissioned Roads	23.9 Miles	23.9 Miles	23.9 Miles	23.5 Miles
RHCA Reconstructed Roads	23.2 Miles	23.2 Miles	23.2 Miles	24.7 Miles
Trails and Trailheads				
Decommissioned Trails	1.7 Miles	1.7 Miles	1.7 Miles	1.7 Miles
Reconstructed Trails	8.3 Miles	8.3 Miles	0 Miles	8.3 Miles
Constructed Trails	2.3 Miles	2.3 Miles	2.3 Miles	7.9 Miles
New Trail Heads	2	2	2	2
Removed Trail Heads	4	4	4	4
Dispersed Camp Sites				
New Dispersed Camp Areas	3	3	3	3
Improved Dispersed Camp Areas	2	2	0	2
Removed Dispersed Camp Areas	3	3	3	3

NOTES: ALT. = Alternative

Projects Considered but Eliminated from Detailed Analysis

- Roads in *LRMP* Appendix C—Roadless Areas
- Harvest and prescribed fire in the scenic and wildlife emphasis areas
- Harvest within RHCAs except for blow down area of Vincent and Vinegar Creek, road construction, and aspen groves
- Reconstruction of Forest Road 4559
- Replacement trailhead for Lemon Cabin Trailhead
- Prescribed fire within higher elevation Moist and Cold Forest types

ENVIRONMENTAL CONSEQUENCES PER GROUPED UNDESIRED/DESIRED

The first section displays a comparison of the alternatives by impacts per identified undesired condition. Some of the undesired conditions were grouped due to overlapping impacts and similarities. This second section is similar but displays the anticipated impacts per Issue.

Undesired Condition—Early Season Peak Flows

Undesired Condition—High Stream Temperatures

Undesired Condition—Damaged Aquatic Habitat

The comparison of these three undesired conditions were combined due to their overlapping influences and similarities.

ALTERNATIVE COMPARISON

AQUATIC PROJECTS

Alternative 1 would do nothing to help improve or enhance riparian conditions, thereby no habitat for the fish utilizing these water bodies would be improved. Early season peak flows, in the late season when stream flows are critical, would continue. Stream channels would remain in their current condition, thereby the rapid run-off of water during the spring would continue. Riparian shade would continue to be below potential along many streams, thereby diminishing the ability to maintain cooler water temperatures.

Expected natural recovery trends in Alternative 1 are quite slow and noticeable change is not expected for at least 50 years as riparian vegetation begins to naturally recover and debris recruitment begins to form pools.

Summary Table 2, on page xxiii, displays aquatic projects that would restore and enhance riparian habitat, which in time, would improve hydrologic function and fish habitat. These streamside and instream structure projects are expected to slow overland flow and capture sediment, improving infiltration and reducing run-off. Water storage capacity associated with the improvements and enhancement of currently disconnected floodplains in meadows and seeps/springs is expected to increase. Sediment would be trapped creating additional in-channel storage. Channels would be reconnected to floodplains by developing channel meander and reconnecting side channels. As riparian habitat improves, i.e. vegetation, stream bank stability would improve reducing sediment delivery and channel shape. Stream temperatures are expected to be the maintained once riparian vegetation providing shade is restored. Water is also expected to absorb into the soils replenishing water to the underground aquifers. Alternatives 2 and 5 would use heavy equipment within stream channels to

expedite and maximize effectiveness of improvement projects while Alternatives 3 and 4 would not use heavy equipment.

These benefits from these projects are mainly long-term, but within the first year the healing process will have begun.

VEGETATION PROJECTS

Summary Table 6 page xxvi,displays the potential estimated impacts to the soil types that have differing degrees of sensitivity to harvest activities. The major disturbances of concern are compaction and displacement that influences how storm events and spring runoff respond to soil conditions. The harvest-systems of tractor, skyline, and helicopter are combined in the totals with tractor having the biggest influence on the total estimated disturbance. Alternative 1 is the No-Action Alternative and Alternative 4 has no commercial harvest, therefore, no additional disturbance from harvest activities would occur under these Alternatives.

Summary Table 6—Harvest Area and Estimated Area of Detrimental Disturbance (Acres)

SOIL TYPE	ALT. 2		ALT. 3		ALT. 1 & 4		ALT. 5	
	Total Acres	Est. Dist.	Total Acres	Est. Dist.	Total Acres	Est. Dist.	Total Acres	Est. Dist.
Inclusions, clayey-nonforested	1301	219	1183	205	0	0	1357	228
Clayey, forested	553	109	550	109	0	0	553	109
Ash over clayey	1431	162	628	99	0	0	1657	164
Residual serpentine	60	7	60	7	0	0	41	7
Ash over serpentine	459	55	426	49	0	0	459	55
Ash over granitics	368	44	314	39	0	0	371	44
Miscellaneous	697	83	582	73	0	0	844	96
Other	4722	707	3672	565	0	0	5278	805
TOTAL	**9591**	**1386**	**7415**	**1146**	**0**	**0**	**10560**	**1508**

NOTES: ALT. = Alternative **EST. DIST**. = Estimated Disturbance based on calculation in 2000.

Impacts from post harvest activities, along with applied mitigation, are expected to be negligible on hydrologic function and fish habitat.

Summary Table 8displays the percent of potential disturbance, depending on type of soil and its sensitivity to erosion, to the amount of activity on these soils, including tractor skidding, skyline skidding, and helicopter yarding.

Summary Table 7—Percent Estimated Disturbance to Total Harvest Activity

ALT. 1	ALT. 2	ALT. 3	ALT. 4	ALT. 5
0	14	15	0	14

Prescribed fire is expected to reduce wildfire hazard resulting in decreases of potential uncharacteristic severe wildfire decreasing the extent of soil damage. By reducing risk of the impacts of severe wildfire these soils would allow water absorption and storage capacity to be maintained across the landscape reducing concentrated overland flows, therefore retaining water for longer periods of time. Both recommended harvest and prescribed fire contribute to the reducing fire hazard.

Summary Table 8—Percent Crown Fire Hazard Remaining Per Forest Type Per Alternative

Crown Fire Hazard by Forest Type	ALT. 1 Existing	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Dry Forest					
High	66	44	50	61	40
Low/Moderate	34	56	50	39	60
Moist Forest					
High	60	55	56	59	54
Low/Moderate	40	45	44	41	46

NOTE: ALT. = Alternative

INFRASTRUCTURE PROJECTS

Roads and trails influence water quantity and timing of when run-off is delivered to streams by intercepting surface and subsurface flows, altering flow paths, and accelerating the removal of water from the landscape.

The net result of implementing road decommissioning and constructing projects is displayed on S-Table 8. These decreases would promote the capture, storage, and safe release of precipitation and are expected to reduce risk of road failures at stream and road crossings due to these road removals. Long-term benefits are expected as soon as 10 years and in other areas in 50 years once the initial disturbance is healed and bank vegetation is established.

Vegetation establishment and capture of sediments in newly developed channel meander is expected to occur within the first year of implementation. About 20% of the planted streams are expected to meet *Land and Resource Management Plan* standards for shade before year 50 with other stream segments moving closure toward the standard. The alternative using heavy equipment to improve aquatic habitat is expected to have a larger impact on enhancement of the riparian habitat. Davis, Vincent, Caribou, Butte, Granite Boulder Creeks and along the Middle Fork of the John Day River are where heavy equipment would be used to improve aquatic habitat. The difference in recovery is expected to be delayed for about an additional 40 years in Alternative 3 and 4 as compared to the expected noticeable recovery in about 10 years as projected in Alternative 2 and 5.

Fewer road miles equate to decreased risk or impacts to other resources; however, there would be less access as well effecting recreational and management uses.

Summary Table 9—Transportation System (Miles)

ITEM	ALT. 1 Existing	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Total Miles	267	219	218	202	228
% Change	NA	-18%	-18%	-24%	-15%
Total Miles Decommissioned	0	67	62	62	62
Decommissioned Miles within RHCAs	0	44	44	44	43
Decommissioned Miles on Sensitive Soils	0	55	55	55	52
New Road Miles	0	18	17	2	22
Total Road Density *	3.45	2.83	2.82	2.61	2.95

NOTE: NA = Not Applicable ***** Miles per Square Mile

The recommended recreation decommissioning of the stream-ATV crossings, improvement of trail/stream crossings, relocation of dispersed campsites, and decommission of three dispersed campsites in RHCAs are expected to have similar benefits as above but smaller in scale, however cumulatively with other projects the long-term results will be beneficial.

EQUIVALENT ROADED AREA (ERA)

A computer model was used to rate the overall cumulative impacts on hydrologic function, which directly ties to these undesired conditions. This model gives the reader a relative since of overall hydrologic condition at the subwatershed scale. These results are not intended to be a conclusive result or degree of significance but an indication for concern. The anticipated impact of an alternative is compared to the equivalent impacts expected form a road.

A Threshold of Concern (TOC) is established per subwatershed depending on soil types, vegetation, slopes, etc. The TOC represents a point of concern for the hydrologic function, which also reflects potential impacts on fish and their habitat. The following are the results from this analysis for each subwatershed, per alternative, and expected impact at implementation and about ten years out.

Summary Table 10—ERA Model Results

PROJECT	ALT. 1	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Davis/Placer TOC 16					
Year 2002	4.7	8.8	8.1	4.7	9.1
Year 2012	3.9	6.7	6.2	3.8	7.0
Vinegar TOC 14					
Year 2002	6.8	10.5	10.4	6.8	12.2
Year 2012	5.1	7.5	7.5	5.0	8.9
Vincent TOC 14					
Year 2002	7.6	14.4	13.9	7.6	16.5
Year 2012	5.7	10.4	10.0	5.7	12.1
L. Boulder/Deerhorn TOC 14					
Year 2002	6.9	9.6	8.7	6.9	10.2
Year 2012	5.3	7.2	6.5	5.2	7.6
Tin Cup/L. Butte TOC 12					
Year 2002	4.3	8.2	6.6	4.3	8.8
Year 2012	3.7	6.2	5.1	3.4	6.8
Butte TOC 12					
Year 2002	5.1	6.9	6.5	5.1	7.2
Year 2012	4.2	5.2	4.9	4.0	5.5
Granite Boulder TOC 18					
Year 2002	7.6	7.7	7.7	7.6	7.7
Year 2012	5.7	5.5	5.5	5.5	5.5

Undesired Condition—Vegetation outside HVR

Undesired Condition—High Wildfire Risk

These two undesired condition were combined due to their similar impacts on vegetation. The discussions will focus on the Dry Forests (predominately ponderosa pine and larch) and the Moist Forests (predominately Douglas-fir and grand fir). The main areas expounded upon below are effects on the desired condition, structural stages, resiliency and sustainability, wildfire risk, public safety and property, and air quality.

ALTERNATIVE COMPARISON

DESIRED CONDITION

Alternative 1 would not treat any forest stands to begin moving their structure, composition, and density toward a desired condition. Stands would continue to become more overstocked, growth would continue to slow, fuels would continue to accumulate, and the forest stands would become increasingly susceptible to uncharacteristically severe disturbances.

The following table displays the percentage of the area receiving treatment of the total area identified as needing silvicultural treatments. The degree of moving toward the desired condition is proportionate to the amount of forest stands treated.

The forest stands treated would respond over several years, adding more crown area and increasing tree growth. Species composition would be shifted toward a more historic condition, giving preference to the early seral species i.e. ponderosa pine. The trees in these areas would improve and increase in health and vigor, which would cause the development of the old forest structural stages to accelerate, decreasing the time for trees to develop into the old structural stages by 40 to 60 years over Alternative 1. Treated forest stands would become more resilient to disturbance, allowing them to continue to grow into larger trees. Disturbance regimes would be closer to the historic scale.

Summary Table 11—Percent Area Needing Treatment Receiving Treatment

ALT. 1 - No-Action	ALT. 2	ALT. 3	ALT. 4	ALT. 5
0	50%	38%	13%	57%

STRUCTURAL STAGES

The forest stand structural stage of most interest is that of old forest, which is generally lacking across the analysis area. Alternative 1 would do nothing to encourage or expedite growth of old forest structure. The current growing trend would not see development of this structure for about 110 years in the Dry Forests and over 60 years in the Moist Forests.

The forest stands recommended for thinning would develop into old forest structure in about 50 years, with the thinning prescription adapted for wildlife corridors taking an additional 25 years due to additional tree being retained for hiding cover. The understory removal treatments would convert old forest multi-strata[11] (OFMS) to old forest single-stratum (OFSS) immediately. Shelterwood regeneration treatments to change species composition would develop into OFSS structure in about 125 years.

Summary Table 12—Expected Percent of Structural Stages in 125 Years

FOREST TYPE	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
Dry HRV	**5-15**	**5-25**	**5-10**	**5-10**	**5-15**	**30-55**	**5-15**
Alt. 1 Existing	5	42	3	7	30	1	12
Alt. 2	5	20	2	7	24	34	9
Alt. 3	5	25	3	7	26	23	11
Alt. 4	5	42	3	7	28	3	12
Alt. 5	5	20	2	7	20	38	8
Moist HRV	**10-30**	**5-10**	**10-20**	**10-20**	**10-20**	**5-15**	**15-40**
Alt. 1 Existing	6	6	4	6	39	5	34
Alt. 2	6	3	4	6	35	11	34
Alt. 3	6	5	4	6	36	8	34
Alt. 4	6	6	4	6	38	6	34
Alt. 5	6	4	4	6	34	12	34

NOTE: SI = Stand Initiation **SEOC =** Stem Exclusion Open Canopy **SECC =** Stem Exclusion Closed Canopy **UR =** Understory Reinitiation **YFMS =** Young Forest Multi Strata **OFSS =** Old Forest Single Strata **OFMS =** Old Forest Multi Strata **HRV =** Historical Range of Variation

In Alternative 1, aspen stands would continue to be displaced due to encroaching conifers and impacted by grazing from cattle and wildlife, further reducing aspen numbers.

[11] See stand structure definitions page 145

In Alternatives 2 and 5, aspen stands would be released by removing conifer competition and protecting them from grazing, improving the vigor of existing aspen and increasing the number of suckers, eventually increasing size of aspen patches.

Alternative 3 and 4 would drop and leave conifers or girdle encroaching conifers depending on snag needs in the area. Follow-up protection from grazing would occur. These alternatives would delay aspen recovery 3-5 years due to this material remaining on the site reducing potential suckering. An increase in fire hazard would occur due to the fuel remaining on the site and follow-up fence maintenance may be needed due to girdled trees falling on protection fences.

In Alternative 1, mountain mahogany and other shrubs would continue to decline due to lack of regeneration, low-intensity fires, and sunlight. Likewise, pine grass and other ground cover would continue to decline due to increasing conifer canopy excluding stimulating sunlight from reaching the forest floor and the nutrient cycling provided by low-intensity fire.

In the Action Alternatives, mountain mahogany and pine grass along with other native shrubs, and grasses would increase where conifer crown closures are released or thinned allowing sunlight to reach the forest floor stimulating growth. As forest litter and accumulated fuels are reduced, shrubs and grasses would benefit from frequent, low intensity fire increasing nutrient cycling making them more vigorous. Alternative 5 would proportionately release more forest ground vegetation due to the additional shelterwood and understory removal prescription opening up more stands than that of the other action alternatives.

RESILIENCY AND SUSTAINABILITY

In Alternative 1, forest stands would continue to slow in growth and decrease in vigor as stand density continues to increase. Risk of attack by bark beetles would increase as the trees lose their vigor and are less able to pitch out the beetles. Risk of outbreaks of defoliating insects would continue to increase as the stand composition continues to shift to more late seral species. Dwarf mistletoe infections would spread with stem and root disease expected to increase as well.

In Alternatives 2, 3, and 5, reducing risk of insect, disease, wildfire is proportionate to the amount of forest stands treated. For those stands that are thinned, stands would increase in vigor allowing them to withstand infestations, infections, or high intensity fire. The reduction in the proportion of late-seral species would also reduce the extent of defoliation by spruce budworm and Douglas-fir tussock moth. The increased height growth rates would allow many of the retained trees to outgrow dwarf mistletoe infections, gradually decreasing the amount of crown infected. Increased tree spacing would also contribute to the reduction of lateral spread of mistletoe. Reduction of late-seral trees would reduce the amount of trees susceptible to root diseases and eventually would decrease this disease to endemic levels. Severe wildfire would be reduced due to less amount of trees, less amount of trees that are more susceptible to fire (i.e. Douglas-fir), and less ladder fuels that allow ground fire to climb into the overstory crowns. Overstory crowns would also be reduced decreasing fire intensities and the potential for a crown fire.

In Alternative 4, no harvest would occur but the recommended pre-commercial thin would reduce a portion of the susceptible trees to fire and reduce the ladder fuel component from the understory. The remaining fir trees would be slightly healthier and less susceptible to attacks. Stem and root diseases may actually increase, as the cut stumps can serve as infection pathways to the remaining fire trees. Dwarf mistletoe would not be reduced due to infected overstory trees remaining in the stand that would continue to infect the understory trees.

For a better understanding of alternative responses to improved resiliency and sustainability, S-Table 10 on page *xxix* displays the percent of recommended treatment on forest stands identified as needing treatment. That table gives a good indication of how well the alternatives respond to this issue..

WILDFIRE RISK

In Alternative 1, ground fuels would continue to accumulate, crown fire risk would increase due to denser forest stands, and fire resistant trees such as ponderosa pine would continue to be replaced by fire intolerant trees such as grand fir. This alternative would not reduce the ground or ladder fuels, which allows ground fires to climb into the overstory canopy. This alternative would not reduce the more fire susceptible tree species in areas that were historically adapted to frequent low intensity fires.

Much of the analysis area would remain at the current high hazard for uncharacteristically severe wildfire. As trees continue to grow and biomass increases, the crown fire hazard would continue to increase. In about 50 years, almost all forest stands would be at a high crown fire hazard

For the action alternatives, S-Table 7 on page 11 displays a comparison calculated from recommended forest stand treatments. That table displays the percentage of crown hazard reduced per alternative if mechanical treatments are implemented.

In Alternatives 3 and 4, amount of prescribed fire is reduced in the Little Butte and a portion of the Deerhorn drainages due to lack of stands being mechanically harvested, which would have reduced fire intensity.

Refer back to S-Table 7 for the anticipated percent crown fire hazard remaining per forest type once commercial, pre-commercial, and prescribed fire prescriptions per alternative have been fully implemented.

For forest stands thinned to about 60 ft^2/acre basal area, a high crown fire hazard rating would not return to these stands for about 50 years. The thinned stands to retain wildlife hiding cover spacing trees to about 80 ft^2/acre basal area won't see a return of high fire hazard ratings for about 25 years. The shelterwood treatment won't see a high rating again for 50 years assuming a follow-up pre-commercial thin is implemented.

PUBLIC SAFETY AND PROPERTY

The current fire hazard conditions would continue to increase in Alternative 1 and access for fire-fighting efforts would continue to degrade putting property and personnel at risk. Potential loss to privately owned lands and structures in Bates, Austin, and Austin Junction would remain at risk. In addition, the blow down event that occurred in the upper Vinegar drainage would not be treated and could easily become a large conflagration, threatening private property and structures in the vicinity of the town of Greenhorn.

In Alternatives 2, 3, and 5, a combination of the recommended vegetation treatments lowering the high crown fire hazard in the area and the improved transportation system making access safer and readily available, greatly reduces the risk of uncharacteristically severe wildfire reaching adjacent privately owned lands and structures in Bates, Austin, and Austin Junction. Treatment within the blown down area of upper Vinegar drainages also greatly reduces the chance of a severe wildfire effecting private property and structures in and near the town of Greenhorn. In Alternative 4, the high fire hazard adjacent to privately owned lands and structures in the Bates, Austin, and Austin Junction areas is slightly improved from the No Action alternative. The risk of fire hazard to the private property and structures in the vicinity of Greenhorn is not reduced and the risk remains comparable to the No Action alternative. This result is primarily due to no harvest removing and reducing biomass and accumulated fuels.

AIR QUALITY

In Alternative 1, there would be no impact to air quality due to no recommended management. However, existing biomass would remain available for consumption by wildfires and would continue to accumulate. This situation would increase the potential for large amounts of smoke during the summer months when diurnal inversions could concentrate smoke at low elevation. This raises the risk of personal health problems, or may violate summertime Class 1 quality visibility standards.

In the action alternatives, much of the slash produced from harvest projects in this alternative would be brought to landings and made available for chipping for fiber or as fuel for cogeneration plants. Other units slash would be either broadcast burned or piled and burned under weather conditions that would meet air quality standards. Prescribed burning would be done in areas not harvested to reduce existing fuels and applied only when weather conditions would allow air quality standards to be met.

These actions would reduce the amount of fuels available for wildfire, reducing the possibility of fire occurring during less than desirable times. This would reduce the amount and duration of pollutants produced by a wildfire as well as reducing the fire intensity. Potential for smoke to be produced during summer months and during inversion periods would be greatly reduced, improving visibility and reducing potential health problems. The summertime Class 1 visibility standards would likely be met. Alternative 4 would be much less effective than the other action alternatives due primarily to no recommended harvest.

Undesired Condition—Degraded Wildlife Habitat

Effects to wildlife are summarized in regards to Dry Forest habitats, Dedicated and Replacement Old Growth and their connective corridors, and big game habitat.

ALTERNATIVE COMPARISON

DRY FOREST TYPE

The majority of treatments are recommended in the Dry Forest types; consequently, the following wildlife discussion will summarize effects on the Dry Forest types only. Alternative 2 recommended harvest treatment on 35% or the Dry Forest types. Alternatives 3, 4 and 5, recommended harvest treatment on 8%, 25% and 40% of the Dry Forest types. None of the action alternatives have significant effects on the Moist Forest types; even the most aggressive alternative only treats 10% of this Forest type. For discussion on other Forest types, refer to the analysis document.

Alternative 1 would result in little change in the existing condition of Dry Forest habitats in the short-term (0-10- years). Stand densities would continue to increase with stand structure remaining relatively similar to the current stand structure. In the short- to mid-term (0-25 years), deadwood habitats would increase with some Old Forest Multi Strata (OFMS) stands changing to Young Forest Multi Strata (YFMS) due to loss of large diameter trees. These losses would continue across the 58% forest stands that are identified as high risk due to overstocked conditions making them vulnerable to insect infestations, disease infections, and uncharacteristically severe wildfire.

These overstocked stands would continue to be at risk to a large-scale loss, potentially displacing species that currently reside in these areas. These current conditions do not match that of what the historic fire regime once provided.

In the action alternatives, forest structure and species composition would change immediately following harvest and prescribed burning activities. This table displays the HRV, existing condition as Alternative 1, and the expected results on the structural percentages per alternative.

Summary Table 13—Dry Forest Structural Stage by Alternative (29,000 acres)

ALTERNATIVES	PERCENT OF STRUCTURAL TYPE						
	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5-15	5-25	5-10	5-10	5-15	30-55	5-15
1 (Existing)	5	42	3	7	30	1	12
2	5	43	2	13	24	4	9
3	5	42	3	11	26	2	11
4	5	42	3	9	28	1	12
5	5	43	2	17	20	5	8

NOTE: SI = Stand Initiation **SEOC =** Stem Exclusion Open Canopy **SECC =** Stem Exclusion Closed Canopy **UR =** Understory Reinitiation **YFMS =** Young Forest Multi Strata **OFSS =** Old Forest Single Strata **OFMS =** Old Forest Multi Strata.

Harvest would convert most of the YFMS stands to a structure of SEOC and UR. In the short-term, habitat would be loss for species that prefer high canopy cover and complex forest stand structure. Alternatives 2 and 5 would potentially reduce the analysis area carrying capacity by one to three reproducing pairs each of pileated woodpeckers and pine martens. Alternatives 3 and 4 would not treat vegetation as aggressively. Alternative 3 would potentially reduce the project carrying capacity by one to two reproducing pairs for each of these species. Alternative 4 would possibly reduce the carrying capacity by one pair. Habitat in the Dry Forests is not considered the highest quality habitat for these species. Population viability for pileated woodpeckers and pine marten would be maintained via old growth in the Moist and Cold Forest types and the system of Dedicated Old Growth, Replacement Old Growth ad Pileated Woodpecker Feeding Areas

Restoration treatments, while reducing habitat for pileated woodpecker and pine marten, would improve habitat for white-headed woodpeckers and flammulated owls. Several OFMS stands would be converted to OFSS, creating the open park-like stands these species prefer. Historically 30 to 55% of the Dry Forests supported OFSS habitat; today only 1% is in OFSS. Treatment of younger stands would improve growth rates on trees and reduce the time it takes to grow large diameter trees for future old growth. Alternative 5 would treat the most acres followed by Alternatives 2, 3, then 4. In Alternatives 2, 3 and 5, treated stands would likely take 25-50 years to develop into OFSS, whereas Alternative 1 and 4 would takes about 100-125 years.

DEDICATED/REPLACEMENT OLD GROWTH AND THEIR CONNECTIVE CORRIDORS

There are currently 13 Dedicated Old Growth (DOG) areas, 1 Replacement Old Growth (ROG) area and 1 Pileated Woodpecker Feeding Area (PWFA) designated for pileated woodpecker and/or pine marten management within the analysis area.

In Alternative 1, existing DOG, ROG and PWFA boundaries would not be adjusted nor would new areas be designated.

The Action Alternatives would modify existing DOG and ROG boundaries to match logical topographical features and to meet minimum *Land and Resource Management Plan* standards. These changes would require a *Land and Resource Management Plan* Amendment to be implemented. The Action Alternatives would designate 11 new ROGs and 4 new PWFAs.

The following table displays changes or additions made to the existing old growth system:

Summary Table 14— Recommended DOGs, ROGs, and PWFAs

ALL AREAS	INDICATOR SPECIES	MINIMUM ACRES	Existing DOG ACRES	Recommended DOG ACRES	Existing ROG ACRES	Recommended ROG ACRES	Recommended PWFA ACRES	TOTAL Recommended ACRES
TOTALS	Pileated Woodpecker and Pine Marten	4,920	3,099	3,214	181	1,773	747	5,734

In Alternative 3 only, current scientific literature indicates habitat needs for pileated woodpeckers may not be adequately met by current *Land and Resource Management Plan* standards. Alternative 3 increases the size of five pileated woodpecker areas from 600 acres (*Land and Resource Management Plan* direction) to 900 acres. See Issue # 10 for differences between Alternative 3 and the other action alternatives.

In the DOGs, no treatment would be recommended under any of the action alternatives. Management activities are recommended in the ROGs, PWFAs, old growth stands located outside designated areas, and LRMP2 wildlife corridors as displayed in the following table. In this range of alternatives, strategies have been included in the management of the ROGs and Feeding Areas to help restore historic stand structure and fire regimes. .

Where these areas don't meet historic conditions, treatments would be implemented to benefit old growth dependent species in the long-term. Management would help restore historic stand structure and fire regimes. Treatments would reduce the risk of an uncharacteristically severe wildfire or insect outbreak, increase the growth of residual trees to provide old structure sooner, and convert OFMS stands (currently over HRV) to OFSS stands (currently below HRV).

Summary Table 15— Recommended Treated Acres within ROGs, PWFAs, Old Growth, and LRMP2 Wildlife Corridors

ALTERNATIVE	HARVEST IN ROGs	HARVEST IN PWFAS	HARVEST IN 300 ACRE ADDITIONS*	HARVEST IN OLD GROWTH OUTSIDE DOGs/ROGs	HARVEST IN LRMP2 WILDLIFE CORRIDORS
1	0	0	0	0	0
2	131	195	257	313	220
3	0	0	0	223	0
4	0	0	0	20	38
5	192	195	257	326	220

NOTE: = Only Alt. 3 expands pileated woodpecker areas by 300 acres. * Harvest in Alts. 2 and 5 treat these areas as General Forest.

BIG GAME HABITAT

Alternative 1 would not address the needs of specific big game habitat to improve forage habitat, reduce potential disturbance from road traffic, and reduce the risk of catastrophic disturbances impacting large areas of habitat.

Alternatives 2, 3, and 4 would meet the needs to improve big game habitat, although to varying degrees. Proportionate to recommended d treatment, these alternatives would improve forage habitat, provide well-distributed cover, reduce potential disturbance from road traffic, and reduce the risk of an uncharacteristically severe disturbance that could destroy large areas of habitat. In localized areas, management has the potential to both positively and negatively impact habitat. Timber harvest and pre-commercial thinning, prescribed fire, road closures, and hardwood planting and protection would have the most pronounced effects. In Alternative 4, precommercial thinning would not impact cover habitat to the same degree as the other action alternatives; however, hiding cover would be reduced where pre-commercial thinning is applied.

In Alternative 5, priority is given to restoring historic vegetation conditions, in some subwatersheds, jeopardizing thermal cover standards. Priority is also given to increasing road access, therefore, not meeting standards for open road density in many subwatersheds. Many of the management tools in Alternative 5 are the same as in the other alternatives, however; in many subwatersheds they are used more intensively.

The following table displays acres of satisfactory and marginal cover harvested in summer and winter range. Expected results are displayed for all action alternatives.

Summary Table 16—Percent of Satisfactory and Marginal Cover Harvested in Summer and Winter Range

ALTERNATIVE	SUMMER RANGE		WINTER RANGE	
	Satisfactory	Marginal	Satisfactory	Marginal
LRMP	12	8	10	15
1 (Existing)	2	8	0	3
2	12	28	10	11
3	5	18	10	9
4	2	8	0	3
5	19	34	12	16

Prescribed fire could temporarily displace deer and elk but animals would be expected to return once burning crews have left and ground has cooled. Mortality of overstory trees is not expected to exceed 10%; impacts to thermal cover would be minimal. Prescribed fire would reduce hiding cover when allowed to burn at higher intensity. These burns are expected to stimulated growth of shrubs and grasses, improving browse for deer and elk.

Calving/fawning habitat would improve. A combination of aspen improvement projects, other hardwood plant and protect projects, and decommission and closure of a number of roads within RHCAs would cumulatively enhance habitat. Refer to the aquatic and infrastructure project discussions for additional detail on riparian restoration.

In implementing the above harvest prescriptions, a variety of road projects are needed to accomplish restoration efforts. The road projects used a combination of new, closed, and decommissioned miles, which have implications on big game habitat. The following table displays percent change in total miles for each alternative. A smaller transportation system reduces the potential for big game disturbance.

Summary Table 17—Total Open Transportation System (Miles)

ITEM	ALT. 1 Existing	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Miles	132	91	91	89	164
% Change	NA	-31%	-31%	-33%	+24%

NOTE: NA = Not Applicable

The following table displays the expected open road densities in summer range, winter range, and the wildlife emphasis area per subwatershed - a measure of potential big game disturbance.

Summary Table 18—Open Road Densities (Miles per Square Mile per Subwatershed)

PROJECT	ALT. 1	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Summer Range LRMP Standard 3.2 Minimum 1.5 Objective					
Davis/Placer	1.97	1.44	1.44	1.44	2.55
Vinegar	1.90	1.54	1.54	1.54	2.20
Vincent	1.73	1.72	1.72	1.72	3.59
Little Boulder/Deerhorn	1.27	0.87	0.87	0.87	1.46
Tin Cup/Little Butte	1.41	1.14	1.14	1.14	1.85
Butte	2.72	1.93	1.93	1.93	2.44
Granite Boulder	1.21	0.59	0.59	0.59	0.70
Winter Range LRMP Standard/2.2 Minimum/1.0 Objective					
Davis/Placer	NA	NA	NA	NA	NA
Vinegar	NA	NA	NA	NA	NA
Vincent	NA	NA	NA	NA	NA
Little Boulder/Deerhorn	1.87	1.77	1.77	1.77	2.68
Tin Cup/Little Butte	3.47	1.54	1.54	1.54	2.10
Butte	1.19	1.15	1.15	1.15	3.20
Granite Boulder	6.74	2.32	2.32	2.32	3.95
Wildlife Emphasis Area LRMP Standard 1.5					
Davis/Placer	0.0	0.0	0.0	0.0	0.0
Vinegar	NA	NA	NA	NA	NA
Vincent	NA	NA	NA	NA	NA
Little Boulder/Deerhorn	0.0	0.0	0.0	0.0	0.0
Tin Cup/Little Butte	0.0	0.0	0.0	0.0	0.0
Butte	0.89	0.70	0.70	0.70	0.81
Granite Boulder	NA	A	NA	NA	NA

Treatment of vegetation, whether through harvest or burning, reduces wildfire risks, and consequently reduces the potential for loss of wildlife habitat to uncharacteristically severe events such as infestations and fire. The table below displays the percent of the forest stands remaining at a high potential for a crown fire after recommended treatments are implemented.

Summary Table 19—Percent Area Remaining at High Crown Fire Hazard

ALTERNATIVE	DRY FOREST	MOIST FOREST
1	66	60
2	44	55
3	50	56
4	61	59
5	40	54

Undesired Condition—Noxious Weed are Present

ALTERNATIVE COMPARISON

Under Alternative 1, current monitoring of new noxious weed sites would continue. Populations included in the Malheur National Forest Noxious Weed Environmental Assessment, June 2000 (Noxious Weed EA) would be treated as analyzed in that document. All new weed infestations would persist, enlarge, and/or spread seed to new locations, displacing an ever-enlarging area of native vegetation. Opportunity of spread would only occur to those soils disturbed from current activities. No additional soil disturbance would occur.

Not eradicating existing new established sites within the analysis area, not identified or addressed in the Noxious Weed Ea, could offset the effects of treatments under the Noxious Weed EA. This could allow

the new untreated populations to re-infest the treated areas. In the long-term, this could offset the effort and expense of eradication efforts within the watershed, and add to the burden of off-forest weed seed that would inevitably initiate new infestations.

In Alternatives 2-5, the major effect to the understory vegetation that creates potential opportunity for noxious weed spread comes from ground disturbance. Total acres to be treated offer a general measure for comparison of relative disturbance for the five alternatives. These soil disturbance activities include upland acres to be treated, road construct and reconstruction; trail and trailhead construction and reconstruction, new dispersed campsites, and aspen release harvests.

Summary Table 20—Acres of Disturbed Soils from Alternative Projects

ACTIVITY	ALT. 1	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Upland Treated Acres*	0	31,650	25,880	18,490	32,570
Road Construction & Reconstruction	0	80	80	13	100
Trail/Trailhead Construction & Reconstruction	0	12	12	3	17
New Dispersed Campsites	0	3	3	3	3
Aspen Release Harvest	0	30	30	30	30
TOTAL	**0**	**31,777**	**26,008**	**18,543**	**32,725**

NOTES: = ALT. = Alternative * = Upland acres include harvest and prescribed burn

Alternatives 2 and 5 would implement a combination of manual and chemical methods of treating the noxious weed sites where as Alternatives 3 and 4 would us manual methods only.

Because manual treatment methods are not always as effective as chemical application, some of the newer weed infestations may persist, enlarge, and/or spread seed to new locations. However, spread of known populations would be slowed, and amount of seed dispersed would be reduced, but both may continue if the infestations cannot be eliminated.

The following table displays the amount of manual and chemical methods to be used in combating noxious weed within the analysis area.

Summary Table 21—Recommended Noxious Weed Treatments

METHOD	ALT. 1		ALT. 2 & 5		ALT. 3 & 4	
	Populations	Acres	Populations	Acres	Populations	Acres
Manual	0	0	4	0.4	10	1.9
Chemical	0	0	6	1.5	0	0
TOTAL	0	0	10	1.9	10	1.9

OTHER CONSEQUENCES

Socio/Economic

ALTERNATIVE COMPARISON

The impacts of the Southeast Galena Restoration Project alternatives with incremental effects of past, present, and reasonably foreseeable future actions and all ownerships may have cumulative effects on the human dimension and the biophysical environment.

Information on demographics; economic base; local communities; recreation use; non-forest timer products; special use permits; attitudes, beliefs, and values; health an safety; American Indians;

environmental justice and implementation costs are partly discussed in the document and further details in the analysis file.

DEMOGRAPHICS

The primary effect on demographics would be from potential changes in total population due to changes in employment. There would be no new employment opportunities created from the no action alternative. Alternatives 2, 3, and 5 would contribute employment from timber-harvest related employment for area residents, which would contribute toward maintaining local population levels over the next two to three years. Opportunities for restoration and enhancement work from post-sale timber –harvest restoration would be provided for the next ten years in addition to recommended project under aquatic and infrastructure improvements.

ECONOMIC BASE/LOCAL COMMUNITIES

The primary effects on the economic base would occur from changes in employment and income associated with level of harvest operations. This has a direct influence on jobs in the area for both temporary and permanent opportunities. There are many factors that influence these projections and are further described in the document and the analysis file.

The table below displays the potential and projected volumes with the related potential jobs and projected incomes per alternative. The jobs and incomes are associated with the recommended timber sales with the other restoration work described under "local communities". There are several way that influence projected jobs and income, which includes *direct* (i.e. harvest, mills, processing), *indirect* (i.e. industry supplies, equipment), and *induced* (i.e. local spending, business spending) influences.

Summary Table 22—Potential/Projected Volumes, Jobs, and Income

ITEM	ALT. 1	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Volume	0	44 MMBF	33 MMBF	0	55 MMBF
Direct Jobs	0	251	188	0	317
Total Jobs		402	301	0	507
Direct Income	0	$7.0 million	$5.2 million	0	$8.8 million
Total Income		$11.2 million	$8.4 million	0	$14.1 million
NOTE: ALT. = Alternatives **MMBF =** Million Board Feet					

Other restorative projects provide a variety of opportunities that require widely varying equipment and skills. Potential benefits to local communities for stewardship employment opportunities are provided by the action alternatives. No new opportunities would be provided under Alternative 1.

For the action alternatives, projects outlined under aquatic, vegetation, and infrastructure would provide opportunity for the next ten years depending on the amount of funding received. These projects include such opportunities as hydrology and fisheries restoration and enhancement projects and dispersed campsites and trail improvements.

RECREATION USE

Demands for recreation on public lands would continue in the future, especially in undeveloped and remote settings. Many of the uses within the Southeast Galena Analysis area include fishing, big game hunting, ATV use, camping, horn hunting, and personal mushroom and firewood collection. All of these uses are impacted by these alternatives and are discussed in more detail in the document and specialist reports in the analysis file. Intrinsic values such as attitude and beliefs are discussed later.

NON-TIMBER FOREST PRODUCTS

Focus for non-timber forest products include changes that occur to the analysis area from timber harvest, burning, and road access.

Alternative 1 would not implement any new projects, therefore, uses for wild food plants (i.e. mushrooms, berries), medicinal plants, and other materials such as firewood, would continue at current levels. What would remain is the high concern toward uncharacteristically severe fire. Depending on the occurrence and the severity of the occurrence, mushrooms, berries, firewood, etc. could be enhanced.

The action alternative projects of timber harvest, pre-commercial thins, and burning would enhance opportunities for a variety of non-timber forest products proportionate to the amount of treatment altering vegetation habitat.

Summary Table 23—Amount of Potential Enhanced Non-Timber Forest Products (Acres)

DISTURBANCE	ALT. 1	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Harvest Acres	0	9,760	7,330	0	11,340
Burn Acres▼	0	11,370	10,640	17,230	10,780

NOTES: ALT. = Alternatives ▼ Acres do not include prescribed fire associated with prescriptive fire on harvest acres.

SPECIAL USES

Many of the special uses located within the analysis area include livestock grazing, power lines, irrigation/mining ditches, and mining claims. One would see no changers if Alternative 1 (no action) was selected. The impacts of action alternatives would affect special use permits, facilities, rights or claims from changes in access, timber harvest, prescribed fire. Improvements or increases in motorized access would provide better access for permittees. Road improvements would benefit power line right-of-ways, but decommissioning would potentially reduce access to some sites. Harvest activities would cause livestock to congregate.

Access plans would affect special use proportionately with the following access plan results.

Summary Table 24—Percent Change in Road Access

	ALT. 1	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Total Miles	267	219	218	202	228
Percent Change	NA	-18%	-18%	-24%	-15%

ATTITUDES, BELIEFS AND VALUES

Attitudes reflect people's evaluation of something as either favorable or unfavorable, beliefs reflect what people think is true about something. Beliefs therefore can be a reason for one or more types of attitude. Values reflect what people consider to be precious to them.

Alternative 1 would have no change from current management. Those who believe that passive management is an appropriate response to ecological restoration—would prefer this approach. However, with this approach the seven identified undesired conditions (see 1.2.1 Undesired Conditions, page 8) would continue at present trends. The importance of spiritual renewal, geographic place attachment, and existence values would be retained in the short-term, but would either exist at high risk of dramatic change to an event such as uncharacteristically severe wildfire, in the long-term, or diaper altogether when an event similar to the Summit Fire occurs. In the same manner, a risk exists for those who appreciate these values in the Scenic and Roadless Areas found within the analysis area.

The Action Alternatives would see short-term impacts for those that prefer more primitive uses and non-motorized settings. The apparent naturalness and sense of attachment would be altered by harvest, prescribed burn, and other modifications from the existing condition. People who feel passive management approaches should be allowed to take their natural course would feel the ecological and non-commodity values were diminished as a result of the active management approaches for restoration in the analysis area. The sense of spiritual renewal, and preserving the area for future generations may be reduced by the amount of management recommended in a number of the action alternatives, to a greater or lesser degree by some people. These projects however, would reduce the risk of an uncharacteristically severe wildfire event from occurring; thereby improvements would begin to move resources in the analysis area into a more resilient, vigorous state which are identified by the desired conditions which were arrived at from goals, objectives, and standards in the *Land and Resource Management Plan* as amended.

HEALTH AND SAFETY

The primary issues raised in regard to health and safety focused on potential smoke from wildfires in the high fire hazard areas and concerns with air quality to people residing in Bates, Austin, Austin Junction,

and Greenhorn. Other issues raised were health effects from chemical treatments, safety concerns to workers and the public about hazard trees and the potential of uncharacteristically severe wildfire as a dangerous event to firefighters and the public alike.

In Alternative 1, high fire hazard would not be addressed and would have the least impact on air quality in the near future. In the long-term (50+ years), the potential for large amounts of smoke from daily inversions would increase due to increases in biomass and fire risk. In the near future, the above populated areas would not be affected, however, in the long-term, air quality, the risk to firefighters during suppression efforts, would grow, depending on the extent, severity, and duration of a wildfire. An increase in traffic and equipment to suppress fire would be a safety concern as well during an uncharacteristically severe wildfire.

Access would continue to deteriorate, resulting in declines in user safety.

No risk to chemical use would occur in this alternative.

In the action alternatives, mechanical and prescribed burning treatments would decrease potential for adverse air quality to occur. Biomass would be reduced and treated during periods of the year when inversion is less likely to occur. These treatments reduce the potential for uncharacteristically severe wildfire, thereby reducing the hazard to the local populated areas and to fire suppression personnel. Alternative 5 would treat the most biomass, followed by Alternative 2, 3, and 4.

In Alternatives 2 and 5, the blow down area in the headwaters of Vinegar Creek would have reductions in fallen material reducing potential for a severe wildfire to the town of Greenhorn. Alternatives 3 would not remove blow down material in the RHCAs of Vinegar Creek but would salvage the uplands, whereas Alternative 4 would not salvage either the RHCAs or uplands. The hazard of a severe fire would remain for Alternative 4 and to a lesser degree it would remain in Alternative 3.

In all action alternatives there would be fewer roads left open than current conditions. Safety for recreation users of roads would improve due to improved conditions of roads left open.

Prescribed burning could produce some smoke hazards across public highways, but signs, local announcements, and pilot cars, if needed, would help reduce risk of an accident.

Potential effects from herbicides would be mitigated by using trained and licensed applicators and following application standards. Chemicals recommended for treatment have low to moderate potential toxic effects but anticipated exposure in Alternatives 2 and 5 is far below the toxic level. No herbicides are recommended in Alternative 3 or 4.

AMERICAN INDIANS

The potential effects to tribal treaty rights and interests were focused to motorized access, fish, wildlife, and plants.

Alternative 1 would have no effect on access to traditional sites for hunting and gathering but for those traditional areas that are currently not accessible due to road conditions, they would remain inaccessible. Recommended aquatic projects to improve habitats would not be implemented continuing the undesirable conditions such as high water temperatures due to lack of shade, sediment delivery due to road locations, low stream meander cue to entrenchment from past mining, and lack of woody debris forming needed pools. These conditions would continue the trend of these undesired conditions adversely affecting fish that once were more abundant. This results in reduced catch rates to American Indians as-well-as recreation fisherman.

Upland vegetation would remain in a conditions in many areas of the analysis area that are out of proportion with historic conditions in structure, composition, and density. Native grasses, forbs, and shrubs would continue to decline due to competition with other vegetation for sunlight, water, and nutrients. Noxious weed would also continue to displace native plants, reducing vegetative diversity, reducing preferred native browse.

In Alternatives 2, 3, and 5, improvements to the transportation system would occur, providing more opportunities for motorized access in areas that are currently difficult to reach. However, many roads would be closed and decommissioned (removed from the transportation system) reducing access to some areas, however, improving resources such fish habitat by the improvement and removal of many of these roads. Other aquatic projects such as construction of in stream structures and improved stream meander would improve habitat, in turn increasing fish numbers. Vegetation projects would reduce tree number to more historic levels which create more resilient forest stands enabling areas to withstand lower levels of insects infestations of lower intense wildfire. The more open stands also improve enhance browse for ungulates and open up the forest floor for growth of more berry crops. Recommended periodic fire would stimulate some cultural plants that tribes and others collect for consumption, and religious uses.

Alternative 4 would benefit from the same improvements to the transportation system but would not see the same stimulating effects from recommended harvest as described above. However, some prescribed fire would occur helping to reduce forest litter.

ENVIRONMENTAL JUSTICE

This section evaluates how the recommended alternatives may affect subsets of people in consideration of equity and fairness in resource decision-making. This analysis focuses on potential effects to minority populations, disabled persons, and low-income groups.

In Alternative 1 all current uses of the National Forest System lands would continue. Effects to minority populations, disabled persons, and low-income groups would not be disproportionate with other current users of these same lands.

Proportionately, the action alternatives provide a variety of opportunities for potential project contracts. Nor would alternatives have impact on the contraction process or the USDA Small Business Administration program for reserving contracts for minority groups.

Changes in access due to increased improvements to road conditions and decreases in open road miles would occur over the long-term. Varying impacts would occur to disabled people, low-income groups that require motorized access to participate in recreational activities such as hunting, dispersed camping, firewood gathering, or collection of non-timber forest products. Impacts include easier access for areas currently inaccessible and improved campsites currently displaying difficult access. There would be less but improved access for areas of forest treatments that result in improve diversity in vegetation such as mushrooms and berries. This is primarily due to reduced forest densities and periodic fire that open up the forest floor stimulating growth of berries and mushrooms. This creates opportunity for disabled and others that currently are restricted due to current conditions of the transportation system and dense forest stands.

ECONOMIC VIABILITY OF TIMBER SALES

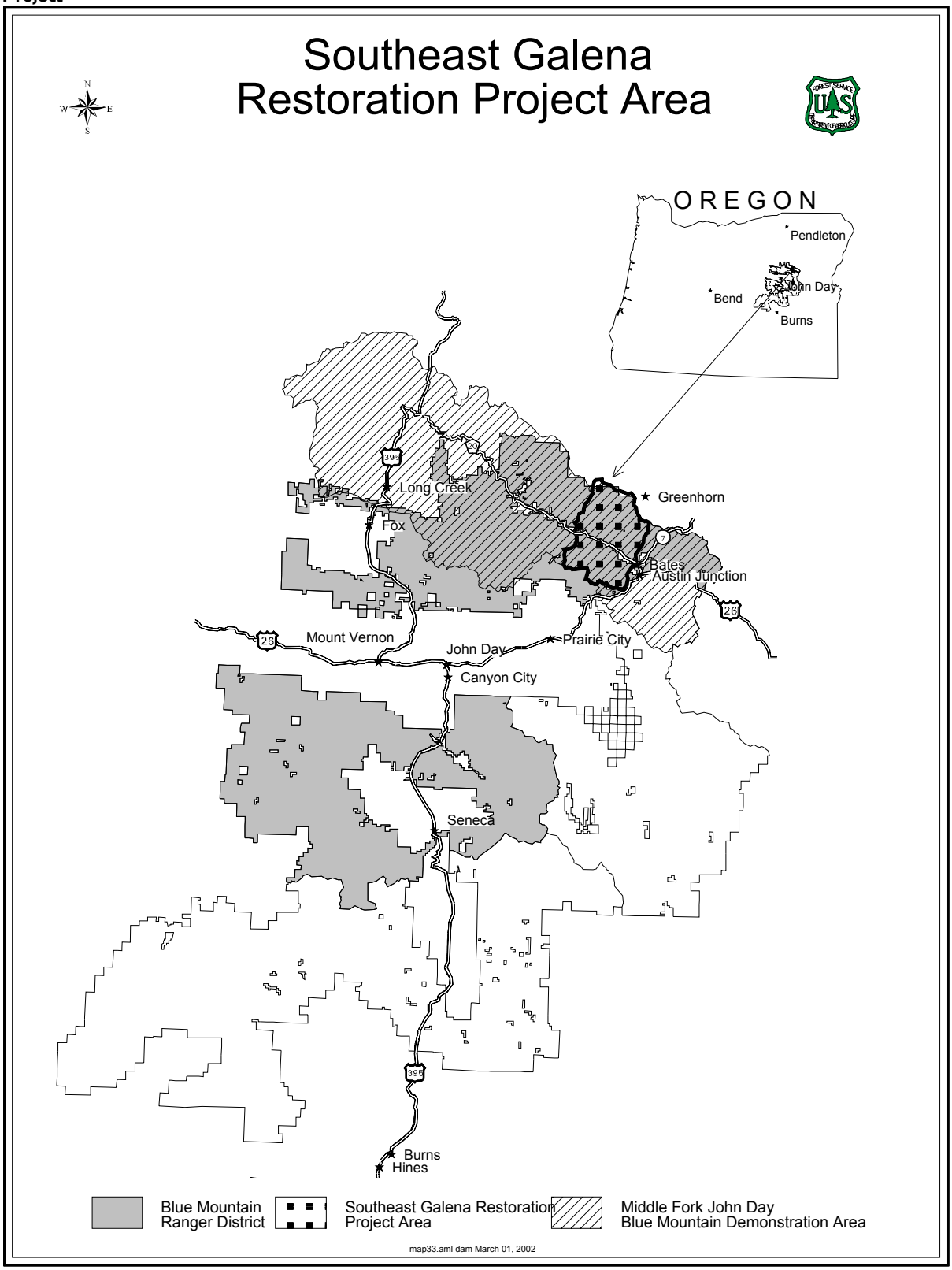
The tentative advertised bid rates estimated reflect the volumes, price, and costs estimated for the analysis. Each action alternative that proposes harvesting would produce positive tentative advertised bid rates indicating that recommended timber sales would receive bids. The following table displays what would be anticipated from each alternative.

Summary Table 25—Tentative Advertised Bid Rates and Volumes

ITEM	ALT. 1	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Bid Rate	0	$52.5/CCF	$59.0/CCF	0	$57.6/CCF
Revenue	0	$4.7 million	$3.9 million	0	$6.4 million
Cubic Ft. Volume	0	85,460 CCF	63,940 CCF	0	107, 920 CCF
Board Ft. Volume	0	45 MMBF	34 MMBF	0	56 MMBF
NOTES: ALT. = Alternative **CCF =** hundred cubic feet **MMBF =** million board feet					

These estimates are subject to change due to differing market conditions.

Map A—Vicinity Map Southeast Galena Restoration Project



CHAPTER 1.0—PURPOSE AND NEED FOR THE RECOMMENDED ACTION

This Chapter is separated into the following sections:

1.2.1 Undesired Conditions **page 8**

1.2.2 Desired Conditions **page 21**

1.3 Scope of this Environmental Analysis **page 28**

1.4 Issues Studied in Detail **page 30**

1.5 Applicable Legal and Regulatory Requirements and **page 35**

1.6 Decision Framework **page 37**

1.0 INTRODUCTION

To respond to the present threat of uncharacteristically severe wildfire, the risk of increased insect activity, high fuel loads in the aftermath of wind damaged forest stands, and isolated small areas with unstable soils which may result in debris torrents from the consequence of storm events; the Forest Supervisor, published in the Federal Register, a Notice of Intent (NOI), on August 16, 1999 to prepare an Environmental Impact Statement with a purpose and need of improving ecosystem health on a landscape scale. A programmatic planning effort in the form of *Galena Watershed Ecosystem Analysis at the Watershed Scale* (EAWS[12]) encompassing the Galena Watershed portion of the Middle Fork of the John Day River was completed June, 1999 prior to the aforementioned NOI. A statement in the Galena EAWS (and hereafter referred to as the *Galena Watershed Analysis)* summarized watershed conditions, "A brief glance today at the watershed, could easily make one believe it is losing its resiliency due to large stand replacement wildfires, increased insect activity, blown down timber stands, and debris torrents in three streams," *(Galena Watershed Analysis*, Synthesis Summary page 4-49). The analysis completed in 1999 made specific recommendations for treatment which responds to undesirable conditions and characteristics found in the Galena Watershed including the analysis area of the *Southeast Galena Restoration, Draft Environmental Impact Statement* (this document (Galena WA, Supplement—2002)).

This watershed analysis shows that vegetation conditions of the analysis area are identical to conditions that caused the 37,961[13] acre 1996 Summit Fire which burned with uncharacteristically severe consequences compared to the magnitude of historic fire behavior. Extensive analysis from the *Summit Fire Recovery Project* is a part of baseline information in this document (Galena WA, Supplement—2002), the Malheur National Forest, *Summit Fire Recovery Final Supplemental Environmental Impact Statement* 1998. Restoration of the vegetation of forest stands across the analysis area would address similar vegetative conditions existing prior to the Summit Fire and propose treatment of forest stands in a manner that reduces the risk of uncharacteristically severe wildfire from occurring.

Three American Indian tribes retain rights in the Middle Fork area including: the Confederated Tribes of the Warm Springs Indian Reservation; Confederated Tribes of Umatilla Indian Reservation; and the Burns Paiute Tribe—all use the Malheur National Forest, for hunting, fishing, gathering, and religious purposes.

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[12] Following a federal procedure of *Ecosystem Analysis at the Watershed Scale*, as revised in Version 2.2 August, 1995

[13] All numbers in this document are approximate.

The *Southeast Galena Restoration*, as a project was already underway when on June 30, 1999, Oregon Governor John Kitzhaber, former USDA, Under Secretary, Dan Glickman and former USDA Forest Service Chief, Mike Dombeck announced the formation of an inter-governmental partnership of forty members. The Blue Mountains Demonstration Area (BMDA) is a collaborative effort focusing state, federal and local watershed restoration in a comprehensive strategy. The Demonstration Area focuses on three areas of the Blue Mountains (see Vicinity Map, opposite page 1 of this document (Galena WA, Supplement—2002)) including the Middle Fork of the John Day River. These lands are utilized by 20 communities within the Blue Mountains Demonstration Area. The *Southeast Galena Restoration,* as a project was a part of this Demonstration Area, and integrated the following collaborative goals of BMDA:

- **Goal Number 1—**Accelerate Forest and Watershed Restoration Activities.
- **Goal Number 2—**Work together through an integrated and collaborative landscape level approach.
- **Goal Number 3—**Contribute to the economic and social health of local communities.

In addition to these goals, the *Southeast Galena Restoration Project* also strived to accomplish many of the BMDA criteria including:

- Provide clean, cool water.
- Restore fish and wildlife habitats.
- Contribute to the recovery of threatened or endangered species.
- Promote sustainable and diverse forest conditions and improve forest health.
- Reduce the risks to property and forest resources from unnaturally severe wildfires.
- Limit the continuing spread of noxious weeds.
- Benefit local communities by providing employment opportunities.

In response to the above goals of BMDA and criteria, and recommendations brought forward from the *Galena Watershed Analysis 1999,* a concise description of a Forest Service recommended action is followed by the Purpose and Need which explains why this proposal was developed.

In addition to these goals, this project also endeavors to put into practice a good number of Oregon Governor John Kitzhaber's, "11-Point Strategy for Restoring Eastern Oregon Forests, Watersheds and Communities," (Kitzhaber, 2001).

1.1 Recommended Action

The total analysis area, encompassing seven subwatersheds, totaling 49,473 acres of the greater Galena Watershed—includes National Forest land and other ownerships. Recommended action, would occur only on federal land (see detailed descriptions of action recommended in Chapter 2.0—recommendations and a range of Alternatives, beginning on page 38). Some restorative activities from recommended actions to accomplish this landscape-scale project, may begin in 2003. Because safety and other factors must be applied on a project by project basis, it is estimated that fire prescriptions may take up to ten years to complete. In 3 to 5 years, projects such as prescribed fire will be evaluated to ensure management direction and intent are being met at that time. Table 2, Table 3, and Table 4, which begin on page 4 shows the types of projects and magnitudes of recommended action the forest service has analyzed as necessary to correct undesirable conditions (see 1.2.1 Undesired Conditions, page 8) in the analysis area.

Table 1 Subwatershed Acres

Subwatershed Name	Davis/ Placer	Vinegar	Vincent	Little Boulder/ ♥Deerhorn	Tin cup/ Little Butte	Butte	Granite Boulder	Totals
SWS Number	**30201**	**30203**	**30205**	**30207**	**30209**	**30211**	**30213**	
SWS Acres	7,462	7,585	3,769	10,983	7,430	4861	7,383	49,473
Malheur NF Acres	6,966	7,118	3,758	10,614	7,173	4,854	6,631	47,114
Acres in other National Forests	411 Wallowa Whitman						713 Umatilla	1,124
Private acres	496	56	11	369	257	7	39	1,235
(See Appendix "M" Map—1 Subwatersheds) ♥Some non-Forest Service maps show this as "Dearhorn"								

Aquatics Projects

While some riparian areas are slowly improving naturally, implementation of aquatic projects now, would begin accelerating conditions in a manner that threatened fish populations begin to benefit from an improved riparian environment at the time of implementation. Aquatic project activities would improve hydrologic/fisheries conditions such as: stream-channel stability; riparian shade; and the lack of a meandering nature the streams currently exhibit. These conditions collectively cause peak stream flows in early spring to allow too much water to leave the landscape too soon, with the consequence of low water flow and high water temperatures during late summer months. To improve hydrologic function and fisheries habitat, some projects within certain stream channels would be implemented by the use of heavy equipment. Project actions would improve hydrologic/fisheries conditions toward a properly functioning condition. These recommended actions would adhere to PACFISH /INFISH objectives and recovery strategy.

Vegetation Projects

This recommended action would initiate restoration management across the landscape: this includes 20% mechanical treatment by commercial harvest; 6% mechanical treatment by pre-commercial thinning; and prescribed burning on 47% of the analysis area. A number of projects are designed to move vegetative conditions such as forest stand structure and tree species mix toward an historic range. Prescribed fire and mechanical methods accomplish this transition. Mechanical methods include: commercial harvest implemented by tractor; skyline; and helicopter systems. Additionally, pre-commercial thinning would be used to implement vegetation prescriptions in order to improve and enhance the growth, quality, vigor, and resiliency of forest stands across the landscape. This includes intermediate treatments (generally small-diameter trees), within the Malheur National Forest *Land and Resource Management Plan*[14] designated Roadless Areas (LRMP Appendix C). A number of wood products including commercial timber, post and poles, pulp wood, fire wood, and other wood products such as biomass would be realized with these treatments.

Infrastructure Projects

Some roads or road segments that are currently located in Riparian Habitat Conservation Areas (RHCAs) would be relocated. The relocated roads or road segments would be constructed outside of the RHCA area, and then the old locations would be decommissioned. New roads would be constructed to access areas for prescribed vegetation management where necessary. Most of the new roads would be closed upon completion of project activities. Existing roads that are still needed to provide access for

[14] Malheur National Forest *Land and Resource Management Plan,* 1990 (also referred to as the Forest Plan and LRMP)

management or recreation would receive reconstruction or maintenance work needed to improve user safety and reduce road related impacts to other resources. Roads no longer needed for management or recreation access would be decommissioned and removed from the transportation system.

Table 2 Recommended Action—Aquatics Projects

Hydrology	
Streamside/Riparian Hardwood Protection	4 Miles/12 Acres
Streamside/Riparian Planting and Protection	16 Miles/16 Acres
Channel/Streamside Projects	90 Miles
Area Projects	1,450 Acres
Channel/Floodplain Rehabilitation	3 Miles/14 Acres
Fisheries	
New In-stream Structures	79 Structures
Improve Existing In-stream Structures	36 Structures
Riparian Planting (Plus work associated with in stream structure projects)	5.5 Miles
Culvert Removal or Replacement	2 Removal 1 Replacement

Table 3 Recommended Action—Vegetation Projects.

Harvest Prescription	
Commercial Thin	5,720 Acres
Commercial Thin in Connectivity Stands	1,230 Acres
Shelterwood	1,690 Acres
Salvage	250 Acres
Understory Removal	880 Acres
Pre-commercial Thin	2,160 Acres
Pre-commercial Thin in Connectivity Stands	950 Acres
Yarding Systems	
Tractor Skid	5,090 Acres
Skyline Skid	2,110 Acres
Helicopter Yard	2,670 Acres
Volumes Associated with a Timber Sale	44 MMBF (MMBF=Million Board Feet)
Other Wood Products (post & poles, firewood, chips, etc. from tractor ground only)	69 MBF (MBF=Thousand Board Feet)
Connected Projects	
New Roads	11.9 Miles
Removal of Undesirable Trees	2,570 Acres
Hand Line needed for Prescribed Burn Associated with Timber Sale	37.6 Miles
Machine Line needed for Prescribed Burn Associated with Timber Sale	11.6 Miles
Prescribed Burn Associated with Timber Sale	2,550 Acres
Hand Pile and Burn Associated with Timber Sale	1,850 Acres
Sub-Soil	1,248 Acres
Competing Vegetation Control (with herbicides)	900 Acres
Plant Conifer	1,930 Acres
Pocket Gopher Control (including pesticides)	1,690 Acres
Browse Control	1,690 Acres
Yard Tops	5,370 Acres
Reserve Tree Protection	20,230 Trees
Prescribed Fire	
Prescribed Fire	11,370 Acres

(Does not include harvest acres already incorporating a Burn Prescription)	
Total Upland Acres Treated (Includes Tractor, Skyline, Helicopter, Pre-commercial Thin & Pre-commercial Thin not Associated with Timber Harvest, and Prescribed Fire acreage)	22,011 Acres
Aspen Stands	
Removal of Conifer	25 Sites
Associated Volume	35.5 MBF
Hand Pile and Burn	25 Sites
Buck & Pole Fence	13 Sites @ 19 Acres
Plastic Fence	12 Sites @ 11 Acres
Delineated Old Growth	
Additional Dedicated Old Growth Acres	115 acres
Additional Replacement Old Growth Acres	1,773 Acres
Additional Pileated Woodpecker Feeding Acres	747 Acres
Noxious Weeds	
Manual Treatment	4 Sites @ 0.4 Acres
Chemical Treatment (Herbicides)	6 Sites @ 1.5 Acres
Roadless Areas	
Mechanically Treated Acres (Dixie Only)	875 Acres Harvest
Prescribed Fire (Dixie and Greenhorn Mountain)	1,495 Acres

Table 4 Recommended Action—Infrastructure Projects.

Roads	
Total Road Miles	219 Miles
Total Road Density	2.8 mi/sq. mi.
Reconstructed Roads	165 Miles
Decommissioned Roads	67 Miles
RHCA Decommissioned Roads	24Miles
RHCA Reconstructed Roads	23 Miles
Trails and Trailheads	
Decommissioned Trails	1.7 Miles
Reconstructed Trails	8.3 Miles
Constructed Trails	2.3 Miles
New Trail Heads	2 Trail Heads
Removed Trail Heads	3 Trail Heads
Dispersed Camp Sites	
New Dispersed Camp Areas	3 Camp Areas
Improved Dispersed Camp Areas	2 Camp Areas
Removed Dispersed Camp Areas	3 Camp Areas

1.2 Purpose and Need for Action

The Forest Service has found with the *Galena Watershed Analysis* and recent field reconnaissance that hydrologic and vegetation resources within the *Southeast Galena Analysis area* exhibit undesirable conditions, which are described in section 1.2.1 Undesired Conditions, page 8. Because of these undesired conditions, the Malheur National Forest has determined the need to:

- Improve riparian conditions in reaches of streams that do not presently have the ability to meet Riparian Management Objectives[15] (RMOs). Recommended activities would fall under the category of **Aquatics Projects** and relate to hydrology and fisheries needs;
- Improve the health, vigor, and resiliency of forest vegetation by actively managing them toward an Historical Range of Variability (HRV)[16]. Recommended activities would fall under the category of **Vegetation Projects** and would relate to forest stands, old growth areas, understory vegetation, noxious weeds and aspen needs;
- Reduce impacts from roads, trails, and camping facilities, specifically impacts to water quality, fish habitat, and wildlife habitat. Recommended activities would fall under the category of **Infrastructure Projects.** While these activities benefit aquatic resources, they are related to infrastructure and are tracked separately.

These above needs equate to the following broader statements that capture succinctly the purposes or objectives of this document (Galena WA, Supplement—2002).

- Stream channels and upland slope hydrologic processes will begin a properly functioning condition (PFC)[17] critical for healthy ecosystems.
- Forest stands and associated vegetation will begin to exist within an Historical Range of Variability (HRV) promoting a landscape that is becoming resilient[18] to natural disturbances such as severe wildfire, insect infestation and disease infection.

Proper hydrologic function and a range of desired vegetative conditions would be achieved over time, while simultaneously protecting, and sustaining wildlife and fish species, and supporting the principle of multiple use.[19]

In assessing recommendations from the *Galena Watershed Analysis* and recent field reconnaissance, seven undesirable resource conditions were identified, which were considered for restorative treatment now, rather than at a later time. Table 5, below, summarizes these seven undesired conditions, which

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[15] **Riparian Management Objectives—**Implementation of Interim strategies for managing anadromous Fish-Producing Watersheds in Eastern Oregon and Washington, Idaho and Portions of California. (Also referred to as PACFISH)

[16] **Historical Range of Variability (HRV)—**The natural fluctuation of ecological and physical processes and functions that would have occurred during a specified period of time. This document refers to the range of conditions that are likely to have occurred prior to settlement of the analysis area by Euro-Americans (approximately the mid 1800s), which would have varied within certain limits over time. HRV is discussed in this document as a reference point, to establish a baseline set of conditions for which sufficient scientific or historical information is available to enable comparison to current conditions. From *Interior Columbia Basin Ecosystem Management Project* Supplemental Draft EIS glossary definition.

[17] **Properly Functioning Condition (PFC)—**Riparian and wetland areas [and upland areas where applicable in this analysis area] achieve Proper Functioning Condition when adequate vegetation, landform, or large woody debris is present to dissipate stream energy associated with high water flows. This reduces erosion and improves water quality; filters sediment, captures bed load, and aids flood plain development; improves floodwater retention and ground water recharge; develops root masses that stabilizes stream banks against cutting action; develops diverse ponding and channel characteristics to provide habitat and water depth, duration and temperature necessary for fish production, waterfowl breeding, and other use; and supports greater biodiversity. The functioning condition of riparian and wetland areas is a result of the interaction among geology, soil, water, and vegetation. From *Interior Columbia Basin Ecosystem Management Project* Supplemental Draft EIS glossary definition.

[18] **Resilient-Resiliency**—The ability of a system to respond to disturbances. Resiliency is one of the properties that enable the system to persist in many different states or successional stages. From *Interior Columbia Basin Ecosystem Management Project* Supplemental Draft EIS glossary definition.

[19] **The Multiple Use Sustained-Yield Act of 1960**— This act confirms the principle that all forest uses are of equal importance and should not damage the ability of the land to serve future generations. This act requires that National Forests be administered for "multiple use and sustained yield of the several products and services obtained there from," (16 USC 531).

are now considered "ripe for decision." This table also contrasts each undesired condition with a desired condition, which can be viewed as a project objective or desired outcome. Following this table under section 1.2.1 Undesired Conditions, descriptions of the seven undesired conditions are discussed in more detail. This is followed by section 1.2.2 Desired Conditions, which describes conditions which would rectify the existing undesired conditions. By taking into consideration these conditions, a better understanding of the contrast (or the discrepancies between these conditions), will show the basis of the underlying Purpose and Need of this proposal.

Table 5 Undesired Condition/Desired Condition matrix

UNDESIRED CONDITONS	DESIRED CONDITIONS
1.2.1.1—Across the landscape, peak stream flows in early spring are intensified, reducing water availability for late season flows (see page 8).	**1.2.2.1**—By implementing aquatic, vegetation and infrastructure projects, cool water is held for longer periods across the landscape of the analysis area and available in late summer/early fall for fish and wildlife species. (see page 21).
1.2.1.2—A number of streams do not meet State standards and are listed on the State of Oregon 303(d) List of Water Quality Limited Waterbodies (1998) Federal Clean Water Act (see page 10).	**1.2.2.2**—With aquatic and infrastructure projects, improved habitat conditions and lowered temperatures for streams within the analysis area are in a manner that sustains viable populations of threatened fish species (see page 22).
1.2.1.3—Some stream segment conditions are outside an expected range for fish species (see page 11).	**1.2.2.3**—By implementing aquatic and infrastructure projects, damaged stream segments within the analysis area are repaired and habitat is created that improves and sustains viable fish populations (see page 22).
1.2.1.4—Vegetation conditions are outside the Historical Range of Variability (see page 14).	**1.2.2.4**—By implementing aquatic and vegetation projects, resilient patterns of forest stands incorporating multi-resource habitat needs dominate the landscape in a mosaic that has the ability to withstand the endemic disturbance regimes of insect infestation, disease infections, and low intensity wildfire. (see page 21).
1.2.1.5—Uncharacteristically severe wildfires are likely to occur in Dry and Moist Forest types (see page 17)	**1.2.2.5**—By implementing vegetation and infrastructure projects, fire adapted forest stands once again dominate the landscape in a mosaic pattern where wildfires normally burn with low intensity over most of the area in Dry and Moist Forest types. (see page 25).
1.2.1.6—Terrestrial wildlife habitat is currently degraded or missing essential components because of past activities.(see page 18).	**1.2.2.6**—By implementing aquatic, vegetation and infrastructure projects, resilient patterns, corridors, linkages, and forest stands once again dominate the landscape and are resilient to endemic disturbances and provide proper structure and cover for wildlife. (see page 27). .
1.2.1.7—Noxious weeds are invading the ecosystem and displacing native species (see page 20)	**1.2.2.7**—The landscape is free of noxious weeds and native vegetation is vigorous and resistant to future weed invasion. (see page 28).

1.2.1 UNDESIRED CONDITIONS

The following seven undesired conditions, were originally identified in the Galena EAWS as opportunities with subsequent recommendations which could be resolved through treatment. These following sections describe why a need exists in the analysis area, and why treatment should occur now rather than at a later time. Recommendations have been brought forward through this document (Galena WA, Supplement—2002) as described under the Recommended Action beginning on page 2. These projects are one way to help move or accomplish the desired conditions as described in 1.2.2 , page 21.

1.2.1.1 Undesired Condition: Early Season Peak Flows

Across the landscape, peak stream flows in early spring are intensified, reducing water availability for late season flows.

Snow melt and summer storm runoff are leaving the landscape too fast in the analysis area. Peak and near peak flows are longer in duration and the total early season flow is greater than in an undisturbed landscape. Late summer base flows are smaller and the duration of low flows is longer. Elevated peak and near peak flows occur because channels have been down cut and are no longer connected with flood plains or side channels. Other factors contributing to elevated flows include:

Photo 1—Hydraulic mining was prevalent in the analysis area.

- Upland soil loss and degradation during mining and early grazing practices prior to and at the turn of the 19th and 20th Centuries;
- The loss of large woody debris in streams due to early logging and other management practices; the loss of riparian hardwoods due to changes in the water table;
- Historic livestock over-grazing (prior to the 1950's) which has led to soil compaction and loss of cover;
- The loss of a natural meandering nature of streams;
- A reduction in naturally occurring vegetation along the riparian areas of streams due to many factors;
- Most recently (since the 1940s), roads have intercepted both overland water flow and groundwater across the landscape, concentrating runoff that would have otherwise been

absorbed and filtered by forest vegetation. Additional soil compaction of landing sites from logging operations is a factor in increased runoff of surface water across the landscape.

Photo 2—From approximately 1905 through the 1940s railroad logging occurred throughout most of the analysis area (see Appendix E, Map 4—Historic Railroad Logging). Courtesy Harney County Historical Museum

Additionally, there is a vulnerability of soils to erosion following storm events of high intensity and short duration. The John Day basin is recognized as having some of the most intense two hour rainfalls in the State of Oregon. This may place areas that have lost ground cover (or infiltration capacity) from historical grazing and other disturbances, at a higher risk than those areas where frequent summer storms do not occur (Galena Watershed Analysis 1999).

Historic increased peak flows have contributed to stream channel down cutting, which has in some instances, disconnected floodplains from the water table. These floodplains no longer act as "sponges" which, formerly captured surface flow. These floodplains no longer store ground water for late season release. Additionally, the removal of beaver from the analysis area has contributed to the decrease of wetlands associated with beaver dams. The construction of beaver dams retained water on the landscape year-round.

This has led to an undesirable condition across the landscape of the analysis area. Late summer base flows are smaller, and the duration of low flows is longer. Some stream segments in the analysis area go dry in summer months because of factors previously described.

Roadless Areas

Within the Dixie and Greenhorn Mountain Roadless Areas, management in the past 100 years has substantially altered the drainage network (including uplands) and its behavior over approximately half of this area. While the undesired conditions described in this section, may not be as severe in the designated roadless area these conditions are nevertheless present.

Compare the previously described undesired condition with following sections in this document (Galena WA, Supplement—2002) 1.2.2.1 Desired Condition: Lower Peak Flows, page 21 ; Chapter 3—Affected Environment, ***3.2.1—Early Season*** Peak Flows*, page 113;* ***3.3.0 Roadless Character****, page 204 and Chapter 4—Environmental Consequences,* ***4.2.1 Treatment Objectives for Early*** Season Peak and Near Peak Stream Flows *, page 239.*

1.2.1.2 Undesired Condition: High Stream Temperatures

A number of streams do not meet Federal Clean Water Act standards and are on the State of Oregon 303(d) List of Water Quality Limited Water bodies (1998).

Under the Clean Water Act (CWA) the primary beneficial use in the analysis area is fish habitat. Other beneficial uses include: irrigation withdrawals and State Scenic River and other aesthetic uses. Segments of seven tributary streams and the Middle Fork of the John Day river, are on the 1998 State Water Quality Limited 303 (d) List[20] for temperature (fish rearing). The Middle Fork of John Day River and the lower segments of many of its tributaries exceed the State standard for temperature (a standard for fish rearing) of 64º(F), over 45 days of the year. Granite Boulder Creek exceeds the State standards for temperature (a standard for bull trout). At higher elevations (over 5000 feet) this temperature standard is exceeded in analysis area streams on an average of less than 6 days per year. In August through September, temperatures in the Middle Fork have been recorded in the 80°s (F), with temperatures staying in the upper 70°s (F) for several weeks. The mainstem of the river is also listed for flow modification based on withdrawals granted by water rights. A need exists to reduce or maintain lower stream temperatures by increasing riparian vegetation in a manner that mimics historic patterns, which shade streams in the analysis area. At least 4 miles of existing hardwood vegetation is currently being heavily browsed in manner that precludes any shade benefit to these streams. Additionally, twenty-five aspen sites have been identified in dramatic decline, further reducing stream shade in these areas.

Loss of ground water storage and reduced base flows in summer (see page 8), flow modifications, reduced stream shade, increased wetted channel width-to-depth ratios,21 declining aspen stands, which assist in riparian storage, and diminished pool frequency and pool volume contribute to elevated stream temperatures. For fish bearing streams several parameters affecting stream temperature do not meet Land and Resource Management Plan standards based on surveys that followed the Region 6 Stream Survey Protocol (USFS 1996). Analysis indicates that about 70% (approximately 50 stream miles) of surveyed streams do not meet Land and Resource Management Plan standards 22 for shade (see 3.2.2—Stream Temperatures, page 124). It is estimated that 50-70% of the analysis area's streams do not meet Land and Resource Management Plan standards for wetted channel width-to-depth ratios. It is also estimated the 70-90% of the areas streams do not meet Land and Resource Management Plan standards for pool frequency. The condition of small perennial and intermittent streams and ephemeral draws contributes to elevated stream temperatures. It is estimated that of the small perennial streams, 70% do not meet shade standards. About 50% of intermittent streams and ephemeral draws have conditions (see 3.2.1—Early Season Peak Flows, page 113) which contribute to accelerated runoff and thus contribute to elevated stream temperatures.

[20] State of Oregon, Department of Environmental Quality's 1998 Section 303 (d) for stream temperature and minimum flow requirements. The 1972 Federal Clean Water Act (CWA) in Section 303 (d) requires each State to identify those waters for which existing required pollution controls are not stringent enough to achieve that State's water quality standards. Within the Southeast Galena analysis area this section of the Middle Fork John Day River is currently listed in Oregon's 1998 Section 303(d) list for exceeding both stream temperature standards and summer flow minimums.

[21] Width-to-Depth Ratio: Low stream channel wetted width-to-depth ratio helps to maintain cooler temperatures by making less sunlight present on the water surface in streams.

[22] LRMP Amendment 29

Photo 3—Logging (railroad and truck logging) occurred through the 20th Century and once supplied two mills that were built to process lumber from the greater Galena Watershed.

Past logging (see Logging, page 210) and mining activities (see Mining, page 209) have straightened channels, reduced shade and reduced the level of woody debris in riparian areas. Historic changes in the landscape, including a lack of riparian forest canopy and a loss of riparian vegetation, contributed to water temperatures being elevated and to the loss of water in riparian storage, which once effectively regulated water flow evenly through the year. Past management activities and natural events have created a condition where a rapid movement of water off the landscape occurs every year, contributing to high stream temperatures. The seven tributaries and the Middle Fork John Day are streams within the analysis area listed on the State 303(d) list, which is prepared by the State of Oregon's Department of Environmental Quality. This list identifies streams in non-compliance with the Federal Clean Water Act. These aquatic habitat conditions have focused attention on the undesired conditions of high stream temperatures as well as the low, late season water flows, as described above, and their relation to potential effects on threatened fish species.

Roadless Areas

Within the Dixie and Greenhorn Roadless Areas, the alteration of the drainage network from past management activities (described in1.2.1.1 Undesired Condition: Early Season Peak Flows, page 8) contributes to elevated stream temperatures in reaches below these areas. While the undesired conditions described in this section may not be as severe in the designated roadless area, these conditions are nevertheless present.

Compare the previously described undesired condition with following sections in this document (Galena WA, Supplement—2002) 1.2.2.2 Desired Condition: Lower Stream Temperatures page 22; Chapter 3— Affected Environment, 3.2.2—Stream Temperatures, page 124; Chapter 4—Environmental Consequences, 4.2.2 Treatment Objectives for High Stream Temperatures, page 253; and 3.3.0 Roadless Character, page 204.

1.2.1.3 Undesired Condition: Damaged Aquatic Habitat

1.2.1.3—Some stream segment conditions are outside an expected range for fish species.

Steelhead trout and bull trout are present in the analysis area and are listed as Threatened under the Endangered Species Act, (see pages127 and 128). Additionally, Chinook salmon and redband trout also present in the analysis area, and are listed as a sensitive species, (see page 129). Vegetation shade

that helped maintain cooler water temperatures that are necessary for these threatened species was more widespread and diverse before settlement by Euro-Americans when aspen and cottonwood stands were more prevalent throughout the analysis area (*Galena Watershed Analysis*). Before settlement, most stream segments in broad valley bottoms also had a natural tendency to meander slowly through the watershed, holding water at cooler temperatures with a dense streamside vegetation cover and an old forest canopy providing shade and bank stability on streams in the area. Historic mining, grazing, and logging have contributed to a change in vegetation type throughout riparian areas as well as upland areas in the project (see 3.2.4 Vegetation by Forest Type, beginning on page 139). Many detrimental conditions for fish in the analysis area streams and the causes of these unfavorable conditions are described in 1.2.1.1, page 8 and 1.2.1.2, page 10. There are no fish hatcheries in the John Day basin which is listed as containing 5 of the 23 healthiest salmon and steelhead stocks in the entire state of Oregon (Huntington 1994). Therefore, all activities affecting fisheries in this system are controversial in nature, due to the presence of wild stocks of steelhead trout and bull trout.

As described in 1.2.1.1 Undesired Condition: Early Season Peak Flows, page 8 the reduction of late season flows equates to smaller streams going dry during summer months, thereby impacting the fall spawning activities of bull trout during the low flows in August through November. Smaller streams are important because these tributaries of the Middle Fork of the John Day River maintain clean water and cool water temperatures for all salmonid species, all of which are in need of high quality rearing habitat during late season flows. Wildlife movement is also impacted across the landscape when wildlife is searching out these denser vegetative areas containing pools of water and relief from heat (see 1.2.1.6 Undesired Condition: Degraded Wildlife Habitat, page 18).

The Middle Fork of John Day River and many of its tributaries exceed the State temperature standard of 64ºF, over 45 days of the year. This occurs through late season flows when bull trout spawn. Water temperatures for bull trout spawning and steelhead trout rearing is vital for these threatened species. Bull trout spawn from August through November requiring optimum water temperatures of 48°F or below. Rearing temperatures for bull trout are 54ºF or below. Optimum steelhead rearing temperatures are less than 64ºF. Spawning temperatures are rarely an issue for steelhead, as this species spawn in the spring when streams exhibit lower temperatures due to surrounding air temperature and ample water from snowmelt runoff.

Pools have been reduced in part due to the removal of riparian vegetation from past logging reducing potential wood debris, past hydrologic mining eliminating vegetation, and extraction of beaver. Beavers played a role in slowing water, providing natural impediments to peak flows and sediment transport as well as providing deep pool habitat for fish. Beavers were removed from eastern Oregon and the analysis area through trapping by the late 1800s (Lichatowich 1999). However, small numbers of these animals have returned to the analysis area (see Beaver Activity, page 136).

Pool to riffle ratios of a range of 1 pool to 1 riffle to 1 pool to 1.5 riffles (1:1 to 1:1.5) are considered excellent fish habitat. Pool to riffle ratios of streams which are greater than 1 riffle to 1.5 pools (1:1.5) indicate reduced pool habitat and are considered riffle ratios, which are not properly functioning. Only 10% of fish bearing reaches in the analysis area have pool to riffle ratios of 1:1 to 1:1.5. The pool to riffle ratios of 90% of fish bearing reaches in the analysis area have pool to riffle ratios greater than 1:2.3. Past efforts by the Forest Service of building log structures in streams (in-stream structures) to improve pool quality and quantity have begun to deteriorate and many of these older structures are in need of repair with several actually widening stream channels and others creating barriers to fish movement at low flows.

Classified roads in the analysis area are contributing to stream sedimentation, increased stream temperature, and reducing fish habitat quality and quantity. Continued use of roads that cause sedimentation is not compatible with aquatic habitat resources. In some instances, the use of unsurfaced roads during wet weather in spring and fall is adding to stream sedimentation.

Photo 4—Native surface roads during wet weather in spring and fall are contributing to accelerated runoff, stream turbidity and sedimentation.

Due to insufficient funds to maintain or upgrade all roads, the condition of some roads would continue to deteriorate and potentially contribute sediment to streams unless appropriate actions such as reconstructing, decommissioning, relocating or closing of roads takes place.

There are approximately 267 miles of existing open and closed roads (this includes all Forest classified roads[23] and road under other jurisdiction). Of these roads, there are approximately 60 miles of roads located in Riparian Habitat Conservation Areas (RHCAs) of which about 33 miles are left open that may be contributing sediment to nearby drainages. These aforementioned conditions when combined with the factors of the undesired conditions outlined in 1.2.1.1 and 1.2.1.2 are degrading fish habitat. Currently total road density within the analysis area is about 3.45 miles per square mile. The USFWS in 1998 and NMFS in 1996 have developed a matrix that rates watershed health for fish pathways and indicators for bull trout and steelhead, respectively. Subwatershed with road densities over 2.4 miles per square mile are considered as functioning at an unacceptable risk for bull trout whereas over 3 miles per square mile is considered as functioning at an unacceptable risk for steelhead.

Roadless Areas

As expressed above and in 1.2.1.1 and 1.2.1.2, the same impacts and concerns are evident within the Dixie and Greenhorn Mountain Roadless Areas. Aquatic habitat has been altered and is not functioning as described in 1.2.2.3 Desired Condition: Functioning Aquatic Habitat, page 22. As with the other undesired conditions, these concerns tend to be in the lower half of the Roadless Areas but can be seen in some of the higher elevations as well.

Compare the previously described undesired condition with following sections in this document (Galena WA, Supplement—2002): 1.2.2.3 Desired Condition: Functioning Aquatic Habitat, page 22; Chapter 3—Affected Environment, 3.2.3 Aquatic Habitat page 125; 3.3.0 Roadless Character, page 204 and Chapter 4—Environmental Consequences, 4.2.3 Treatment Objectives for Aquatic Habitat, page 255.

[23] **Classified road.** A road wholly or partially within or adjacent to National Forest System lands that is determined to be needed for long-term motor vehicle access, including State roads, County roads, privately owned roads, National Forest System roads, and other roads authorized by the Forest Service. If a system road is no longer necessary for long-term resource management it is considered a candidate for decommissioning.

1.2.1.4 Undesired Condition: Vegetation Outside Historical Range of Variability

Vegetation conditions are outside the Historical Range of Variability.

Current stand structure and tree species composition are not meeting the HRV (see definition page 6), particularly in the Old Forest Single Strata[24] (OFSS) structural stage. Present growth conditions and stand structures are not on a trajectory to increase the early seral species, or to restore the large tree component (open park-like stands) that is lacking across the landscape. Over 50% of the ponderosa pine and western larch forest stands (Dry Forests[25]) are not within the HRV. These forests were once more open and park-like in appearance, dominated by early seral tree species such as ponderosa pine and western larch. Even the mid elevation Moist Forest types (Douglas-fir and grand fir) were less dense and more resistant to major disturbance events such as insect, disease, or fire than they are at present.

Photo 5—Open and park-like stands of large fire-resistant trees such as these were once prevalent throughout the analysis area(OFSS).

Due to fire suppression and past logging practices (see, page 210), the character of the forest has changed in the analysis area, as it has throughout the Blue Mountains. There are fewer large, fire resistant trees and many more smaller trees in forest stands. These Dry Forests have become more susceptible to uncharacteristically severe wildfire, disease and insect infestation.

In the Dry Forest types, (about 58% of the analysis area), only 1% of the area is now Old Forest Single Strata (OFSS). This open park-like stand structure, now present only as a remnant, was once representative of historical stand conditions which was stocked with primarily fire tolerant species, ponderosa pine and western larch. These fire adapted forests (OFSS) once comprised 30 to 55% of the landscape, dominating the analysis area.

[24] **OFSS** See Stand Structure Definitions page 145

[25] see 3.2.4.1 Dry Forest Type, page 140.

Photo 6— Due to fire suppression and other activities, the character of the forest in the Analysis area has changed, as it has throughout the Blue Mountains.

The Moist Forest types (about 23% of the project acres) is not as far out side of the HRV as the Dry Forests. Formerly OFSS comprised up to 15% of the Moist Forest where today, OFSS makes up about 5% of the Moist Forest type(see Appendix E, Map 7 Forest Stand Structural Stages). The exclusion of fire has allowed grand fir species to reproduce and proliferate in the shade of remaining larger ponderosa pine and western larch. The lack of fire has allowed this reproduction of grand fir to create high densities of fire-susceptible trees. Formerly, low intensity cooler smaller-scale fires periodically would under burn these areas in small patches creating larger trees in open park like stands (Agee, 1993). Now, fire-susceptible forest stands dominate 99% of the landscape of the Moist Forest portion of the analysis area.

Chapter 3 of this document (Galena WA, Supplement—2002) discusses in more detail the analysis area's current stand structure including age classes and how it relates to the HRV (see 3.2.4 Vegetation , page 139).

Quaking aspen stands are isolated, declining, and smaller in numbers than they were historically. According to recent research, aspen stands are less than 10% of their former range and distribution (Tatum 2001). Fire stimulates aspen growth, and because of fire exclusion, few sprouts are emerging. The new shoots that do emerge are often browsed by deer, elk, and cattle. Overstocking of conifers is causing stand encroachment and shading in the remaining aspen stands. When the factors that contribute to aspen decline are combined, it is clear that current conditions are effectively suppressing any aspen regeneration. The thriving re-growth of burned and fenced stands in the nearby Summit Fire area that was prescribed in the *Summit Fire Recovery Project* (see Photo 10, page 76) attests to the viability and regenerative capacity of even small, late-to-old-structure groves of aspen when sites are protected.

Photo 7—The overstocking of stand conditions impact numerous resources in an undesired manner.(YFMS)

Understory vegetation is deteriorating in a manner similar to the aspen stands. The alteration of natural fire regimes has resulted in uncharacteristically dense shade from the overstory, decreasing the understory vegetation and ground cover. Because of the understory vegetation reduction, the availability of wildlife forage has been reduced.

Roadless Areas

Within the Dixie and Greenhorn Roadless Areas, management in the past 100 years has substantially altered Dry Forests and lower elevations of Moist Forest causing these forests to move outside HRV. Examples of these activities include railroad logging, truck logging and exclusion of wildfire. The higher elevation Moist and Cold Forest types are likely close to HRV, largely because management activities have not occurred in these areas in the same manner as in lower elevations.

Compare the previously described undesired condition with following sections in this document (Galena WA, Supplement—2002): 1.2.2.5 Desired Condition: Low Severe Wildfire Risk page 25; Affected Environment, 3.2.5 High Wildfire , page 159;3.2.4 Vegetation , page 139 Logging, page 210 Fire Exclusion Policies, page 211;3.3.0 Roadless Character, page 204 and Environmental Consequences, 4.2.5 Treatment objectives for High Wildfire , page 262.

1.2.1.5 Undesired Condition: High Wildfire Hazard

Uncharacteristically severe wildfires are likely to occur in Dry and Moist Forest types.

Uncharacteristically severe wildfires are likely to occur because fire has been excluded from forest stands for the past 100 years and most of the large fire resistant ponderosa pine and western larch has been removed. Analysis area forest stands historically existed as fire adapted forests with a fire regime of frequent, low intensity fires, particularly in large fire resistant ponderosa pine and western larch stands. With the exclusion of wildfire, hazardous fuels have accumulated. Multi-layered tree canopies are dominant across the landscape. Historically the single layered old forests (OFSS) with the open park-like conditions covered 30 to 55% of the Dry Forest type. Historically when fire entered the ecosystem, they were more frequent and low intensity ground fires due to the open park-like stands that retained very little ladder fuel to allow fire to climb into the overstory crown and were made up of fire-resistant trees. Currently, many of these areas are now multi-layered stands with accumulations of dead surface litter and thick understories of grand fir. This structure of fuel acts as a ladder connecting right into the larger tree crowns, consequently wildfires can commonly progress into high intensity crown fire, and very likely develop rapidly into a large number of acres as an uncharacteristically severe wildfire (e.g. Summit Fire, 1996, which burned adjacent to the analysis area). Fires of this type consume the organic layers of soils and kill virtually all vegetation over significantly greater numbers of acres than the low-intensity fires that occurred historically (*Galena EAWS,* Malheur National Forest, 1999 also see Appendix F this document (Galena WA, Supplement—2002)) . Uncharacteristically severe wildfires put natural resources, human safety, and local structures at unacceptable risks.

Photo 8—In 1996 the Summit Fire started on the Umatilla National Forest and burned 37,961 acres across two National Forests (see Appendix E, Map 2—Large Fire History).

Nationally, only two per cent of fires escape in a manner that would produce an uncharacteristically severe wildfire (*Roadless FEIS* 2000 p.98). However, many factors exist in the Southeast Galena analysis area that cause this area to be more vulnerable. Due to local weather patterns, fire frequency in the Galena Watershed is the highest on the Malheur National Forest. Weather patterns coupled with overstocked forest stand conditions have accounted for over one-third of the watershed in the past decade being subject to uncharacteristically severe wildfire, including the 1996 Summit Fire (see page 159), and the 1994 Reed Fire. These recent fires have burned with such intensity that the ecosystems of many of these areas have been drastically changed.

Currently, about 75% of the analysis area has conditions which are rated as a high fire hazard,[26] with vegetation conditions that indicate a crown fire may become the typical fire behavior pattern in over 60 percent of this area.

26 Fire Hazard relates to fuel accumulation or loadings while **Fire Risk** is a term relating to the probability of a fire starting,.

In 1997, in the Vincent and Vinegar Subwatersheds, a wind event blew down a substantial amount of trees over 1400-acre area. These conditions presents an additional fire-hazard from an excess of ground fuels—and may also pose a threat of a large insect infestation.

Due to these undesired fuels accumulating from overstocked vegetation conditions and (standing dead and forest floor accumulations) in and around the analysis area (excluding the recent fire occurrences) and the recorded high level of lightning strikes in the Galena area, uncharacteristically severe wildfire may spread outside the analysis area from fires originating in analysis area stands. Uncharacteristically severe wildfire could spread into the analysis area from other adjacent watersheds that are in similar conditions. Resources along with historic and contemporary structures on adjacent public and private lands are vulnerable to loss. Suppressing uncharacteristically severe wildfire under current forest stand conditions is dangerous and unpredictable for wildland fire fighters—presenting a threat to human life (see Appendix E, Map 2—Large Fire History).

Roadless Areas

Most of the conditions found in Dixie Butte and Greenhorn Mountain Roadless Areas are as in the previously described undesired condition about HRV, and in this present discussion of wildfire hazard. This equates to many of the same concerns as described above with conditions susceptible to uncharacteristically severe wildfire. This is especially true in the Dry Forest types and lower elevation Moist Forest types that have been substantially altered from past harvest, changing forest composition and fire suppression changing forest composition and structure. The Moist and Cold Forests in the upper elevation of these roadless areas provide important large, undisturbed areas for wildlife and may closely represent what occurred in these forests historically. However, while stand replacing fires are the historic fire regime for upper Moist and Cold Forest types these areas are currently in jeopardy of loss because lower elevation Dry Forests are outside HRV that uncharacteristically severe wildfire starting down slope are more likely to burn through the high elevation areas (see Roadless Areas, page16) than what occurred historically.

Compare the previously described undesired condition with following sections in this document (Galena WA, Supplement—2002): 1.2.2.5 Desired Condition: Low Severe Wildfire Risk page 25; Affected Environment, 3.2.5 High Wildfire , page 159; Logging, page 210 ; Fire Exclusion Policies, page 211; and Environmental Consequences, 4.2.5 Treatment objectives for High Wildfire , page 262.

1.2.1.6 Undesired Condition: Degraded Wildlife Habitat

Terrestrial wildlife habitat is currently degraded or missing essential components because of past activities.

Threatened, Endangered or Sensitive (TES[27]) species, Management Indicator Species (MIS[28]), and Species of Interest (SOI[29]) utilize the analysis area. Habitats for these species developed with the fire adapted forests of the past. As forest conditions moved outside of their HRV, habitat conditions for these species were also altered. A combination of management activities, including timber harvest, road construction, grazing, and fire suppression, and natural disturbances, such as wildfire and windstorms

27 Endangered Species: An animal or plant species listed under the Endangered Species Act that is in danger of extinction throughout all or a significant portion of its range.
Threatened Species: An animal or plant species listed under the Endangered Species Act that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.
Sensitive Species: Species identified by a Forest Service regional forester for which species viability is a concern either a) because of significant current or predicted downward trends in population numbers or density, or b) because of significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.
28 Management Indicator Species (MIS): A species used to monitor the effects of planned management activities on viable populations of wildlife and fish, including those that are socially or economically important.
29 Species of Interest (SOI): A species of high public interest or demand.

have reduced some habitats below historic levels. Particularly noted are losses in old growth[30] habitat, dead wood habitat (large snags and down logs), grass and shrub forage. High open road density elevates the potential to disturb sensitive wildlife species.

The most pronounced habitat loss is in the Old Forest Single Strata (OFSS) structural stage, as described in 1.2.1.4 Undesired Condition: Vegetation Outside Historical Range of Variability, page 14. This is a trend in forested stands throughout much of the Interior Columbia Basin, raising significant ecological concern for species that are associated with OFSS. The white-headed woodpecker is identified as an MIS in the Malheur NF *Land and Resource Management Plan*.

There is concern for potential losses to Old Forest Multi- Strata[31] (OFMS) predominantly found in the Moist and Cold Forest types. OFMS habitat has been altered from historic conditions. Some areas, such as in the Granite Boulder Subwatershed, have seen high losses in OFMS due to large wildfires such as the 1994 Reed Fire. Other areas, such as the Butte Subwatershed, have been highly fragmented by timber harvest units that create inclusions of young forests. The harvested patches average 30-55 acres in size, which diminish the value of OFMS habitat by creating more forest edge and less interior habitat. While forest edge is favored by some species such as the great gray owl, other species, such as the pileated woodpecker, pine marten and Pacific fisher, rely on contiguous habitat with little edge to avoid predators and competitors. Both the pileated woodpecker and pine marten are identified in the *Malheur Land and Resource Management Plan* (LRMP) as MIS for OFMS. The Pacific fisher is a sensitive species.

Direction in the *Land and Resource Management Plan* requires establishment of a network of Dedicated Old-Growth (DOG) areas across the Forest to provide habitat for wildlife species dependent on OFMS conditions. *Land and Resource Management Plan* direction also requires the establishment of Replacement Old Growth (ROG) areas to counter possible catastrophic damage or deterioration of dedicated old growth areas. Thirteen DOG's have been designated within the Southeast Galena analysis area to help provide a network of habitat blocks for MIS pileated woodpecker and pine marten. Existing DOG's are not always tied to logical stand or topographical boundaries. ROG's have not been established for 11 out of 13 DOG's. Pileated feeding areas have not been established for 4 out of 5 pileated woodpecker DOG's (see management direction in Dedicated Old Growth and Connectivity, page178).

The *Land and Resource Management Plan* identifies eleven MIS as indicators of dead and defective tree habitat because they create their own nesting cavities in dead or defective trees. Primary cavity nesters include such species as pileated woodpecker, white-headed woodpecker, and the three-toed woodpecker. The *Land and Resource Management Plan* specifies that to provide habitat for 100 percent potential population levels of primary cavity excavator species, i.e., it is necessary to have a minimum of 2.4 snags per acre greater than 21 inches dbh, averaged over approximately 40 acres of forested land. Currently 58% of the watershed, primarily in Dry Forest types, does not provide this required level of snag habitat. There are probably areas 40 acres in size or larger with very few or no snags, providing habitat for less than 20 percent potential population levels. Stands are in younger structural stages and consequently deficient in large diameter trees. Because stands are overstocked, individual tree growth is low. Without management is it is unlikely these stands can grow the large diameter trees required to provide a sustained flow of large diameter snags. In Dry Forest areas, population viability for primary cavity excavator species is likely to remain low. As snags eventually fall and provide down logs, any deficiency in snags, could also lead to a future deficiency in down log habitat.

Rocky Mountain Elk are identified as a MIS due to the economic and social value of these animals, and their response to changes in forest cover, forage quality and open road densities. Elk and deer numbers appear to be out of balance with forage, particularly in the amount of understory grasses and shrubs

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30 Old Growth: A forest stand compose of mature/over mature trees (150 years old or older) which provides habitat for wildlife species dependant upon mature/over mature trees. LRMP IV-105 In this DEIS old growth is subdivided into two structural stages, Old Forest single Strata (OFSS) and Old forest Multi-strata (OFMS).

31 See structural stage definitions, page 145

these animals browse upon. Growing conditions for forage plants are less favorable on many sites compared to historical conditions. This is largely a result of fire suppression, which allowed conifers to increase and shade out understory grasses and shrubs. Dry Forests occupy 28,600 acres (58% of the Southeast Galena Area).

Currently, about 50% of the Dry Forests acres are highly or moderately overstocked, causing decreased grass, forage, and shrub availability. Additionally, fire no longer acts as a rejuvenating agent; underburning invigorates many shrub and grass species and is vital to some species such as ceanothus. Hardwood tree and shrub habitats are particularly deficient, and being over-browsed. At least 21 miles of stream needs hardwood planting and protection to help restore riparian vegetation along stream banks. At least 4 miles of existing hardwood vegetation needs to be fenced. Twenty-five aspen sites are in dramatic decline.

Roads open to motorized traffic allow easy access to big game habitat. Motor vehicles and associated human activities can cause stress in some big game animals, which leads to poor distribution of animals within available habitat. Easy access on forest roads leads to reduced buck and bull escapement during the hunting season and facilitates poaching. In winter range, road densities in the Tincup/Little Butte and Granite Boulder Subwatersheds greatly exceed the Land and Resource Management Plan (LRMP)standard of 2.2 miles of open road per square mile. Currently, the Tincup/Little Butte Subwatershed has 3.9 miles of open road per square mile and the Granite Boulder Subwatershed has 7.0 miles of open road per square mile. Elsewhere, subwatersheds meet open road density standards, but do not always meet the target levels recommended by the Land and Resource Management Plan (LRMP) Record of Decision (1.5 open road miles per square mile in summer range; and 1.0 open road miles per square mile in winter range).[32] The LRMP, Record of Decision states that these target densities will be met.

Roadless Areas

Within the Dixie Butte and Greenhorn Mountain Roadless Areas, as described in two previous sections (pages 16 and 17) are outside HRV in low elevation Dry Forests and Moist Forests. Although large, unroaded areas usually provide higher quality wildlife habitat—these roadless areas are so far outside HRV, as to be unsustainable, placing wildlife species and wildlife habitat at a higher risk than when fire adapted forests were prevalent. Relatively undisturbed landscapes are important to biological diversity and the long-term survival of wildlife species are currently at risk because of these conditions. At present, approximately 75% of the analysis area have conditions which present a high fire hazard. Another uncharacteristically severe wildfire in the manner of the 1996 Summit Fire in this area would result in the losses of large blocks of wildlife habitat.

(Compare the above undesired condition with: 1.2.2.6 Desired Condition: Wildlife page 27; 3.2.6 Wildlife Habitat, page 165; and 4.2.6 Treatment Objectives for Degraded Wildlife Conditions, page 284.)

1.2.1.7 Undesired Condition: Noxious Weeds are Present

1.2.1.7—Noxious weeds are invading the ecosystem and displacing native species

Noxious weeds are difficult to manage, non-native plants which pose a threat to native plant communities. Natural controls to limit the size of noxious weed populations do not exist, so populations tend to expand rapidly at the expense of the native flora. Heavy infestations can increase fire hazards, replace valuable forage with non-palatable or less nutritious forage for both wildlife and cattle, cause economic losses to adjacent farming and ranch communities, decrease the quality of recreational

[32] The LRMP Record Of Decision states "access management planning will strive for 1.5 miles of open road per square mile area (mi/mi^2) unless these densities do not allow activities that maintain a healthy and productive Forest as envisioned in the desired future condition, or interfere with access to private land."

activities, and reduce the diversity of native plant and animal communities. Plant species listed as sensitive may be moved towards listing by loss of habitat to weed invasion. Besides reducing complexity of biological communities, weed infestations can indirectly affect water runoff and sediment yield from infested sites (Quigley and Arbelbide, 1997).

Noxious weeds have been identified in the analysis area occupying approximately 56 sites that cover a total of about 28 acres. Because these noxious species are most highly adapted to increase rapidly on newly disturbed ground (e.g. bladed roadsides, new roadbeds, logging decks, skid trails, areas of concentrated cattle use, etc.), the amount of ground disturbance (in acres) generated by the project gives a measure of potential weed spread.

Compare the above undesired condition with: 1.2.2.6 Desired Condition: Wildlife 1.2.2.7 Desired Condition: Noxious Weeds, page 28;3.2.7—Noxious Weeds , page 203; and 4.2.7 Treatment Objectives for Noxious Weeds, page 320.

1.2.2 DESIRED CONDITIONS

The following are seven desired conditions or objectives which contrast the seven undesired conditions previously discussed. These desired conditons adhere to PACFISH recovery objectives and strategies.

1.2.2.1 Desired Condition: Lower Peak Flows

Compare with 1.2.1.1 Undesired Condition: Early Peak Flows, page 8.

Table 6 Water availability.

STATEMENT OF NEED	DESIRED CONDITION
A need exists to capture and hold water into the summer/fall season making water available for fish and wildlife species during this critical time of the year.	By implementing aquatic, vegetation, and infrastructure projects, cool water is held for longer periods of time across the analysis area and is available in late summer/early fall for fish and wildlife species.

Establishing ample woody debris, increased pools, and the natural meandering nature of streams will slow early season runoff and retain water across the landscape through dry seasons when threatened fish populations need it the most. Vegetation on areas denuded from past soil degradation and compaction will be re-established by riparian and upland plantings. A diversity of vegetation, including variable tree structure, age, and species, will provide stream shade, as well as bank stability leading to improved (reduced) channel width to depth ratios. In this manner, canopy cover will move toward historic/expected levels, serving to slow snowmelt and to intercept and slow intense rainfall. Reestablishing populations of beavers through riparian habitat improvement projects will accelerate the process of raising water tables, reconnecting flood plains as well as reducing sediment and creating deep pool habitat.

Reduced road miles associated relief drainage and stream crossings will slow surface movement of water in the watershed as well as reduce sediment input to streams. After planting an appropriate array of riparian vegetation, stream banks will become stable with minor, expected channel cutting occurring. Floodplains will be reconnected to stream flows, and a resulting late seasonal flow of water will be captured and held to support viable populations of fish and wildlife.

About 3% of the analysis area (about 1,450 acres) will be re-vegetated lowering the risk of future debris torrents from occurring. This will treat upland conditions caused by historic overgrazing and similar to the conditions which existed in Lemon Creek prior to a storm event that caused a severe debris torrent.

1.2.2.2 Desired Condition: Lower Stream Temperatures

Compare with 1.2.1.2 Undesired Condition: High Stream Temperatures, page 10.

Table 7 Water temperatures.

STATEMENT OF NEED	DESIRED CONDITION
A need exists to lower stream temperatures that are on the State of Oregon *303(d) List of Water Quality Limited Waterbodies (1998)* to comply with *Federal Clean Water Act* and State standards.	With the implementation of aquatic, vegetation, and infrastructure projects, improved habitat conditions that lower and maintain stream temperatures are in a condition that sustains viable populations of fish..

The most stringently regulated beneficial use, for analysis area streams, as determined by the State of Oregon, Department of Environmental Quality, under authority of the Federal Clean Water Act of 1972 (CWA), is the proper water temperature for fish, based on species presence and needs. Distributions of seasonal flow in a desired condition would be similar to an historic environment, when temperatures of late season (late summer/early fall) flows were lower. A diversity of vegetation, similar to historic conditions, including structure, age, and tree species, would provide shade for fish, as well as stream bank stability through well-established root systems. Low stream channel wetted width-to-depth ratio helps to maintain cooler temperatures by making less sunlight available on the surface water. Proper stream bank vegetation ensures a lower ratio by keeping stream banks from eroding.

Managing habitat conditions in a manner which establishes a proper streamside vegetative cover of plant-life and proper channel conditions would result in maintaining cooler water temperatures.[33] Viable populations of threatened fish species may then become sustainable as streams systems begin to function properly. Stream temperatures may not be reduced enough to meet State standards and remove streams included on the 303(d) list for temperature because many of the streams in the analysis area flow out of the ground at temperatures of up to 60°degrees Fahrenheit. Temperature standards of 48° for bull trout spawning in these streams would be unobtainable.

By establishing even, seasonal distributions of water flow, a trend toward cooler water temperatures, similar to historic conditions, may develop over time. Greater flows during summer will assist in regaining desirable lower temperatures. Where a greater natural tendency for stream channels to meander across the landscape exists, this condition would create a larger pool to riffle ratio slowing and maintaining water temperature as it leaves the landscape. If a greater quality and quantity of large woody debris exists in streams and an increased quantity of late seasonal water flow exists across the landscape, subwatershed streams will begin to persevere with lower water temperatures as successful restoration efforts establish a properly functioning condition of hydrological processes.

1.2.2.3 Desired Condition: Functioning Aquatic Habitat

Compare with 1.2.1.3 Undesired Condition: Damaged Aquatic Habitat, page 11

Table 8 Aquatic conditions

STATEMENT OF NEED	DESIRED CONDITION
A need exists to correct damaged stream segments in a manner that demonstrates aquatic habitat conditions that are capable of sustaining viable populations of fish and wildlife species.	By implementing aquatic and infrastructure projects, riparian conditions of channel meander and diverse vegetation will be improved providing riparian habitat needed for dependent fish and wildlife.

[33] Lower stream temperatures would comply with Oregon State Department of Environmental Quality (DEQ) requirements which administers the Clean Water Act (CWA) for protection of waters in the State of Oregon (Oregon Administrative Rules, Chapter 340-41) and comply with the Malheur National Forest *Land and Resource Management Plan* (*Forest Plan;* p. IV-39).

Aquatic habitat in the Southeast Galena Analysis area will function in a proper condition including adequate late season stream flows (described in 1.2.2.1), cooler water temperatures (described in 1.2.2.2), ample woody debris, a greater pool frequency, suitable stream meander, stable stream banks and desired stream side shade.

Fish of particular concern that utilize the analysis area drainages are bull trout and steelhead, which are currently threatened fish species.[34] Greater habitat complexity (including pool quality and quantity) will benefit all salmonids in the analysis area by increasing summer and winter rearing habitat. A diversity of vegetation, including vegetation structure, age and tree species, will provide shade for maintaining water temperature, as well as improve stream bank stability, and provide hiding cover that will benefit threatened fish species. Some of this riparian vegetation will eventually become large woody debris that creates pool habitat and provides hydrologic control. Pool riffle ratios will increase as will the amount of deep pool habitat to provide high quality habitat for both resident and anadromous salmonids. Increased beaver activity in analysis area streams will also improve fish habitat.

Bull trout, which spawn in late summer and early fall when stream temperatures are highest, will have no thermal barriers to movement and would have greater potential spawning areas with lower temperatures and greater base flows. In the Southeast Galena Analysis area under future, desired optimum conditions—lower water temperatures will enable bull trout to spawn in water temperatures of 48ºF or below from August through November. Rearing temperatures for bull trout will be maintained at 54º F or below. Optimum steelhead rearing temperatures are less than 64ºF. therefore, maintaining waters for bull trout will provide optimum-rearing conditions for steelhead. By managing for bull trout, the analysis area over time will establish a vegetative vigor and trend where spawning and rearing habitat will once again be provided where this species historically resided. Spawning and rearing temperatures for steelhead will also be within an acceptable range in the spring when water temperatures are not likely to be an issue and that the rearing temperatures for steelhead is higher than the rearing temperatures for bull trout.

Open and closed roads would be properly maintained and would be hydrologically disconnected to the extent practical, sediment sources are minimized and culverts would be suitably sized and positioned so that fish can pass through unobstructed. Reducing road miles across the landscape will in time increase native vegetation and reduce sediment delivery to drainages. By implementation of successful restoration efforts, properly functioning hydrologic conditions will exist throughout the analysis area, which include repair of damaged stream segments. Relocating and reconstructing roads and trails located in RHCAs and decommissioning of other roads no longer needed for management or private access will benefit both resident and anadromous fish.

Providing improved fish habitat conditions will support increased populations of anadromous and resident fish under direction of the *Land and Resource Management Plan* (LRMP*,* p. IV-2); a properly functioning condition will exist.

Roadless Areas

Roadless features evident in the Dixie and Greenhorn Mountain Roadless Areas would include undisturbed soil and water resources displaying healthy watersheds that catch, store, and safely release water over time, protecting downstream environment and serving to maintain abundant and healthy fish and wildlife populations.

[34] The Malheur National Forest *Land and Resource Management Plan* (Forest Plan) states, "efforts are to be made to manage fish habitat and riparian areas to achieve increases in fish habitat capability," (p. IV-17). The Forest Plan continues, "to manage riparian areas to protect and enhance their value for wildlife…" (p. IV-62). "Critical habitats, and other habitats necessary for the conservation of threatened or endangered species, will not be destroyed or suffer adverse modification,"(p. IV-17).

1.2.2.4 Desired Condition: Forest Stands Moving Toward Resilient Conditions

Compare with 1.2.1.4 Undesired Condition: Vegetation Outside Historic Range of Variation page 14.

Table 9 HRV

STATEMENT OF NEED	DESIRED CONDITION
A need exists to alter deteriorating forest stands across the landscape, moving conditions toward historical forest stand structures, composition, and density in a resilient manner and range that withstands endemic, natural disturbance factors such as disease infection, insect infestation and low intensity wildfire.	By implementing vegetation projects, resilient patterns of forest stands incorporating multi-resource habitat needs dominate the landscape in a mosaic that has the ability to withstand the endemic disturbance regimes of insect infestation, disease infections, and low intensity wildfire.

Forest stands would move toward the Historical Range of Variability (HRV) as directed by the Regional Forester's Eastside Forest Plan Amendment #2[35] (June 1995). Forest stand sustainability and resiliency[36] would be the overall goal for stewardship of the natural resources.

Vegetation of the analysis area would begin to exist in a fire adapted condition essential for viable ecosystem components and the sustainability of resources dependent on fire at the appropriate interval, intensity, and season.

Figure 1. Existing condition

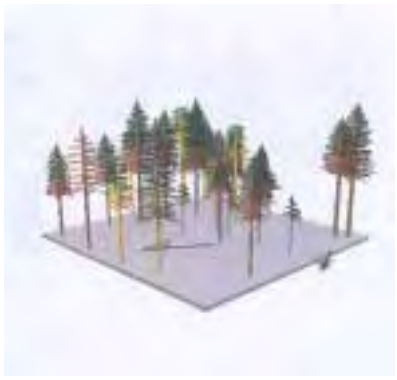

Figure 2. Desired Condition

Resilient plant life would dominate the landscape, and possess the ability to withstand common disturbance patterns of insect infestation, disease infections, and low intensity wildfire. A mosaic of stands in various stages of development would cover the landscape— patterned as a fire-adapted forest. The lower elevation Dry Forest type (which includes higher elevation south facing slopes) is predominantly Old Forest Single Strata (OFSS) dominated by large ponderosa pine and western larch that are adapted to frequent, low intensity fire. The Moist Forests would be composed of a patch work of open stands of ponderosa pine, western larch, Douglas-fir, and grand fir with a larger portion of forest stands with higher understory densities of Douglas-fir and grand fir than the Dry Forests. Aspen stands would include early and middle structural stages in their composition. Under burning would stimulate production in the same manner. The opening of conifer stand structure near aspen groves would allow light for growth of suckers giving rise to new generations of aspen. Browsing of young shoots by deer, elk, and cattle will be reduced.

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[35] **Forest Plan (LRMP) Amendment No. 2:** Interim Management Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales, Also referred to as *Regional Forester's Eastside Forest Plan Amendment No. 2.*

[36] Resiliency is the ability of the ecosystem to respond to, or recover from disturbances. The major disturbances affecting the analysis area include, fire, insects, and disease. Tree species composition and forest structural stages are factors that influence the resiliency of the forested component of the ecosystem.

A mosaic of open park-like stands with pockets of more densely spaced trees, predominately in the Dry Forest types, effectively provides more forage and interspersed cover for game animals. Open canopies in Dry Forests would allow a greater diversity of understory plant species to thrive. Periodic low intensity fires (both natural and prescribed) would stimulate renewal of these same fire adapted species.

Roadless Areas

In the Dixie and Greenhorn Mountain Roadless Areas the desired conditions would be as stated above in terms of meeting HRV however, keeping in mind that the area has been subject to management during the past one hundred years and effects from railroad logging and mining will be present for some time. In viewing the Dixie and Greenhorn Mountain Roadless Areas from a distance, the quality of a natural-appearing landscape would be apparent due to the appearance of a natural appearing contiguous forest canopy. However, in walking through the area where past logging practices have occurred during the past one hundred years, evidence of treated areas and old railroad grades and tree stumps would be perceptible as they are presently.

1.2.2.5 Desired Condition: Reduced Risk of Severe Wildfire

Compare with 1.2.1.5 Undesired Condition: High Wildfire Risk, page 17.

Table 10 Fire Risk

STATEMENT OF NEED	DESIRED CONDITION
A need exists to change stand structure, landscape vegetation patterns, and species composition to replicate historic vegetation conditions and reduce the likelihood of uncharacteristically severe wildfire destroying multiple resources and opportunities for human use.	By implementing vegetation and infrastructure projects, fire adapted forest stands once again dominate the landscape in a mosaic pattern where wildfires normally burn with low intensity over most of the area in Dry and Moist Forest types.

A landscape resistant to uncharacteristically severe wildfire would exist predominately in the Dry Forest types. Moist Forest types would have a reduction in tree densities and a reduction in fuel accumulation when compared to current levels. The Dry Forests contain a pattern in the forest landscape that forms a mosaic of "patches," of trees that are less dense than the present overstocked levels. This includes higher proportions of fire-tolerant species such as ponderosa pine and western larch, growing in open, park-like stands (*Land and Resource Management Plan;* p. IV-10). Low elevation, Dry Forests would offer opportunities for thinning-in conjunction with prescribed fire—to contribute to restoration of wildlife habitat while making forests more resistant to uncharacteristically severe fire.

Photo 9 Thinning and prescribed fire treatments can be used in tandem to restore sustainable and resilient forests on dry sites. Changing dense forest conditions (see photo 7, page 16) to one that more closely approximates the historical (pre-settlement) composition and structure would move forest structure toward expected disturbance regimes. The area pictured above is within the analysis area (Moe TS) which was treated in 2000.

A desired condition would exhibit reduced surface and ladder fuels in a manner to preclude crown fire. Forested environments would be susceptible to wildfire of an expected intensity and size similar to an historical range, rather than uncharacteristically severe wildfires that are unpredictable and likely to occur under current conditions. Forest stands would be resistant to insect, disease, and severe fire. Prescribed fire could be used to resume an historic role wildfire has performed in the ecosystem. After meeting a range of sustainability in a desired condition in the future, natural fire which meets management objectives could be left to burn, as long as conditions meet the proper conditions. Fire will be managed to benefit resource objectives (*Wildland Fire Management Policy*, August 1998) and will establish a trend toward a fire-adapted forests that once occurred.

Under burning (the use of low intensity ground fire) is commonly used for managing mixed ponderosa pine and associated fir stands in order to reduce fir encroachment and perpetuate ponderosa pine and western larch.

Burning projects are designed to improve rangeland and wildlife habitat (*Land and Resource Management Plan*, p. IV-10) with low intensity fire that improves vegetation vigor in a manner that mimics the fire adapted forested environment that once occurred. An ongoing program of tree thinning and prescribed fire would be used to move the landscape toward an historic range of variability, improving forest health, reducing fuels, and maintaining or enhancing the old-forest structure and conditions (Regional Forest's Eastside Forest Plan Amendment #2).

Roadless Areas

Wildfire would burn in the Dixie and Greenhorn Mountain Roadless Areas from time to time, but low intensity fire would be the common outcome. Fire suppression efforts would continue with a reduced danger of crown fire igniting large contiguous blocks of wildlife habitat as the lower elevation Dry Forests and Moist Forests have begun a trend toward a Historical Range of Variability and fire regimes take on the historical beneficial role in the forest.

1.2.2.6 Desired Condition: Wildlife Habitat

Compare with 1.2.1.6 Undesired Condition: Degraded Wildlife Habitat, page 18.

Table 11 Wildlife

STATEMENT OF NEED	DESIRED CONDITION
A need exists to restore deteriorating wildlife habitats.	By implementing aquatic, vegetation and infrastructure projects, resilient patterns, corridors, linkages, and forest stands once again dominate the landscape and are resilient to endemic disturbances and provide proper structure and cover for wildlife.

Terrestrial habitat is in a condition or moving towards a condition that provides for viable populations of Threatened, Endangered and Sensitive (TES) species, Management Indicator Species (MIS) and Species of Interest (SOI).[37] This is best achieved by moving vegetation conditions and natural disturbance regimes back toward an Historic Range of Variability (HRV). Risk of catastrophic insect infestations or uncharacteristically severe wildfires is low, reducing threats to crucial wildlife habitat.

Old growth habitat is within HRV and well distributed. Dry Forest types are being managed to restore historic OFSS conditions that support dependent species such as the white-headed woodpecker. In the Moist and Cold Forest types, large, contiguous stands of OFMS provide quality habitat for a variety of dependant wildlife species including pileated woodpeckers, pine marten and Canada lynx. Where timber harvest is scheduled, Cold and Moist Forest types are managed in size blocks which mimic their fire regimes. Younger aged stands (YFMS, SECC and SEOC)[38] would be actively managed to move them more quickly toward OFMS and OFSS. Trees would be distributed in a patchy, or clumpy nature to better mimic historic conditions. Sufficient travel corridors are provided to permit movement and dispersal of animals between locally isolated blocks of old forest habitat.

Snags would be well distributed and present at levels that support 100% of the potential populations of primary excavator species. Large down logs are at historic levels. Forest insects and diseases are operating at endemic levels, killing trees in low but sufficient numbers to provide a continuous supply of snags and downed logs.

Habitat quality for deer and elk is high, particularly in winter range. There would be a good distribution of cover for thermal regulation and security, and an abundance of open stands with native grasses and shrubs for forage. Low intensity burns and thinning would be used regularly to stimulate the abundance and vigor of forest plants used for forage. Improved upland forage combined with streamside planting and protection will help reduce over-browsing in RHCAs. Riparian plantings will improve calving and fawning habitat. Good distribution of cover and forage habitat combined with reduced road density and human disturbance allow better distribution of deer and elk across the landscape and consequently, more effective use of the available habitat.

Habitat for Canada lynx meets requirements in the Canada Lynx Conservation Assessment and Strategy (Ruediger, 2000). Key linkage areas provide habitat for dispersal and movement of lynx and other large, wide-ranging carnivores between geographically isolated habitat areas throughout the Blue Mountains.

Roadless Areas

In the Dixie Butte and Greenhorn Mountain Roadless Areas, emphasis is to have these areas function as biological strongholds for populations of threatened and endangered species as well as provide large, relatively undisturbed areas for wildlife dependent on this character.

[37] *Land and Resource Management Plan*; p. IV-17, and IV 27-33.
[38] See Stand Structure Definitions page 145

1.2.2.7 Desired Condition: Noxious Weeds

Compare with 1.2.1.7 Undesired Condition: Noxious Weeds are Present page 20.

Table 12 Noxious Weeds

STATEMENT OF NEED	DESIRED CONDITION
A need exists to control populations of noxious weeds while enhancing the vigor of native vegetation to reduce future weed infestations.	The landscape is free of noxious weeds and native vegetation is vigorous and resistant to future weed invasion.

The *Land and Resource Management Plan* on page IV-45, states that managers will implement a weed control program to confine present infestations and prevent establishment of noxious weeds in new areas. Chemical treatment of infestations would be limited but would be used along with other control methods (mechanical, biological) wherever they are effective. Disturbed areas will be re-vegetated as quickly as possible with native plant species capable of resisting noxious weed encroachment. Known weed populations would shrink, and not be allowed to set seed. New sites would be inventoried regularly, and treatment results would be effectively tracked.

Roadless Areas

Communities of diverse native plants would exist in the absence of non-native invasive species due to the absence of disturbances caused by roads and accompanying activities.

1.3 Scope of this Environmental Analysis

A more complete list of past, present, and future actions considered in this analysis is found in Appendix C. The "scoping" process (described later in this Chapter) helped narrow the range of concerns or issues that were analyzed within this document (Galena WA, Supplement—2002).

1.3.1—Present Actions Leading to this Document

The 1996 Summit Fire burned across two National Forests and private lands and engulfed almost one third of the Galena watershed (37,961 acres). The Summit Fire was an uncharacteristically large and severe wildfire compared to historical fires. Forest conditions in the Southeast Galena analysis area are similar to those which generated the Summit Fire.

On July 2, 1998, a severe windstorm blew down thousands of trees over about 1,400 acres in the headwaters of Vincent and Vinegar subwatersheds[39]. Immediate concerns were the high fuel loads (about five times higher than normal) on the ground, which if a fire were to burn in this area it would be very difficult to contain as a small fire. Additional concerns were the high amount of blow down creating suitable host for spruce and Douglas-fir bark beetles, the loss of shade, the loss of soil holding capacity to the streams, and the loss of cover habitat for big-game. District personnel began an Environmental Assessment the summer of 1998 to develop alternatives in addressing these concerns. District personnel also began a Categorical Exclusion in the same year to clear hazardous conditions along open roads that had been affected by the wind event and as well to utilize materials along adjacent closed roads.

Following consultation with Forest managers, Regional Office Staff, Resource Specialists from three Tribal Governments: the Confederated Tribes of the Warm Springs Indian Reservation; Confederated Tribes of Umatilla Indian Reservation; and the Burns Paiute Tribe (see 1.3.4—Relevant Planning and Scoping); and Resource Managers from two Federal regulatory agencies, the Malheur National Forest determined that significance of the situation was far more complex than just the blow down area. The

[39] **Banner Blowdown**: This has been referred to as the "Banner Blowdown" or variously in Forest Service documents as the Banner wind event of 1998.

Forest decided to complete a watershed analysis (WA) for the Galena Watershed using the process Ecosystem Analysis at the Watershed Scale—A Federal Guide for Watershed Analysis. The goal was to analyze the condition of the whole watershed and identify opportunities that could be undertaken, which would lead to a healthier watershed under a landscape scale approach. In this analysis the Galena Watershed Analysis included effects of the1996 Summit Fire, as well as the Reed and Indian Rock Fires of 1994.

In January 1999, District resource specialists began the *Galena Watershed Analysis* and completed it in June 1999. To act on the recommendations of the *Galena Watershed Analysis*, the National Environmental Policy Act (NEPA) process started according to CFR 1500-1508.

Simultaneously, the Forest initiated the VV Beetle Containment Project, Trap Tree Salvage (Decision Memo, May 4, 1999) and VV Bark Beetle Containment Project (Decision Memo, May 7, 1999) to reduce the beetle population that was expected to emerge from the felled trees from a large wind event within the headwaters of Vincent and Vinegar Subwatersheds during the month of July in 1998. Beetles were expected to emerge from trees in the spring/summer of 1999. Attractant pheromones were used to draw insects to funnel traps and green spruce "trap" trees outside of RHCAs were felled to draw insects to the trap tree and away from the remaining standing spruce. In addition, disruptive pheromones to repel insects from heavy concentrations of remaining live spruce and Douglas-fir were also implemented. These actions were continued through 2001 and appear to have been successful in protecting the remaining trees from insect mortality.

1.3.2—Present Actions Relevant to this Document

A number of environmental analyses have been completed or are near completion which have been included within the framework of this analysis. A few of these analyses considered as cumulative effects with this analysis include M&O Environmental Assessment (Moe Timber sale), Crawford Vegetation Management Project Environmental Assessment, Olmstead Environmental Assessment, Dry Fork Environmental Assessment, Clear Creek Environmental Assessment, Summit Environmental Assessment (Pog-Pogo), and the Summit Fire Recovery Project Final Supplemental Environmental Impact Statement (see page 160), all located in the Middle Fork of the John Day River watershed. These analyses were considered to be similar in action to this Southeast Galena Restoration Project. See Appendix C for a complete listing of projects considered in this analysis, depending on the individual resource concerns and needs.

1.3.3 Future Actions Relevant to this Document

One foreseeable action that will be located within the Galena Watershed is the Northwest Galena Restoration Project. The Northwest action would be similar in scope and magnitude as displayed in the Southeast Galena Restoration Project and therefore considered to be similar in nature and included in this analysis cumulatively. To date, a project initiation letter for the Northwest Galena Restoration Project has not been completed, but is on the Malheur Schedule of Recommended Actions.

1.3.4—Relevant Planning and Scoping Dates

The National Forest Management Act (NFMA) and National Environmental Policy Act (NEPA) encourages an open process to be used to invite public participation. This can be useful in order to refine the scope of a project and to identify key or significant issues that may have been overlooked in the recommended action. The Forest Service requests information and comments from Federal, State, and local agencies, and other groups or non-governmental agencies as well as individuals interested in or affected by the recommended action. For this Environmental Impact Statement the following steps were taken as a part of public involvement.

- July 1998 through January 1999—Forest Service began discussions with the Forest Service Regional Office out of Portland Oregon to determine the scope of a potential project and type of analysis to be pursued.
- January 1999—the Malheur National Forest decided to look at the project on a landscape scale to reduce chances of another Summit Fire size disturbance and to analyze insect infestation concerns at a broader scale.
- January 1999 through June 1999—the planning process known as, *Ecosystem Analysis at the Watershed Scale—Federal Guide for Watershed Analysis* was used in developing the *Galena Watershed Analysis*, which incorporated public participation.
- May 1999 a *Decision Memo* for use of pheromones and trap trees in the Vincent/Vinegar Creek blow down area was implemented with public participation.
- On July 15, 1999, a *Notice of Intent* (NOI*)* to prepare the *Southeast Galena Restoration Project* was published in the *Federal Register*.
- On August 19, 1999, a scoping document seeking public comment was mailed to over 1,000 individuals, organizations, and agencies.
- On August 25, 1999, a notice inviting comments on the project was published in the *Blue Mountain Eagle*, one of the Malheur National Forest's newspapers of record.
- On January 28, 2000, a newsletter informing the public of projects recommended by the Malheur National Forest within the Blue Mountain Demonstration Area and included a description of the *Southeast Galena Restoration Project* and was mailed to over 1,000 individuals, organizations, and agencies.
- On April 6, 2000, Forest Managers and the Southeast Galena Analysis Team Leader met with representatives from the Burns-Paiute Indian Reservation to exchange information on aspects of this analysis.
- On April 19, 2000, Forest Managers and team members met with resource specialists from the US Fish and Wildlife Service and the National Marine Fisheries Service to discuss aspects of this project as it relates to the Endangered Species Act since this meeting there have been regular meetings to discuss the project.
- On April 21, 2000, Forest Managers and team members met with resource specialists from the Confederated Tribes of the Warm Springs Reservation of Oregon, the Confederated Tribes of the Umatilla Indian Reservation, and the Columbia River Inter-Tribal Fish Commission to exchange information on aspects of this analysis.
- On August 28, 2001, a public contact letter was sent to over 1,000 individuals, organizations, and agencies informing them that a DEIS will soon be available and asking if they prefer a hard copy, CD ROM, access the Web-Site, or removed from this mailing list.

1.4 Issues Studied in Detail

Careful consideration was given to comments received from the public, other agencies, and Forest Service resource specialists. From this scoping process, it was determined that the following 12 key issues are significant to the decisions to be made concerning the *Southeast Galena Restoration Project*. These issues directly influenced the development and technical design of the range of alternatives including the recommended action.

ISSUE 1.4.1—Restricted Access

Issue #1 Statement*: The Agency's recommended action to decommission and close a number of roads will reduce motorized access within the analysis area.*

Public use of the analysis area for recreation, or commercial uses have risen steadily. Forest access is an important issue with many members of the public; some want increased motorized access, while

others want more areas closed to motorized use to reduce impacts to fish and wildlife habitat, and develop more pristine areas.

Measures:—Total road densities per subwatershed.—Open road densities per subwatershed.—Miles of open roads per subwatershed.—Miles of closed roads per subwatershed.—Miles of decommissioned roads per subwatershed.—Miles of new roads.

ISSUE 1.4.2—Effects of All Terrain Vehicle (ATV) use

ISSUE #2 STATEMENT: *The Agency's proposal is inadequate in addressing ATV use that is causing resource damage, especially within RHCAs.*

This issue is twofold: 1) current damage caused by ATV use on existing trails; and 2) damage caused by ATV use cross country. In the past 10 years, ATV use has risen due to increased interest in horn hunting, mushroom collecting, pleasure driving, and hunting. Areas are now impacted from this increased use, especially during wet seasons.
There is evidence across much of the lower elevation landscape that ATVs are now being used cross-country. This type of use, may be adding to resource damage. By driving ATVs through drainages a possible increase in sediment occurs raising concerns for the area's anadromous threatened fish e.g. steelhead, bull trout.

Measures: —Number of improved stream/trail crossings. **—**Miles of ATV trails improved and upgraded.**—**Improved or relocated trailheads.

ISSUE 1.4.3—Effects of Ground Based Systems

Issue #3 Statement: *The Agency's recommended action of tree harvest with associated activities would cause unnecessary damage to the hydrologic function of the area's soils and streams.*

There are numerous impacts that influence hydrologic processes. In Southeast Galena, the major concerns of harvest activity impacts to the area's soils and streams.
This concern is twofold:

Concern 1: Soil compaction and, **Concern 2:** Concentration of water run-off.
The harvest activity that contributes the most to soil compaction is tractor skidding and roads direct water run-off, which contributes to stream sediment concerns. Tractor skidding, skidding networks, and the transportation system contributes to surface water interception and directs overland flows to near by drainages. These actions reduce water infiltration and increases risk of sediment transport. These impacts raise the risk of potential sediment increases to nearby streams increasing the potential cumulative impacts to fish populations.

Measures: —Acres of ground-based systems used in each alternative and specifically on sensitive soils. —Acres of skyline-based system used in each alternative and specifically on sensitive soils. —Miles of road construction per subwatershed. —Miles of road reconstructed per subwatershed. —Miles of decommissioned roads per subwatershed.—Miles of roads removed from RHCAs. —Miles of open and closed roads. —Total road density and open road density per subwatershed. —Equivalent Roaded Acres cumulative effects model.

ISSUE 1.4.4—Effects of Heavy Equipment in RHCAs

ISSUE #4 STATEMENT: *The Agency's proposal of using heavy equipment within RHCAs to create a meandering nature to stream channels, enhance aspen stands, and to place in-stream structures may damage stream channel functioning.*

Heavy equipment operating within RHCAs may compact soil, damage stream banks, and contribute sediment to streams. Access through the RHCA to the project site would also compact these sensitive soils and possibly damage vegetation and down woody material.

Measures:—Miles of stream segments with heavy equipment use.—Numbers or acres of Aspen groves treated with heavy equipment within RHCAs.

ISSUE 1.4.5—Effects of Prescribed Fire in RHCAs

ISSUE # 5 STATEMENT: *The Agency's proposal to allow prescribed fire to burn within some Riparian Habitat Conservation Areas (RHCAs) will reduce riparian vegetation, and may decrease shade and soil holding capacity.*

Burning within RHCAs carries a risk of being too intense due to existing fuel levels and ladder fuels. Fire can kill riparian vegetation reducing streamside shade and bank stability.

Measures: —Miles of RHCA boundary at risk.

ISSUE 1.4.6—Inadequate RHCA Size

ISSUE #6 STATEMENT: *The Agency's design to apply Pac Fish buffers may be inadequate in size to protect fish and their habitat.*

Some RHCAs are located in areas with soils that are more susceptible to adverse impacts from management activities e.g. Clarno[40] soil types. Additional precautions or mitigations should be taken around Category IV streams to ensure protection from possible compaction due to skidding equipment. This equipment may create more intense overland flows and potential sediment delivery to streams due to compaction.

Measures: —Acres of increased buffers. —Miles of stream side increased buffers.

ISSUE 1.4.7—Blow down in Vincent/Vinegar RHCAs

ISSUE #7 STATEMENT: *The Agency's recommended action to remove material from within RHCAs may adversely impact the riparian resource and harvest associated activities with new stream crossings may reduce riparian functioning.*

This concern is twofold:

Concern 1: The removal of material within Pac Fish buffers in the Vincent/Vinegar blow-down area where a storm event in 1998 blew down about 1400 aces of trees; and

Concern 2: The removal of material within new stream crossings.

Harvest activities within these areas may decrease current and future coarse woody debris, decrease shade to streams, and increase risk of sedimentation from logging-related activities.

Measures: —Total acres where material is removed from RHCAs.

ISSUE 1.4.8—Effects of Toxic Chemicals

ISSUE #8 STATEMENT: *The Agency's proposal to use chemicals to control competing vegetation, pocket gopher populations and noxious weeds, may pose harmful risks to aquatic and terrestrial wildlife and humans using the area.*

Some members of the public view the use of chemicals on public lands as harmful rather than beneficial to the environment with risks outweighing the short-term benefits that could be provided by other means of treatment.

[40]Clarno soil type clayey surface soils from ancient volcanic ash deposits that ranging in depth from 4-15 in. generally with higher erosion risk, absorbs less water, and holds water longer increasing road, trail and ground-based skidding problems.

The herbicides hexazinone and glyphosate are recommended to kill vegetation competing with planted seedlings. The herbicide glyphosate is recommended to be used to combat noxious weeds. Strychnine baiting and aluminum phosphide fumigation are recommended to eradicate pocket gophers that could damage seedlings. There is a contention that fish and wildlife species could be poisoned, either directly or indirectly, by exposure to these chemicals

Human exposure to chemicals could create health and safety concerns. Workers may be exposed to unacceptable levels of chemicals during application. The general public using the Forest may be exposed to chemicals following application.

> **Measures:** Acres treated for control of competing vegetation. —Acres treated for noxious weed control. —Acres treated for pocket gopher population control.— Herbicide and rodenticide toxicity and exposure levels—Rodenticide toxicity and exposure levels.

ISSUE 1.4.9—Inadequate Amount of Treatment

ISSUE #9 STATEMENT: *Current forest stand composition and structure predispose stands toward a risk of uncharacteristically severe wildfire, insect infestations, and disease infections. The Agency's recommended action does not manage enough forest stands to adequately meet the purpose of this action of returning this area to a historical range of variability for stand composition and structure.*

A large portion of the analysis area has had the large tree component of fire resistant trees removed and is densely stocked with small trees. The remaining forest is more likely to burn with increased intensity and change into an uncharacteristically severe wildfire. The remaining forest is no longer a fire adapted forest. There is a concern that silvicultural prescriptions in the Agency's recommended action does not manage enough forest stands to adequately meet the purpose of this action of returning forest stands in this area, within an historical range of variability for stand composition and structure.

> **Measures: —**Acres of overstocked Dry Forest thinned**—**Acres of understory removed**—**Acres of Dry and Moist Forest types converted from late seral species to early seral species.

ISSUE 1.4.10—Insufficient Pileated Woodpecker Habitat

ISSUE #10 STATEMENT: *The proposal does not adequately address needed habitat for pileated woodpeckers according to current scientific literature (i.e., according to a 1993 study by Bull and Hothausen).*

This concern is twofold:

Concern 1: Dedicated old-growth areas (DOGs), replacement old-growth areas[41] (ROGs) and pileated woodpecker feeding areas (PWFAs) in the recommended action are not large enough to meet habitat requirements for pileated woodpeckers (see also, Dedicated Old Growth and Connectivity, page 178). Current literature (Bull and Holthausen 1993) indicates that pileated woodpeckers may require a 900-acre home range per breeding pair rather than the 600-acre area recommended in the *Land and Resource Management Plan* . The DOGs, ROGs and PWFAs need to be expanded to provide adequate habitat.

Concern 2: The recommended action would not retain a sufficient level of wildlife snags to meet habitat requirements for this species. Pileated woodpeckers typically require higher levels of large snag habitat than many other primary cavity species. Current literature (Bull and Holthausen 1993) recommends that pileated woodpeckers may require at least 4 large snags per acre rather than the 2.4 snags per acre recommended in the *Land and Resource Management Plan* .

Measures: —Total acres of new DOG, ROG and PWFA;—number of reproducing pairs of woodpeckers which DOGs, ROGs and PWFAs could support;—number of reproducing pairs analysis area could support.

ISSUE 1.4.11—Effects on Connectivity for Wildlife

ISSUE #11 STATEMENT: *The Agency's proposal needs to manage wildlife corridors for old growth dependent species (LRMP Amendment #2 connectivity) and the Key Linkage Areas (KLA)s for wide-ranging carnivores more aggressively to reach the forest stand HRV.* (see definition, page 6).

Silvicultural prescriptions in the Agency's proposal should not be modified to accommodate habitat connectivity. Prescriptions are not within HRV in ecosystem composition and structure which would be expected under natural disturbance regimes.

Measures: —Acres treated and type of prescription applied to the KLA. —Acres treated and type of prescription applied to connective corridors.

ISSUE 1.4.12—Effects of Managing Roadless Areas

ISSUE #12 STATEMENT: *Roadless areas provide large, relatively undisturbed landscapes, which are important to biological diversity and the survival of species dependent upon the "undisturbed character," of these areas. Management would alter this character as well as the quality of dispersed outdoor recreation for undisturbed open space and natural settings.*

The Agency's proposal to treat forest stands within the Greenhorn Mountain and Dixie Butte Roadless Area may disturb wildlife which are dependent upon undisturbed character. Trails and trailheads join these areas, which may affect the quality of recreation experience for a period of time while project activities occur, and for a period of time after project implementation.

Measures: —Acres treated of mechanical treatment —Acres treated of prescribed fire.

1.4.13—Other Items Tracked but not Considered to be a "Key" or "Significant" Issue

Although these items are not key issues to the recommended action, they are still necessary for the decision maker in making an informed decision and for the public and decision maker to see how they compare across a range of potential alternatives.

Socio/Economics: Timber-harvest related employment, restoration opportunities for local communities, population, recreation use, non-timber forest products; attitudes, beliefs and values; human health and safety; American Indian Tribes; Environmental Justice; Financial Viability; Economic Efficiency.

Visuals and Visual Quality Objectives: Effects to Visual Quality are measured in terms of whether the alternatives meet the Visual Quality Objectives outlined in the Forest Plan. Effects to Landscape Aesthetics are measured in terms of positive or negative impacts to scenic integrity and ecological landscape integrity.

1.5 Applicable Legal and Regulatory Requirements and other Planning Documents

1.5.1—Applicable Laws and Treaties

- *The National Historic Preservation Act:* The Oregon State Historic Preservation Officer (SHPO) will be consulted concerning recommended activities in the *Southeast Galena Analysis area*. The Advisory Council on Historic Preservation (ACHP) will be consulted about measures to protect significant archaeological sites from adverse affects, should any be identified.
- *The National Environmental Policy Act* (NEPA), 1969*:* NEPA establishes the format and content requirements of environmental analysis and documentation. The entire process of preparing an environmental impact statement was undertaken to comply with NEPA.
- *The Endangered Species Act of 1973*, as amended: A draft biological assessment is being prepared to document effects of recommended activities on endangered and threatened species in the *Southeast Galena Analysis area*. Appropriate coordination, conferencing, and consultation with USFWS and NMFS will be completed before the FEIS is published.
- *The National Forest Management Act* (NFMA), 1976: All alternatives were developed to be in full compliance with NFMA.
- *Clean Air Act Amendments*, 1977: The Oregon State Implementation Plan and the Oregon State Smoke Management Plan will be followed to maintain air quality.
- *The Clean Water Act*, 1982: This act establishes a non-degradation policy for all federally recommended projects. The recommended action meets anti-degradation standards agreed to by the State of Oregon and the Forest Service, Region 6, in a Memorandum of Understanding (Forest Service Manual 1561.5). This will be accomplished through planning, application, and monitoring of Best Management Practices (BMPs). Site-specific BMPs have been designed to protect beneficial uses.
- *Treaty with the Walla Walla, Cayuse, and Umatilla Tribes, June 9, 1855* and
- *Treaty with the Tribes of Middle Oregon, June 25,1855:*

  "That the exclusive right of taking fish in the streams running through and bordering said reservation is hereby secured to said Indians, and at all other usual and accustomed stations, in common with citizens of the United States, and of erecting suitable house for curing the same; also the privilege of hunting, gathering roots and berries, and pasturing their stock on unclaimed lands, in common with citizens, is secured to them."

  The analysis area falls within lands which were ceded by the Confederated Tribes of the Warm Springs Reservation.
- *Public law 92-488:* This law recognizes the Burns Paiute Tribe and their reservation. As a Federally recognized tribe, the Burns Paiute Tribe retain rights of inherent sovereignty.
- *Canada Lynx Conservation Assessment and Strategy* USDA Forest Service, USDI Fish & Wildlife Service, USDI National Park Service, USDI Bureau of Land Management (2nd Edition August 2000).This Lynx Conservation Assessment and Strategy was developed to provide a consistent and effective approach to conserve Canada lynx on federal lands in the contiguous United States.

1.5.2 Planning Documents

- Malheur National Forest *Land and Resource Management Plan* (also referred to as the LRMP and the Forest Plan). *Record of Decision* (May 25, 1990), Final Environmental Impact Statement (FEIS), and the Regional Forester's Eastside Forest Plan Amendment #2 (June 6, 1995). The following Management Areas outlined in the *Land and Resource Management Plan* were used in the development of the desired conditions described earlier in this chapter. See Appendix E, Map 3—Management Areas and Roadless Areas.

  MA 1 and 2—General Forest/Rangeland: Manage for timber production and other multiple use on a sustained yield basis (MA 1) and manage for livestock forage production and other multiple use on a sustained yield basis (MA 2).

  MA 4a—Big-Game Winter Range Maintenance: Mange to maintain usable forage for elk and deer on potential winter range.

  MA 7—Scenic Area: Manage to preserve and protect the outstanding natural esthetics of the Vinegar Hill—Indian Rock Scenic Area.

  MA 13—Old Growth: Manage old growth for wildlife and plant habitat, ecosystem diversity, and aesthetic quality.

  MA 14—Visual Corridors: Manage view shed corridors with primary consideration given to their scenic quality.

  MA 21—Wildlife Emphasis Area with Non-Scheduled Timber Harvest: Manage to provide for high quality fish and wildlife habitat and water quality.

  RHCAs—Riparian Habitat Conservation Areas including MA 3b: Manage these areas toward an expectation of the characteristics of healthy, functioning watersheds, riparian areas, and associated fish habitats. RHCAs are areas of the watershed where riparian-dependent resources receive primary emphasis, and management activities are subject to specific standards and guidelines. See Appendix E, Map 3—Management Areas And Roadless Areas.

- *Region 6 FEIS for Managing Competing and Unwanted Vegetation Record of Decision (December 1988) and the terms of the Mediated Agreement (March 1989).This analysis examined ways of managing competing and unwanted vegetation on the National Forests of the Pacific Northwest Region. The effects of the options on the physical and biological environment, on human health, on social and economic conditions, and on resource management were presented.*

- Malheur National Forest, *Noxious Weed Control Project,* Environmental Assessment June, 2000 This document was prepared to control the spread and eradicated noxious weeds over time on the Forest.

- *General Water Quality Best Management Practices, USDA, Pacific Northwest Region (November 1988).* This document is was intended to facilitate understanding of Best Management Practices for protection of water quality in the Pacific Northwest Region.

- *Interior Columbia Basin Ecosystem Management Project* Supplemental Draft EIS

- *Interim Strategies for Managing Anadromous Fish-Producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California* USDA Forest Service and USDI Bureau of Land Management (February 1995).This is an interim strategy for managing anadromous fish-producing watersheds in eastern Oregon and Washington, Idaho, and portions of California.

1996 Malheur National Forest, Bear Valley Ranger District *Pocket Gopher Control Environmental Assessment*.

1.6 DECISION FRAMEWORK

After appropriate site specific NEPA is complete (Categorical Exclusion, Environmental Assessment, Environmental Impact Statement):

The Responsible Official may decide (in a Decison Memo, Decison Notice or a Record of Decison) whether or not to:

- Select the recommended proposed action,
- Select an alternative to the Recommended Action, or
- Select portions from the developed range of alternatives and combine them in a logical package as long as the combined effects are fully disclosed and understood.

In selecting one of the above options, the terms and conditions of the selection will be fully displayed and understood. Within the parameters of this decision space, it will also be determined if a *Land and Resource Management Plan* amendment would be necessary. The decision maker will take into consideration relationships of alternatives to the identified issues of this document (Galena Watershed Analysis Supplement—2002) or further site specific analysis revelant to the project proposed.

This analysis documents the results of the anticipated effects of the alternative of no action and range of potential action alternatives. From these results, the responsible official will have considered appropriate options in making sound environmental decisions and will have been properly informed from the disclosure of the anticipated environmental effects displayed in this document, or site specific analysis relevant to future proposed actions.

CHAPTER 2.0—RECOMMENDATIONS AND A RANGE OF ALTERNATIVE RECOMMENDATIONS

2.1 INTRODUCTION

Alternatives including the Recommended Action is the heart of this document (Galena WA, Supplement—2002). This chapter describes the activities of the No-Action Alternative and all action alternatives. Then based on the descriptions of the relevant resources in Chapter 3: Affected Environment, and the predicted effects of all alternatives in Chapter 4.0 Environmental Consequences, this chapter presents the predicted attainment of project objectives and the predicted effects of all alternatives on the quality of the human environment in comparative form, providing a clear basis for choice among the options for the decision maker and the public.

This chapter has eight key sections:

2.2 Process and Design Used to Formulate the Alternatives, page 38
2.3 Alternatives Eliminated From Detailed Analysis, page 42
2.4 Alternatives Considered in detail, page 44
2.5 Format and Description of the Projects, page 48
2.5.6 MITIGATION, page 90
2.6 Alternative Relationship to Key Issues: page 99
2.7 Comparison Summary of the Alternatives, page 103
2.8—Identification of the Forest Service, Preferred Alternative, page 110

2.2 PROCESS AND DESIGN USED TO FORMULATE THE ALTERNATIVES

2.2.1 PROCESS

The key issues to the recommended action described in Chapter 1(see pages 30-34) of this document helped to formulate the range of alternatives, prescribe mitigation measures, and to focus the analysis to the affected environment.

In the Columbia River Basin, the Forest Service and the Bureau of Land Management manage salmonid habitat under the direction of PACFISH[42] (USDA AND USDI 1994) and INFISH Inland Native Fish Strategy; USDA 1995). These interim management strategies endeavor to protect areas that add to salmonid recovery and improve riparian habitat and water quality throughout the basin, which includes the John Day subbasin. These strategies have also facilitated the ability of the federal land mangers to meet requirements of the ESA (see above) and avoid jeopardy. Under PACFISH/INFISH the seven subwatersheds have been denoted “key watersheds” to protect and restore important fish habitats. PACFISH guidelines have been used in recommendations for restoration in the analysis area for the protection of habitat and threatened populations of anadromous fish. These guidelines have been used in all design of recommended restoration for Aquatic, Vegetation and Infrastructure projects(see 2.2 Process and Design Used to Formulate the Alternatives, page 38). INFISH guidelines have been used in

[42] *Interim Strategies for Managing Anadromous Fish-Producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California* USDA Forest Service and USDI Bureau of Land Management (February 1995).This is an interim strategy for managing anadromous fish-producing watersheds in eastern Oregon and Washington, Idaho, and portions of California.

recommendations for restoration in the analysis area for the protection of habitat and threatened populations of bull trout.

To meet recovery objectives, these strategies have been key in establishing watershed and riparian goals to maintain or restore all fish habitat. Under PACFISH/INFISH watershed analyses such as this present analysis will be used to set priorities and provide guidance on priorities for watershed restoration.

The no action alternative is included and provides a basis for comparing the environmental effects of the action alternatives including the recommended action.

Projects and associated mitigation were combined to address the key issues logically while moving toward fulfillment of the purpose and need.

Some resource projects and mitigation were common among the action alternatives, while other projects and mitigation varied across the range of alternative.

The decision maker will have the prerogative to combine design or mitigation elements from any of the alternatives in the decision document—to form the Forest Service's Recommended Alternative.

2.2.2 DESIGN

Multiple projects or actions were identified that would begin to effectively move resources in the *Analysis Area (Galena WA, Supplement—2002)* toward the desired conditions. The major project categories are **Aquatics**, **Vegetation,** and **Infrastructure**. These projects impact the hydrologic function and vegetation character of the area and are aligned with the Purpose and Need (see page 6). These categories are used in the following detailed descriptions for all action alternatives.

2.2.2.1 Aquatics

Proper aquatic function across the landscape is invaluable to all resources and in particular the riparian-wetland areas. The proper upland hydrologic function directly influences riparian areas and benefits a wide variety of needs for fish and wildlife habitat, watershed protection, and human uses. Projects were designed to meet objectives specifically for hydrologic function and fisheries habitat; but are expected to have benefits for all resources across the landscape. Projects includes: riparian planting and protection, in-stream structure creation, woody debris placement, channel modification and slash-filter windrow placement in uplands.

The scale of projects vary across the range of alternatives, and will have varying levels of success in meeting the purpose and need for recommended action. Cumulatively, projects described later under vegetation and infrastructure would also contribute to the long-term benefits in the function of the area's aquatics.

The Analysis Area *(Galena WA, Supplement—2002)* supports the following Threatened Endangered and Sensitive fish species(TES): Columbia Basin Bull Trout (Threatened), Mid-Columbia River Summer-run Steelhead (Threatened), and Chinook Salmon (Sensitive) that must be considered for Essential Fish Habitat. Projects were designed to improve habitat and rectify elements of undesired conditions that are detrimental to threatened fish.

2.2.2.2 Vegetation

Vegetation projects in the action alternatives are designed to move vegetation toward the Historic Range of Variability (HRV) making them more resilient to disturbances such as wildfire and insect infestations, reducing the uncharacteristic severity that has been occurring due to current forest stand conditions. These treatments would move forest stands toward a more resilient balance of forest stand and tree composition, structure, and distribution.

Implementation Tool—Mechanical Treatments

All action alternatives reduce tree stocking by way of mechanical harvest, including both commercial and non-commercial harvest (i.e. precommercial thinning). Moderate- to high-risk forest stands were included for treatment to reduce stocking, or to shift tree species composition from encroaching late seral species, such as grand fir back to historic ponderosa pine and western larch dominated stands. The amount of stand management and treatments prescribed depends on the issues that an individual alternative is addressing. These features are included in 2.5 Format and Description of the Projects, page 48; Implementation Tool—Mechanical Treatments.

Implementation Tool—Fire Treatment

All action alternatives would implement prescribed fire. Prescribed burning would be implemented in forest stands that are primarily stocked with ponderosa pine, western larch, and Douglas-fir and which may contain understories of undesirable species such as grand fir or western juniper that have become established as a result of fire exclusion. A low intensity ground fire with flame lengths less than four-feet is planned to meet the objectives of fuel reductions, vegetation treatment, and resource protection. Burn intensity would be varied on a site-specific basis, depending on weather, fuel, topographic, and tree characteristics to result in no more than 30 percent crown scorch of the dominant and co-dominant trees. The scorching of the lower live branches is desirable to reduce the chance of tree crowns being ignited by a wildfire. Understory trees that are in excess and not needed to meet other resource needs can exceed 30 percent crown scorch. Mosaic burning including some unburned areas is desirable to have diversity in ground vegetation stages. This vegetation modification would allow prescribed fire to be safely used at the landscape level, in an effort to mimic the historic role of fire as described below.

The amount of prescribed fire will vary across the action alternatives depending on the level of harvest and issue implementation. Harvest prescriptions incorporate fuel reduction by mechanical methods and prescribed fire as a connected action. In the areas outside these harvest areas, fire would be implemented to restore resilient structure and restore fire regimes and establish a trend toward HRV.

Mechanical and burning prescriptions were designed, in part, to address: hydrology, fisheries, visual, wildlife, recreation and heritage resources. These features are included in 2.5 Format and Description of the Projects, page 48; Implementation Tool—Mechanical Treatments page 59 and 2.5.4.2 Implementation Tool—Fire Treatment page 70.

Dedicated and Replacement Old Growth Designation

To provide future habitat needs for pileated woodpeckers and pine martens, the action alternatives would expand Dedicated Old Growth (DOG) areas, Replacement Old Growth (ROG) areas, and Pileated Woodpecker Feeding Areas (PWFAs). Alternatives vary as to the number of acres managed for these species. A system of DOGs, ROGs and PWFAs would provide the means for managing large contiguous blocks of habitat through time.

Wildlife connectivity between old-growth areas would be addressed through a system of wildlife corridors, also referred to as *Land and Resource Management Plan* Amendment #2 wildlife corridors or LRMP2 corridors. Mechanical and fire prescriptions would be modified to maintain higher levels of wildlife cover than the standard prescriptions.

Aspen Restoration

The action alternatives would help restore aspen stands. Conifer trees encroaching on aspens would be harvested, felled and left on site, or converted into wildlife snags. Fences would be constructed around aspen stands to protect new regeneration from deer, elk or livestock.

Noxious weeds

The action alternatives would treat noxious weed sites. Alternatives vary regarding whether chemical or manual measures are used to eradicate the weeds.

2.2.2.3 Infrastructure

Resource needs, user groups, modes of travel, economic and legal issues, traffic, and safety requirements were all considered in developing projects responding to the network of roads, trails and trailheads, and dispersed campsites. National and Regional policy was incorporated along with Forest direction and standards from the *Land and Resource Management Plan*.

An optimum road and trail system is a function of land stewardship needs and management objectives. These needs and objectives are in a state of change. Therefore, reassessing road and trail systems and their needs is a dynamic process. A balance between the benefits of public and management access and potential effects on other values and resources such as clean water, fish and wildlife habitat, and maintaining choices for future generations is explored in this project.

A proper balance will result in a more efficient transportation system with less risk to the environment and public safety. Methods considered in responding to resource and public needs were: decommissioning, closing, constructing, reconstructing, maintaining, and relocating the roads, trails, or campsites.

2.2.3 ADAPTIVE MANAGEMENT/MONITORING

2.2.3.1 Vegetation

Harvest

A number of units contain a minimal amount of saw log material. If during layout of these mechanical prescriptions, the market values are down and the cost of harvesting a particular unit is not economical, the benefits of pre-commercial thinning, decking the material, removal of the material by other methods, or burning would be explored. If a change or changes are made and not considered substantial and are within or near the anticipated affects described in Chapter 4.0, then documentation of these changes would be filed and projects would be implemented. However, if the changes are considered substantial, the effects are outside the current ranges of alternatives, or the responsible official feels that the interested public should be informed and given an opportunity to respond to the changes, then additional NEPA or public participation would occur.

Harvest and small tree thin prescriptions implemented in the range of action alternatives include commercial thinning (HTH), commercial thinning in connectivity stands (HTH1), shelterwood (HSH), salvage removal (HSV), understory removal (HUR), small tree thinning (SPC), and modified small tree thinning (SPC1).

Prescribed Fire

Actual acres burned over the ten-year project activity period would probably be fewer than recommended . It is ultimately up to the burn boss on each prescribed fire to meet resource objectives.

Before prescribed fire can be ignited, a burn plan would be prepared outlining some of the decisions of where and when to burn in order to meet:

- Resource Objectives;
- Area by area conditions (e.g. forest stand density, fuel accumulations);
- Designed mitigations for resource protection, and
- Weather conditions needed to meet the fire intensity and treatment objectives.

A combination of drip torches, fusees, flare guns, ATVs with mounted drip torches, and helicopters may be used to ignite these burns.

Implementing burning may take place over a 10 year period due to:

- The large size of the area to be burned,
- Smoke management restrictions,

- Limited days that conditions would allow burning e.g. weather, and
- Timing of possible timber sales and other mechanical treatments.

However, this burning program should be examined every 3 to 5 years to ensure intent of this decision, objectives for the burn, and trends or results of applied burns are meeting current management direction at that time.

2.2.3.2 Infrastructure

The *Southeast Galena Roads Analysis* as directed by the USDA Forest Service (August 1999) was conducted specifically for this Analysis Area (Galena WA, Supplement—2002) . The roads analysis process is intended to complement and integrate previous and ongoing analytical processes. This document incorporates information from the Roads Analysis and may be modified through an adaptive management approach as refinement and better, site-specific information is gathered.

If changes occur and continue to be within the anticipated effects analyzed in the context of this analysis, they may be implemented as needed. If the change is found to be outside the range of anticipated effects or the responsible official feels that the public should be informed and allowed opportunity to respond to these changes, then additional NEPA, or public involvement will be needed. Regulatory agencies would be informed, per Endangered Species Act requirement as this new information becomes available.

2.3 Alternatives Eliminated From Detailed Analysis

2.3.1 Roads in Roadless Areas (*Land and Resource Management Plan* Appendix C)

Pending the Final Rule of 36 CFR Part 294 Special Areas; *Roadless Area Conservation*, direction from this rule was considered in this analysis process. Early in the planning process, consideration was given to building roads into the Dixie Butte Roadless Area. New roads would have facilitated ground-based logging systems to provide the most economic return while reducing forest stand risk to insect infestation, disease infection, and reducing the likelihood of uncharacteristically severe wildfire. Subpart B Section 294.12 of the above Rule states that road construction and road reconstruction in inventoried roadless areas are prohibited with some exceptions. The purpose and need for the *Southeast Galena Restoration Project* would not meet the criteria as any of these exceptions. Therefore, pursuant to prohibitions in the aforementioned Rule, road construction in Dixie Butte Roadless Area was dropped from detailed analysis.

2.3.2 Harvest and Prescribed Fire in the Scenic and Wildlife Emphasis Areas

Timber harvest and prescribed fire were both considered within portions of the Vinegar Hill-Indian Rock Scenic Areas and the Dixie Butte Wildlife Emphasis Area (see Appendix E, Map 3-Management Areas and Roadless Areas). The *LRMP* does not permit scheduled harvest within these Management Areas unless it benefits respective resources.

Timber harvest was considered but dropped because in the short-term existing vegetation is currently in a condition that generally benefits, rather than harms, wildlife and scenic integrity. Most of these areas are in Cold Forest and Moist Forest types. Vegetation conditions are relatively close to historic conditions particularly at higher elevations in these areas. Although conditions in lower elevations may be outside HRV, the 2000 *Canada Lynx Conservation Assessment and Strategy* suggests a conservative approach toward habitat management. In addition, the 1996 Summit Fire destroyed a large portion of the available

lynx habitat in the Galena Watershed. Consequently, additional habitat modification should be deferred until portions of the Summit Fire area have revegetate.

Prescribed fire was considered but dropped for two reasons: 1) frequent underburning is outside the historic fire regime for Cold Forest types and much of the Moist Forest types; and 2) where frequent fire was the historic fire regime, such as in lower elevations, existing vegetation conditions are not within the expected HRV in structure and composition that would allow prescribed fire without resulting in unacceptable tree mortality (see 2.3.6 Prescribed Fire within Higher Elevation Moist & Cold Forest Stands, page 44).

Therefore, because of the considerations just described, a conservative approach was decided upon for both the scenic and wildlife emphasis areas in order to preserve the current amenities.

2.3.3 Harvest within RHCAs

Analysis of timber harvest within RHCAs to help sustain riparian objectives was considered early in the process of project objectives. Field reconnaissance and stream surveys have revealed that many stream channels in the Analysis Area (Galena WA, Supplement—2002) do not have sufficient large wood. An exception is the headwaters of Vinegar Creek where a blow down event occurred, leaving an excess of large down wood on about 1,400 acres (see **1.2.1.3 Undesired Condition: Damaged Aquatic** Habitat page 11). A portion of this downed material is being included for removal in action Alternatives 2 and 5 to reduce fuel accumulations and assist in lowering the severity of potential fire and improving ease of control of wildfire, which may occur. Prescribed fire would also be allowed to back down into RHCAs in some locations in Alternatives 2, 4 and 5. Some RHCAs have been denuded of vegetation and soil due to past hydraulic mining (see **1.2.1.3 Undesired Condition: Damaged Aquatic** Habitat page 11).

Harvest within RHCAs, was eliminated from detailed study due to the overall lack of large woody material and riparian vegetation, except for:1) the area in Vincent and Vinegar Creek headwaters where the wind event of 1998 occurred; and 2) treatment in aspen enhancement units (treatment of conifers encroaching into Aspen stands) in Alternatives 2 and 5. Therefore, other than the previously mentioned two exceptions, harvest in RHCAs was eliminated from detailed analysis because of the overall lack of large woody material and the general lack of riparian vegetation within the Analysis Area (Galena WA, Supplement—2002) .

2.3.4 Reconstruction of Forest Rd. 4559 access to Lemon Cabin

A segment of Forest Road 4559 is currently closed due to a washout of the road at the Lemon Creek drainage which occurred in 1998. Reconstruction would allow vehicles to access a cabin site as well as the scenic area trailhead. The Lemon cabin, built in the 1920s for a mining claim and is now National Forest property. Reconstruction of Forest Road 4559 for access to Lemon Cabin and Vinegar Hill-Indian Rock Scenic Area trailhead was considered. Reconstructing the closed segment of Forest Road 4559 would entail removing the deposited material from the washout (in an area with threatened fish species), installation of a major culvert which meets current standards at the Lemon Creek crossing, and replacement of an existing bridge over Granite Boulder Creek (just above the cabin). Such an undertaking would be costly and produce limited benefits. Even if a new culvert is installed, because large debris deposits have accumulated upstream, the Lemon Creek crossing would continue to be vulnerable to another washout. Therefore, decision not to repair this bridge was based on the age and high cost of bridge repair. Additionally, a decision not to reconstruct Forest Road 4559 to allow vehicles to access the cabin site, as well as the scenic area trailhead, was made in a similar manner based on the high cost of such a project and the distinct possibility of a continued failure of Lemon Creek drainage after reconstruction.

2.3.5 Blackeye and Tempest Mine Trailheads

The following actions were considered for the Forest Road 4559, the Blackeye Trailhead, and the Tempest Mine Trailhead: 1)Currently, a road closure on Road 4559 and Junction of Road 4559283 is not adequate for a trailhead. This area was considered for a trailhead, but because it can not facilitate vehicles with horse trailers, or recreational vehicle campers, this area is not adequate. Creating a trailhead here would have created traffic problems which could not have been alleviated without cost-prohibitive and adverse impacts to fisheries resources. This site was not large enough to support a desired level of parking, or would have required removal of a large amount of fill dirt causing affects to fish habitat. Therefore, a road closure on Road 4559 and Junction of Road 4559283 is not adequate for a trailhead. 2) Another trailhead location was considered at the end of Road 4557; this new section of trail would have been on steep ground and consequently not a good location. The final location which was considered but eliminated from detailed analysis is located at the end of Road 4559283. To connect this new trailhead location to the existing trail, construction of a connector trail would have been necessary this action would have crossed the headwaters of Granite Boulder Creek creating resource concerns in an area with threatened fish species.

Therefore, the trailhead options described above were eliminated from detailed analysis because of inadequate location and because two existing trailheads provide adequate access to the trail system into the Vinegar Hill—Indian Rock Scenic Area. One of these trailheads are located off Forest Road 4555 on the Sunrise Butte Trail system, and the other is located on Forest Road 2010 (see Appendix E, Map31—recommended Trails, Trailheads, and Campsite Projects—for Action alternatives).

2.3.6 Prescribed Fire within Higher Elevation Moist & Cold Forest Stands

Prescribed fire was considered in the wetter portions of the Moist Forest and Cold Forest types. However, these forest types are dominated by late seral species with thin bark and full crowns that often reach the ground, creating ladder fuels. As a result, heavy mortality can be expected from most fires due to bole scorch, torching, and crowning activity even in low intensity fires.

Therefore, due to these areas currently resembling what can be expected in these forest types and due to the risk of a severe fire to occur, it was decided to not apply prescribed fire at this time. High tree mortality and large block of acres can be expected to be lost. Additionally, because of the uncharacteristically severe wildfires of the 1990's in the Galena watershed, the creation of additional areas of stand replacement burns is not desired.

2.4 Alternatives Considered in Detail

The following alternatives are described with recommended actions which differ alternative to alternative.

2.4.1 Alternative 1—No Action

No action would occur under this alternative meaning that existing *Land and Resource Management Plan* activities and past decisions would continue as currently planned. Other opportunities may be implemented on a subwatershed scale, or smaller as the need arises and proper planning procedures are conducted. Current Access Travel Management planning would continue communication with consulting agencies. Activities such as road maintenance, fire suppression, firewood cutting, administering recreation policies and routine trail and road maintenance would continue to occur as well as wildlife, vegetation, hydrologic, and cultural surveys. Restoration planning activities on a large landscape scale as described in the recommended action and other alternatives to the recommended action would not happen. However, site specific opportunities with the appropriate planning documents for implementation could occur at any time.

2.4.2 Alternative 2—Recommended Action

This alternative would initiate restoration management across the landscape: this includes 20% mechanical treatment by commercial harvest; 6% mechanical treatment by pre-commercial thinning; and prescribed burning on 47% of the Analysis Area (Galena WA, Supplement—2002). The total Analysis Area (Galena WA, Supplement—2002) includes National Forest land and other ownerships encompassing seven subwatersheds totaling 49,473 acres of the greater Galena Watershed (see Map A Vicinity Map page i). Restoration projects are designed to begin reversing adverse hydrologic/fisheries and vegetation trends while accelerating other slowly improving riparian trends. Project activities would improve hydrologic/fisheries conditions such as stream-channel stability, riparian shade, stream meander, and peak stream flows in early spring toward their properly functioning condition. Heavy equipment would be used within stream channels to improve hydrologic function and fisheries habitat.

Vegetation projects are designed to move forest stands and associated vegetation such as stand structure and tree species mix toward their historic range. New roads would be included in this proposal to access areas for management as well as relocate other roads currently located in RHCAs. Most new roads would be closed upon completion of these projects and a number of roads no longer needed for management, recreation access, or are causing resource damage would be decommissioned and removed from the transportation system. Prescribed fire and mechanical methods, including commercial harvest using tractor, skyline, and helicopter systems and precommercial thinning would be used to implement vegetation prescriptions in order to improve and enhance the growth, quality, vigor, and resiliency of forest stands across the landscape. This includes intermediate treatments (thinning), within the Malheur National Forest *Land and Resource Management Plan* designated Roadless Areas (LRMP Appendix C). A number of wood products including commercial timber, post and poles, pulp wood, fire wood, and biomass for power generation would be realized with this treatment. Aspen stands would also be enhanced through a number of restoration projects including felling or girdling of encroaching conifer, hand piling and burning of slash, planting of aspen, and fencing to discourage ungulate pressure. Trees felled within conifer treatment in aspen sites, which occur in RHCAs may be removed as long as down and in stream LWD standards are met.

Restorative activities described below could have begun in 2003, and most actions would have been completed within the next five years. The timing of restorative measures such as prescriptive harvest and thinning, prescribed fire and and road work will be dependent upon furthur legal planning requirments, timing opportunities, funding, and safety factors. Because safety and other factors must be applied on a project by project basis, it is estimated that fire prescriptions may take up to ten years to complete. In 3 to 5 years after legal planning requirements are met, projects such as prescribed fire that are not complete will be evaluated to ensure management direction and intent are being met at that time.

Aquatics Projects

While some riparian areas are slowly improving naturally, implementation of aquatic projects now, would begin accelerating conditions in a manner that threatened fish populations would begin to benefit from an improved riparian environment at the time of implementation. Aquatic project activities would improve hydrologic/fisheries conditions such as: stream-channel stability; riparian shade; and the lack of a meandering nature streams currently exhibit. These conditions collectively cause peak stream flows in early spring to allow too much water to leave the landscape too soon, with the consequence of low water flow and high water temperatures during late summer months. To improve hydrologic function and fisheries habitat, some projects within certain stream channels it would be necessary to implement the use of heavy equipment in stream channels. Project actions would improve hydrologic/fisheries conditions toward a properly functioning condition (e.g. culvert replacement at road crossings to allow all life stages of threatened fish stream connectivity) .

Vegetation Projects

This recommended action would initiate restoration management across the landscape: this includes 20% mechanical treatment by commercial harvest; 6% mechanical treatment by pre-commercial thinning; and

prescribed burning on 47% of the Analysis Area (Galena WA, Supplement—2002) . A number of projects are designed to move vegetative conditions such as forest stand structure and tree species mix toward an historic range. Prescribed fire and mechanical methods accomplish this transition. Mechanical methods include: commercial harvest implemented by tractor; skyline; and helicopter systems. Additionally, pre-commercial thinning would be used to implement vegetation prescriptions in order to improve and enhance the growth, quality, vigor, and resiliency of forest stands across the landscape. This includes intermediate treatments (generally small-diameter trees), within the Malheur National Forest *Land and Resource Management Plan*[43] designated Roadless Areas (LRMP Appendix C). A number of wood products including commercial timber, post and poles, pulp wood, fire wood, and other wood products such as biomass would be an outcome of these treatments.

Infrastructure Projects

Some roads or road segments that are currently located in Riparian Habitat Conservation Areas (RHCAs) would be relocated. For the location of Riparian Habitat Conservation Areas see Appendix E, Map 3—Management Areas and Roadless Areas and Map 29—Access Travel Management Plan Alternatives 2, 3, and 4. The relocated roads or road segments would be constructed outside of the RHCA area, and then the old locations would be decommissioned. New roads would be constructed to access areas for prescribed vegetation management where necessary. Many of the new roads would be closed upon completion of project activities. Existing roads that are still needed to provide access for management or recreation would receive reconstruction or maintenance work needed to improve user safety and reduce road related impacts to other resources. Roads no longer needed for management or recreation access would be decommissioned and removed from the transportation system.

To see specific project intensity for all projects, refer to **Table 68**, page 103. See also Appendix E, Map 8—Stream and Riparian Rehabilitation for Action Alternatives; Map 13—Recommended Logging Systems Alternative 2; Map16—Prescribed Fire Opportunities Alternative2 and 5; Map 20—Wildlife Connectivity—For Action Alternatives; Map 29—Access Travel Management Plan Alternatives 2, 3, and 4; Map 31—Recommended Trails, Trailheads, and Campsite Projects—For Action Alternatives; Map 28—Noxious Weed Sites—Existing Condition; and Map 9—Recommended Mechanical Treatments Alternative 2.

A non-significant *Land and Resource Management Plan* amendment would be required to :

- Reduce big game cover below *Land and Resource Management Plan* standards (in summer range) in the Little Boulder/Deerhorn subwatershed.

Modify existing DOG/ROG boundaries to match logical topographical features such as stream and roads and/or existing stand boundaries, and to meet minimum *Land and Resource Management Plan* standards.

2.4.3 Alternative 3—Reduced Short-Term Impacts

This alternative strives to reduce potential short-term impacts to the Analysis Area (Galena WA, Supplement—2002) from direct impacts from the long-term restoration treatments. For instance, only hand crews would be used to implement instream projects and heavy equipment would not be used. Approximately 15% of the Analysis Area (Galena WA, Supplement—2002) would be mechanically treated by commercial harvest (commercial thinning, understory removal, salvage, and shelterwood treatments), 5% would be pre-commercial thinned, and 22% of the Analysis Area (Galena WA, Supplement—2002) would be prescribed burned outside mechanical treatment areas (most areas mechanically treated would also be prescribed burned). There would be no use of chemical herbicides or rodenticides for seedling protection. There would not be any commercial harvesting in *Land and Resource Management Plan* inventoried roadless areas. The same access management plan would be implemented as for Alternative

43 Malheur National Forest *Land and Resource Management Plan* 1990 (also referred to as the Forest Plan or LRMP)

2, with a few minor differences due to the reduced harvesting. Products such as commercial timber, post & poles, pulpwood, biomass, and firewood would still be realized.

For a better understanding of specific project intensity refer to Table 68, page 103. See also Appendix E, Map 8—Stream and Riparian Rehabilitation for Action Alternatives; Map 10—Recommended Mechanical Treatments Alternative 3; Map 20—Wildlife Connectivity—For Action Alternatives;; Map 14—Recommended Logging Systems Alternative3; Map 29—Access Travel Management Plan Alternatives 2, 3, and 4; Map 24—Big Game Cover Alternative 3; Map 28—Noxious Weed Sites—Existing Condition; and Map 31—Recommended Trails, Trailheads, and Campsite Projects—For Action Alternatives.

A non-significant *Land and Resource Management Plan* amendment would be required to :

- Modify existing DOG/ROG boundaries to match logical topographical features such as stream and roads and/or existing stand boundaries, and to meet minimum *Land and Resource Management Plan* standards.
- To expand DOGs/ROGs/PWFAs for pileated woodpeckers from 600 acres to 900 acres to better meet home range size.

2.4.4 Alternative 4—No Harvest Restoration

Alternative 4 strives to enhance and improve the area's vegetative processes with out the use of commercial harvest. The area's vegetation will be treated by use of prescribed fire on 39% and pre-commercial thinning on 6% of the Analysis Area (Galena WA, Supplement—2002) (2/3 of the thinning would be prescribed burned, 1/3 would not). Trees would not be removed as a timber sale product. Some relocation of roads out of RHCAs would occur and no heavy equipment would be used within stream channel restoration projects. Prescribed fire and pre-commercial thinning would occur within the *Land and Resource Management Plan* inventoried roadless areas. See the comparison table below for more detail.

For a better understanding of specific project intensity refer to Table 68, page 103. See also Appendix E, Map 11—Recommended Mechanical Treatments Alternative 4; Map 31—Recommended Trails, Trailheads, and Campsite Projects—For Action Alternatives; Map 29—Access Travel Management Plan Alternatives 2, 3, Map 28—Noxious Weed Sites—Existing Condition; and 4; Map 25—Big Game Cover Alternative 4; and Map 11—Recommended Mechanical Treatments Alternative 4.

A significant *Land and Resource Management Plan* amendment would be required to:

- Reclassification of Davis Creek Trail to non-motorized use exclusively.

A non-significant *Land and Resource Management Plan* amendment would be required to:

- Reduce big game cover below LRMP standards (in summer range) in the Little Boulder/Deerhorn subwatershed.
- Modify existing DOG/ROG boundaries to match logical topographical features such as stream and roads and/or existing stand boundaries, and to meet minimum LRMP standards.

2.4.5 Alternative 5—Additional Treated Areas—Increased Access

Alternative 5 is more aggressive in treating vegetation to increase sustainability and resiliency. Approximately 23% of the Analysis Area (Galena WA, Supplement—2002) would be mechanically treated by commercial harvest (commercial thinning, understory removal, salvage, and shelterwood treatments), 6% would be pre-commercial thinned, and 22% of the Analysis Area would be prescribed burned outside mechanical treatment areas (most areas mechanically treated would also be prescribed burned). This alternative reduces harvesting costs by incorporating more tractor skidding and less helicopter yarding. This alternative would require additional new roads and would leave more roads open than recommended in Alternatives 2 or 3. Identified roads no longer needed for management, recreation access, or are

causing resource damage would be decommissioned and removed from the transportation system. Hydrologic/fisheries projects are similar to Alternative 2 in that heavy equipment would be used within stream channels. The *Land and Resource Management Plan* inventoried roadless areas would also receive more treatment than in Alternative 2. Various wood products would be realized as in Alternative 2.

For a more complete understanding of the intensity of the projects within this and each alternative see Table 68, page 103.See also Appendix E, Map 12—Recommended Mechanical Treatments Alternative 5; Map 15—Recommended Logging Systems Alternative5; Map16—Prescribed Fire Opportunities Alternative2 and 5; Map 30—Access Travel Management Plan Alternatives 5; Map 28—Noxious Weed Sites—Existing Condition; and Map 31—Recommended Trails, Trailheads, and Campsite Projects—For Action Alternatives.

A non-significant *Land and Resource Management Plan* amendment would be required to :

- Reduce big game cover below LRMP standards (in summer range) in the Vincent and Little Boulder/Deerhorn subwatersheds.
- Reduce big game cover below LRMP standards (in winter range) in the Tincup/Little Butte subwatershed.
- Increase open road densities beyond LRMP standards in the Vincent subwatershed, (in summer range) and the Little Boulder/Deerhorn and Butte subwatersheds (in winter range).
- Modify existing DOG/ROG boundaries to match logical topographical features such as stream and roads and/or existing stand boundaries, and to meet minimum LRMP standards.

2.5 Format and Description of the Projects

2.5.1 Format

The format of the following project descriptions will use the same outline as displayed earlier with the major headings of **Aquatics**, **Vegetation**, and **Infrastructure.**

These three project headings are delineated further into the sub-headings listed below. This format will help the decision maker and reader to better understand and track the multiple projects within each alternative. **Aquatics** includes the sub-categories of Hydrology and Fisheries. **Vegetation** includes the sub-categories of Conifer and Associated Vegetation, Aspen Stands and Noxious Weeds. **Infrastructure** includes the sub-categories of Roads, Trails and Trailheads, and Dispersed Campsites.

Table 13 Projects per Alternative

PROJECTS	ALT. 1	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Hydrology					
Streamside/Riparian Hardwood Protection	No	Yes	Yes	Yes	Yes
Streamside/Riparian Planting and Protection	No	Yes	Yes	Yes	Yes
Channel/Streamside Projects	No	Yes	Yes	Yes	Yes
Area Projects	No	Yes	Yes	Yes	Yes
Channel/Floodplain Rehabilitation	No	Yes	No	No	Yes
Fisheries					
New Instream Structures	No	Yes	No	No	Yes
Improve Existing Instream Structures	No	Yes	Yes	Yes	Yes
Riparian Planting	No	Yes	Yes	Yes	Yes

PROJECTS	ALT. 1	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Culvert Removal or Replacement	No	Yes	Yes	Yes	Yes
Vegetation					
Conifer and Associated Vegetation					
Harvest	No	Yes	Yes	No	Yes
Pre-commercial Thin	No	Yes	Yes	Yes	Yes
Prescribed Fire	No	Yes	Yes	Yes	Yes
Aspen Enhancement	No	Yes	Yes	Yes	Yes
Noxious Weed Control (C,M)	No	C,M	M	M	C,M
Infrastructure					
Roads					
Hazardous Tree Removal	No	Yes	Yes	Yes	Yes
New Roads per Mechanical Treatment	No	Yes	Yes	No	Yes
Reconstruction	No	Yes	Yes	Yes	Yes
Decommission	No	Yes	Yes	Yes	Yes
Trails and Trailheads					
New Construction	No	Yes	Yes	Yes	Yes
Reconstruction	No	Yes	Yes	Yes	Yes
Decommission	No	Yes	Yes	Yes	Yes
New Trailheads	No	Yes	Yes	Yes	Yes
Removed Trailheads	No	Yes	Yes	Yes	Yes
Dispersed Camp Sites					
New Dispersed Camp	No	Yes	Yes	Yes	Yes
Improved Camps	No	Yes	Yes	Yes	Yes
Removed Camps	No	Yes	Yes	Yes	Yes

NOTE: C = Chemical M = Manual

2.5.2 DESCRIPTIONS OF THE PROJECTS BY ALTERNATIVES

Table 13 displays the array of projects that are a part of each alternative. However, the amount or intensity of the project does vary from alternative to alternative thus creating differences among the range of alternatives. Those differences are displayed in the tables later in this chapter.

2.5.3 Aquatics

The aquatics section is divided into **Hydrology** and **Fishery** projects. Both sets of projects overlap each other and will have cumulative impacts to consider. These projects also have potential long-term, beneficial impacts on other resources that depend on aquatic habitats. These projects are designed to help capture, store, and safely release snowmelt and rainfall, improving timing, quantity, and quality of stream flows. Due to these expected improvements, these projects specifically move the resources toward the Purpose and Need for these actions. See 1.2 Purpose and Need for Action, page 6 and 1.2.1 Undesired Conditions, pages 8 through 11. Recommended projects adhere to PACFISH strategy and objectives.

By implementing Aquatic Projects, damaged stream segments within the analysis area would be repaired to create habitat which improves and sustains viable populations of fish species.

2.5.3.1 HYDROLOGY

The following project descriptions are those brought forward in this restoration effort. The tables following the descriptions display the amount or intensity of the project being applied per subwatershed (SWS).

These projects can be tracked to Undesired Conditions and the Desired Conditions and objectives for treatment found in the purpose and need for this project (see 1.2 Purpose and Need for Action, page 6;see also 1.2.1 Undesired Conditions, beginning on page 8 and 1.2.2 Desired Conditions, beginning on page 21).

2.5.3.1.1—Streamside/Riparian Hardwood Protection

Native hardwoods are needed to create shade that helps maintain cooler water temperatures and improve stream bank stability and floodplain function. In protecting and allowing reestablishment of the hardwoods, the results would include the following benefits:

- Retained early season runoff becoming available for late season flows enhancing fish habitat,
- Stabilized stream banks reducing erosion,
- Established hardwoods withstanding ungulate browsing,
- Established hardwoods providing a future seed source, and
- Recovered floodplains enhancing vegetative diversity improving fish and wildlife habitat.

Many hardwoods along Davis/Placer, Vinegar, and Little Boulder/Deerhorn Creeks are sparse, decadent, or heavily browsed. Existing hardwoods would be caged or fenced along the streams in these subwatersheds, using hand crews. This Restorative project is the same for all action alternatives.

Table 14 Stream side/Riparian Hardwood Protection

Subwatersheds	Alternative 2, 3, 4 & 5	
	Miles	Acres
Davis/Placer Gulch	1	4
Vinegar	0	5
Vincent	0	0
Little Boulder/Deerhorn	2	1
Tin Cup/Little Butte	1	2
Butte	0	0
Granite Boulder	0	0
TOTALS	4	12

2.5.3.1.2—Streamside/Riparian Planting and Protection

In planting and protecting these planted native hardwoods, many of the benefits and results would be the same as displayed above. Hardwood vegetation is sparse or absent along stream segments in Davis/Placer, Vinegar, Little Boulder/Deerhorn, Tin Cup/Little Butte, and Granite Boulder subwatersheds. Hardwood shrubs of alder, dogwood, and maple would be planted and protected using native seed sources. Hand crews would protect plantings with fences or small cages.

Table 15 Streamside/Riparian Planting and Protection

Subwatersheds	Alternative 2, 3, 4 & 5	
	Miles	Acres
Davis/Placer Gulch	8	2
Vinegar	2	5
Vincent	0	0
Little Boulder/Deerhorn	4	3
Tin Cup/Little Butte	0	6
Butte	0	0
Granite Boulder	2	0
TOTALS	16	16

2.5.3.1.3—Channel/Streamside Projects

Projects of this nature would improve channel function, shade, and stream bank protection that would promote the formation of riparian meadows. Many of these areas lack habitat that would allow a proper functioning condition. Hand placement of coarse woody material, fiber matting, hardwood protection, and hardwood planting, would occur along many stream reaches. Plantings would include cottonwood, willow, alder, dogwood, and maple from native seed sources. As in the previous project descriptions, these streamside projects are the same for all action alternatives.

Table 16 Channel/Streamside Projects

Subwatersheds	Alternative 2, 3, 4 & 5
	Miles
Davis/Placer Gulch	19
Vinegar	18
Vincent	3
Little Boulder/Deerhorn	15
Tin Cup/Little Butte	13
Butte	15
Granite Boulder	7
TOTALS	90

2.5.3.1.4—Area Projects

These projects tend to be larger, generally contiguous areas that include both uplands and connected channels or riparian areas. The results of these projects would slow runoff, which would limit sediment movement. As concentrated flows decrease, sediment accumulates, vegetation recovers, and long-term water storage is increased.

These areas contain unstable soils where rilling, gullying, or sheet erosion has occurred with many of these areas denuded of ground vegetation. Coarse woody material, woody windrows, and fiber matting would be placed by hand crews across the uplands. Planting, protection of existing hardwoods, and coarse wood placement would occur in the drainages within these areas. This project is the same for all action alternatives.

Table 17 Area Projects

Subwatersheds	Alternative 2, 3, 4 & 5
	Acres
Davis/Placer Gulch	0
Vinegar	960
Vincent	260
Little Boulder/Deerhorn	20
Tin Cup/Little Butte	40
Butte	30
Granite Boulder	140
TOTALS	1,450

2.5.3.1.5—Channel/Floodplain Rehabilitation—Area Projects

Projects of this nature focus in on the drainage floodplains to help improve the following:

- Reduce entrenchment,
- Stabilize valley bottom and floodplain,
- Raise water table,
- Decrease sediment input,
- Improve aquatic and terrestrial habitats,
- Improve aquatic and riparian productivity,
- Improve aesthetics,
- Improve diversity and vigor of riparian vegetation, and
- Reduce risk of wide-scale flood damage.

In improving these factors, fisheries and wildlife habitat conditions are enhanced, creating better distribution and protection of aquatic and terrestrial species dependent of these habitats.

Identified channels recommended for this project lack sinuosity, riparian vegetation, and properly functioning floodplains due to past activities e.g. hydraulic mining.

These projects would require the use of heavy equipment such as excavators, backhoes, or bulldozers along with some handwork to rehabilitate channel shape and function. Re-establishment of channels would occur on former floodplains by using relic channels or constructing new channels, including filling of existing channel; raising or lowering existing channel bed to connect with restored floodplain; and decreasing width/depth and entrenchment ratio by shaping upper slopes of channel and stabilizing both channel bed and banks.

This project is the same for action Alternatives 2 and 5 and is not implemented in action Alternatives 3 and 4.

Table 18 Channel/Floodplain Rehabilitation

Subwatersheds	Alt 1		Alts. 2 & 5		Alts. 3 & 4	
	Miles	Acres	Miles	Acres	Miles	Acres
Davis/Placer Gulch	0	0	0	0	0	0
Vinegar	0	0	0	0	0	0
Vincent	0	0	2	10	0	0
Little Boulder/Deerhorn	0	0	1	4	0	0
Tin Cup/Little Butte	0	0	0	0	0	0
Butte	0	0	0	0	0	0
Granite Boulder	0	0	0	0	0	0
TOTALS	**0**	**0**	**3**	**14**	**0**	**0**

2.5.3.2 FISHERIES

Recommendation in the *Galena Watershed Analysis* identified stream rehabilitation needs in four drainages: Granite Boulder, Vinegar, Butte, and Davis Creeks. These streams supported bull trout habitat historically, a threatened species in the Middle Fork John Day Sub-basin. Recommended projects adhere to PACFISH strategy.

The following project descriptions are those brought forward in this restoration effort. The tables following the descriptions display the amount or intensity of the project being applied per subwatershed (SWS).

2.5.3.2.1—New In-stream Structures

The objectives for these structures in improving and enhancing fish habitat are:

- Increase pool frequency and provide high quality pool habitat,
- Increase spawning gravels,
- Create winter rearing habitat for salmonids, and
- Improve accessibility of fish habitat.

Conditions in many stream segments echo the same conditions as outlined in the hydrology section above. Elements such as stream sinuosity, disconnected flood planes , lowered water tables, reduced habitat complexity (particularly deep pool habitat), and the lack of soils to support riparian vegetation are among the most important fisheries habitat concerns. Log and rock weir structures would be placed in stream by a backhoe, excavator, or superhoe. Access for streamside projects would be scarified, water barred, planted, and seeded to reduce risk of erosion, if needed. A combination of hardwoods, conifers, sedges, and grasses would be planted to revegetate and stabilize soil surface and stream banks.

This project is the same for action Alternatives 2 and 5 and is not implemented in action Alternatives 3 and 4.

Table 19 New Instream Structures

Subwatershed	Alt. 1	Alts. 2 & 5	Alts. 3 & 4
Davis/Placer Gulch	0	0	0
Vinegar	0	3	0
Vincent	0	0	0
Little Boulder/Deerhorn	0	0	0
Tin Cup/Little Butte	0	0	0
Butte	0	14	0
Granite Boulder	0	62	0
TOTAL	**0**	**79**	**0**

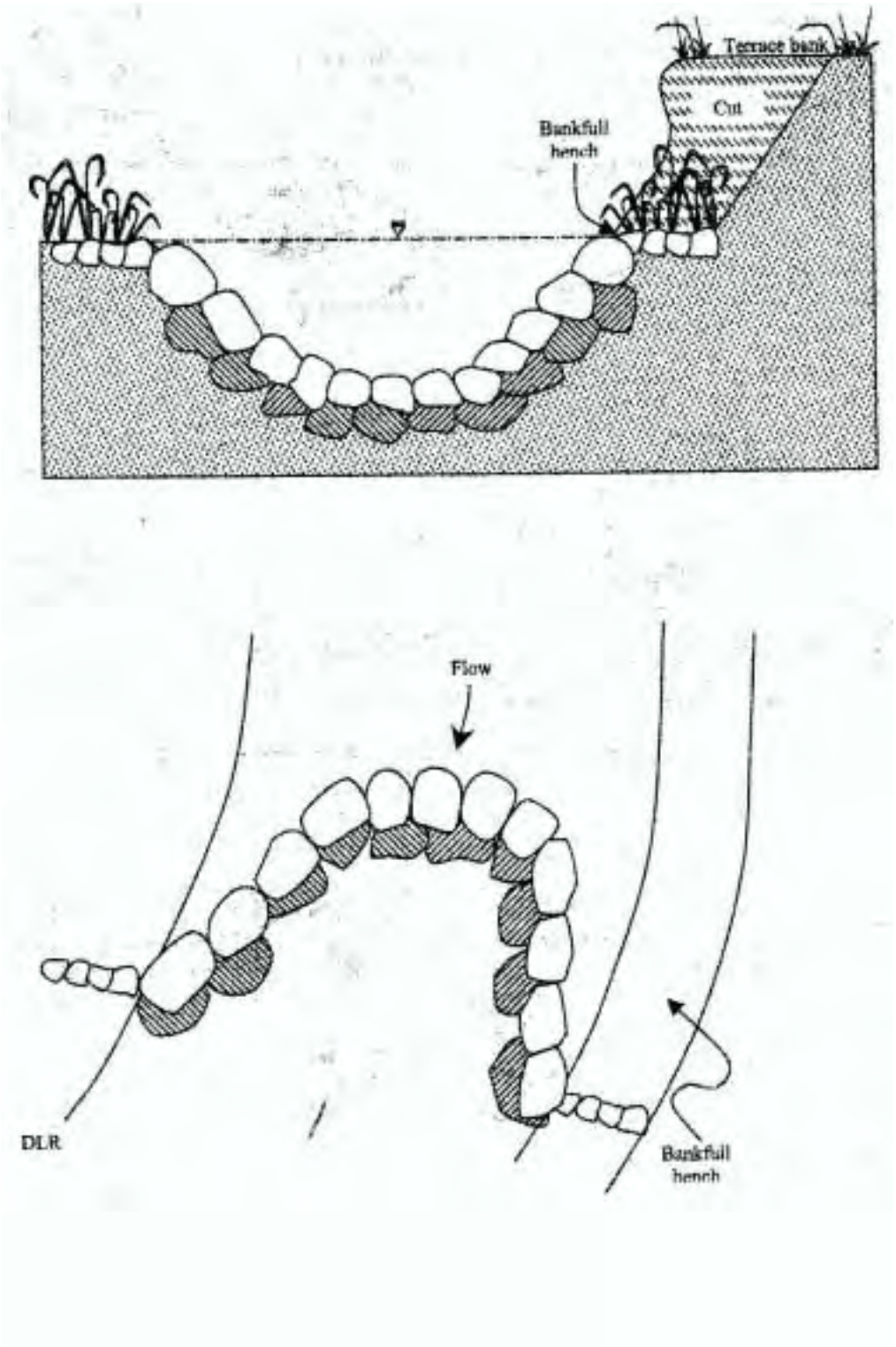

Figure 3—Boulder Cross-vane: Is a method used to enhance fish habitat by creating pool habitat.

Graphic courtesy of Wildland Hydrology, Pagosa Springs, Colorado.

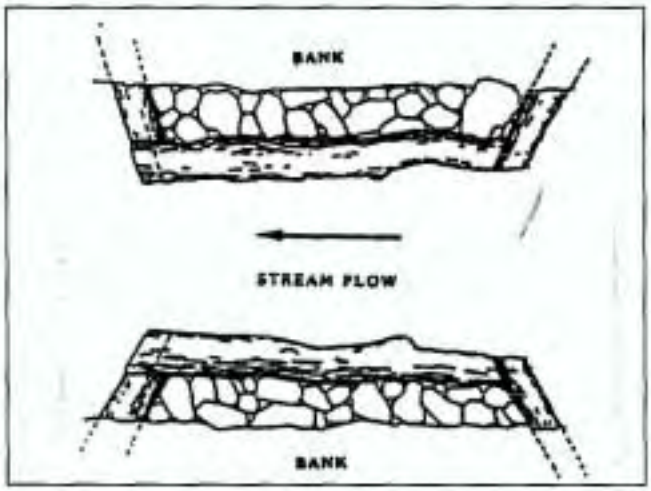

Figure 4—Channel Constrictor: Purpose is to narrow and deepen channel generally up to 80%.

Graphic courtesy of Wildland Hydrology, Pagosa Springs, Colorado.

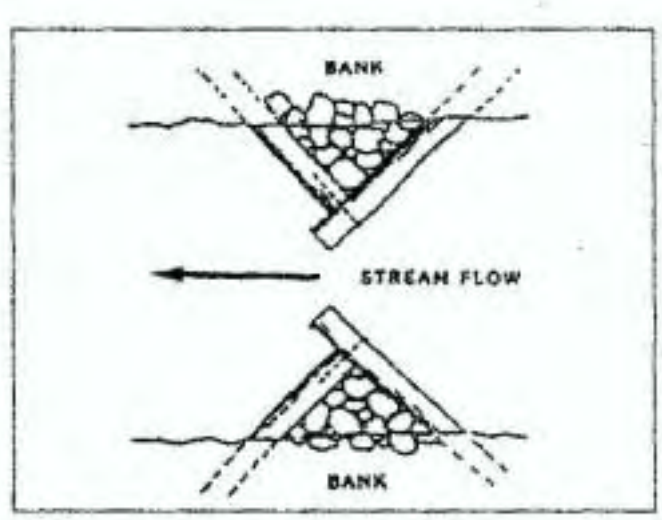

Figure 5—Double wing deflector: Purpose is deflect stream flow to narrow channel and increase stream velocity so that a deep pool is scoured in center of channel.

Graphic courtesy of Wildland Hydrology, Pagosa Springs, Colorado.

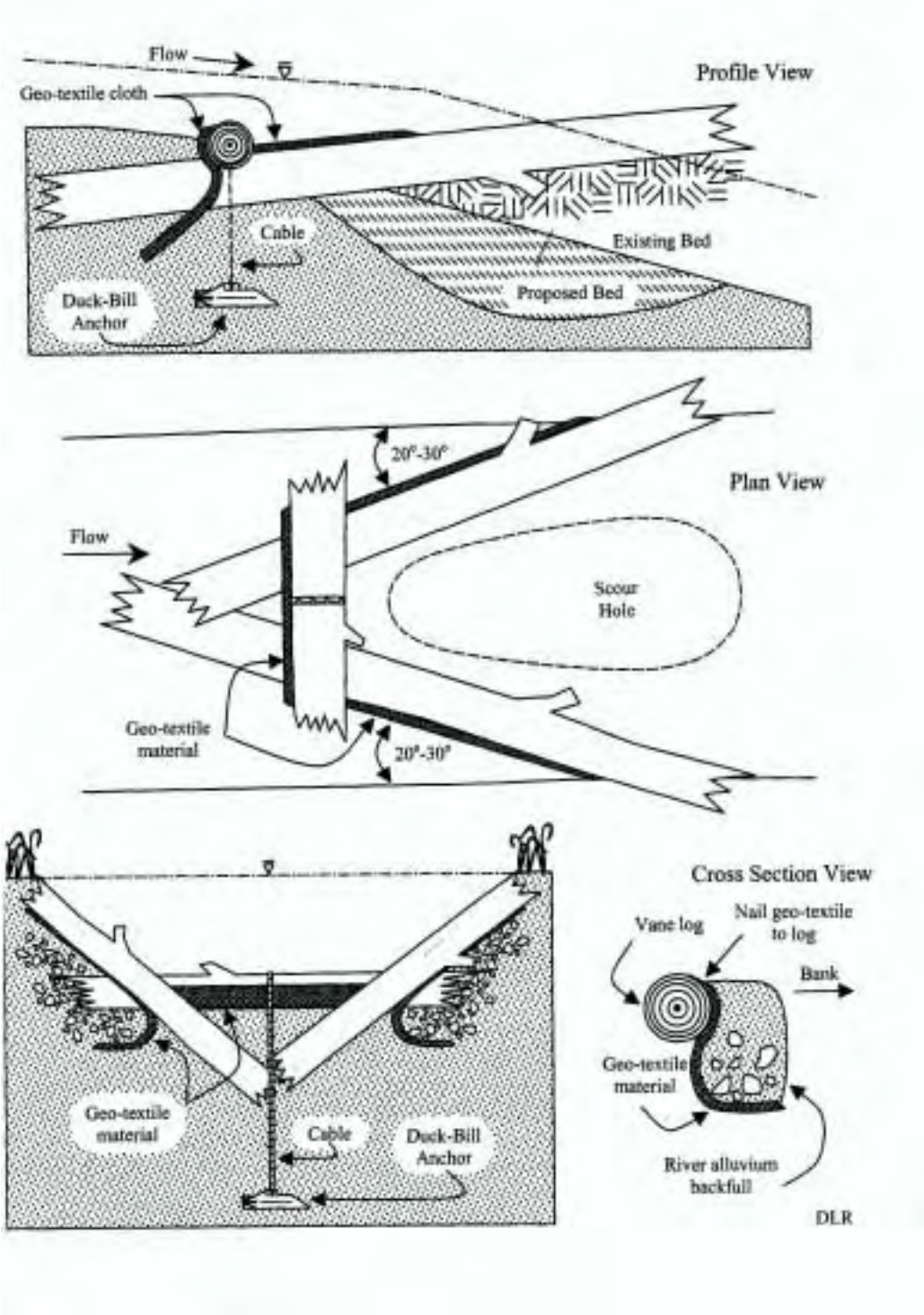

Figure 6—Cross-Vane using logs and a duck-bill anchor will increase stream velocity so that a deep pool is scoured in center of channel increasing pool to riffle ratios thereby enhancing fish habitat which has had a scarcity of pools because of mining and other activity.

Graphic courtesy of Wildland Hydrology, Pagosa Springs, Colorado.

2.5.3.2.2— Existing Instream Structure Improvements

The objectives for repairing these existing structures are to:

- Improve them to accomplish the above objectives outlined under new instream structures and
- Allow year-round fish passage.

Many of the existing instream structures are not functioning as intended and acting as partial fish barriers. Hand crews would improve existing structures during the same time period that nearby new instream structures are installed. If structures cannot be repaired by hand, they would be repaired using the same equipment as new structures under action Alternatives 2 and 5 but not under action Alternatives 3 and 4.

Table 20 Existing In-stream Structure Improvements

Subwatersheds	Alts. 2 & 5	Alts.3 & 4
Davis/Placer Gulch	0	0
Vinegar	0	0
Vincent	0	0
Little Boulder/Deerhorn	0	0
Tin Cup/Little Butte	0	0
Butte	29	0
Granite Boulder	7	0
TOTALS	**36**	**0**

2.5.3.2.3—Riparian Planting

Planting would enhance riparian and fish habitat, with the following benefits expected:

- Increased shade to maintain water temperatures and provide fish hiding cover,
- Improved stream bank stability to reduce erosion, and
- Decreased width to depth ratios that improve fish habitat and connectivity.

Many channel segments and associated floodplains in Vinegar Creek are currently recovering from past mining (primarily). Sinuosity, hiding cover, and pool development are improving but are not yet creating high quality fish habitat. Therefore, planting with a combination of hardwoods and conifers in segments in Vinegar Creek is the only recommended project at this time.

Davis Creek is similar to Vinegar Creek in that channel structure is generally recovering but fish habitat still needs improvement. Riparian planting would be beneficial as described above.

Table 21 Riparian Planting

Subwatersheds	Alts. 2, 3, 4 & 5
	Linear Feet
Davis/Placer Gulch	5,900
Vinegar	18,000
Vincent	0
Little Boulder/Deerhorn	0
Tin Cup/Little Butte	0
Butte	5,200♣
Granite Boulder	Yes♥
TOTALS	**29,100**
TOTALS	**5.5 Miles**
NOTES: ♣ 5,200 linear feet plus associated instream structure work. ♥Associated with instream structure work	

2.5.3.2.4—Culvert Removal or Replacement

These improvements would increase fish access to historic use areas and reduce sediment.

The identified locations are currently blocked due to an insufficient size or placement of culverts; or there is a ford through the stream channel. In Butte Creek, the remains of a log culvert located just upstream of

Bennett Creek, would be removed and the banks contoured to the natural grade. The same would be applied to the remains of a culvert in Sulphur Creek. Where soil disturbance is caused by the project, it would be seeded to reduce potential sediment delivery. The Butte Creek crossing is in conjunction with the Davis Creek Trail, which is the portion of the trail that would be decommissioned and no longer used. It is highlighted here to emphasize the importance of this work getting accomplished regardless if the trail project is implemented or not. The existing ford at the intersection of Davis Creek and Forest Road 2614 needs to be replaced with a large culvert.

In 2001 the Malheur National Forest initiated a Forest-wide evaluation of road crossing sites where structures exist that could present barriers to fish passage. Road crossing improvement work that involves fish passage issues is recommended with all of the action alternatives (see Table 22). Funding for the improvement of culverts with passage problems will be associated with timber sale activities (haul routes) or sought from Forest Service Regional Office, Blue Mountain Demonstration Area funds, Title II funds, and other cooperative agreements.

These projects would be accomplished using heavy equipment from existing road bed (equipment would not be allowed to enter into stream channels) and during seasonal periods of low to no water flows and during the July 15-August 15 in-stream work period (PACFISH/INFISH 1995).

Table 22 Culverts on Fish Bearing Streams

Subwatersheds	Alts. 2, 3, 4 & 5
Davis	2 replace or improved
Vinegar	5 replace or improved
Vincent	3 replace or improved
Little Boulder/Deerhorn	2 replace or improved
Tin Cup/Little Butte	6 replace or improved
Butte	2 removals
Granite Boulder	4 replace or improved
TOTALS PROJECTS	**22 replace or improved 2 removed**

2.5.4 Vegetation

To clearly address the projects brought forward under vegetation, this section is further divided into the following categories: Conifer and Associated Vegetation, Aspen Stands, and Noxious Weeds. The goal for these recommendations would be to begin moving the area toward many of the desired conditions outlined in Chapter 1. These projects specifically address the following Undesired Conditions Outlined in Chapter 1:

1.2.1.4 Undesired Condition: Vegetation Outside **, page 14.**

1.2.1.5 Undesired Condition: High Wildfire **page 17.**

1.2.1.6 Undesired Condition: Degraded Wildlife Habitat**, page 18; and**

1.2.1.7 Undesired Condition: Noxious Weeds**, page 20**

Issue statements in the *Galena Watershed Analysis* (pages 4-18 to 4-49) concur with the findings in this document that vegetative conditions in the analysis area are not desirable and recommend projects which would begin managing vegetation toward a more resilient, sustainable condition, in a manner stated in the Purpose and Need for this DEIS. Although conifer stands are highlighted in this proposal, the total vegetation diversity, including hardwoods and grasses, benefit from the following actions:

2.5.4.1 Treatments for Restoration of Conifers and Associated Vegetation

The management tools of mechanical and fire treatments are recommended to begin moving the vegetative resources toward desired conditions. Mechanical treatments include cutting and skidding of

trees for removal, thinning of young trees, and non-fire treatment of down fuels (including chipping, mastication, piling, or scattering slash). A detailed description of this proposal follows.

Implementation Tool—Mechanical Treatments

Mechanical treatments are designed to reduce the risk of a major adverse event by shifting these forest stands toward a more desired variation in forest stand structure, composition, and fuel levels to produce a forest landscape that is healthier, more resilient, and sustainable.

The action alternatives include a number of harvest prescriptions using mechanical treatments (chainsaws or mechanical harvesters) with the following connected actions:

- Pre-commercial thinning to reduce tree competition and for reverting tree composition to historic values;
- Treatment of harvest or pre-commercial thinning produced slash by skidding to landings for potential utilization for forest products, mastication or crushing, or hand piling, or burning to reduce accumulated fuels to reduce fire intensity;
- Site preparation, and
- Planting with protection measures for young trees to achieve desired species composition and stocking levels.

Alternatives 2 and 5 propose mechanical treatment within *Land and Resource Management Plan* Roadless Areas while Alternatives 3 does not. Alternative 4 proposes only pre-commercial thinning in the roadless area Each action alternative also proposes a number of pre-commercial thinning areas not associated with a harvest prescription.

A range of products and benefits from the harvest and pre-commercial thinning would be realized that may include saw logs, post and poles, firewood, or other fiber products such as pulp wood, chips, and hog fuel for power generation. A number of new roads may be needed along with reconstruction to accomplish the recommended restoration work.

The following describes the recommended mechanical prescriptions.

Commercial Thin—HTH

This prescription would harvest merchantable trees in immature forest stands to reduce stocking levels and to enhance individual tree growth. A secondary objective in mixed species stands would be to select for retention of ponderosa pine and western larch. It's designed to reduce the competition among trees for sunlight, water, and nutrients. The result would be a more vigorous, healthier forest stands. Trees would be left at a varied spacing, as opposed to even, standard spacing. In addition, trees 21" dbh and larger (as with all prescriptions) would be retained (except hazard trees) to keep a varied stand structure (multiple age classes) across the landscape to mimic a more natural appearing forest within the historic range of variation.

Commercial Thinning in Connectivity Corridors—HTH1

This prescription is a modification of commercial tinning in response to the *Land and Resource Management Plan* Amendment #2 to establish old growth connectivity corridors (LRMP2 corridors) and the *2000 Canada Lynx Conservation Assessment and Strategy* to establish Key Linkage Areas (KLAs) for wide-ranging carnivores. A similar philosophy for wildlife connectivity has been incorporated into the SPC1 prescription (see Pre-commercial Thin in Connectivity Stands—SPC1 page 64). This prescription retains additional trees per acre compared to that of HTH, to provide denser forest stands for security. LRMP2 corridors and KLAs provide vegetation in quantity and arrangement to provide wildlife species with sufficient habitat for dispersal and movement across the landscape. Connected forests allow animals to easily move long distances in search of food, cover and mates. This application varies across the alternatives.

Table 23—HTH & HTH1 Prescription per Subwatershed

Subwatershed	ALT. 2 Acres		ALT. 3 Acres		ALT. 4 Acres		ALT. 5 Acres	
	HTH	HTH1	HTH	HTH1	HTH	HTH1	HTH	HTH1
Davis/Placer Gulch	1,090	0	1030	0	0	0	1,120	0
Vinegar	570	430	570	430	0	0	970	0
Vincent	900	580	890	470	0	0	1,380	0
Little Boulder/ Deerhorn	1,440	120	1,030	0	0	0	1,650	120
Tincup/L. Butte	1,190	100	780	0	0	0	1,550	100
Butte	550	0	90	0	0	0	390	0
Granite Boulder	0	0	0	0	0	0	0	0
TOTAL	**5,720**	**1,230**	**4,390**	**900**	**0**	**0**	**7,060**	**220**

NOTES: These acres are approximate

Shelterwood—HSH

This prescription treats forest stands that were historically composed primarily of ponderosa pine and western larch, but are currently overstocked and composed largely with grand fir and Douglas-fir. This prescription would remove a large proportion of the grand fir and Douglas-fir, while retaining the ponderosa pine and western larch. Treated stands would vary in appearance, depending on the amount of pine and larch present. Leave tree spacing would be variable. Undesired trees under merchantable size would be removed and slash would be reduced. Stands stocked below recommended levels would be planted and seedlings would be protected from vegetation competition and animal damage to ensure adequate survival. The objective is to convert these stands from mostly grand fir and Douglas-fir to a majority of ponderosa pine and western larch. In time, these forest stands would be managed for the reintroduction of fire.

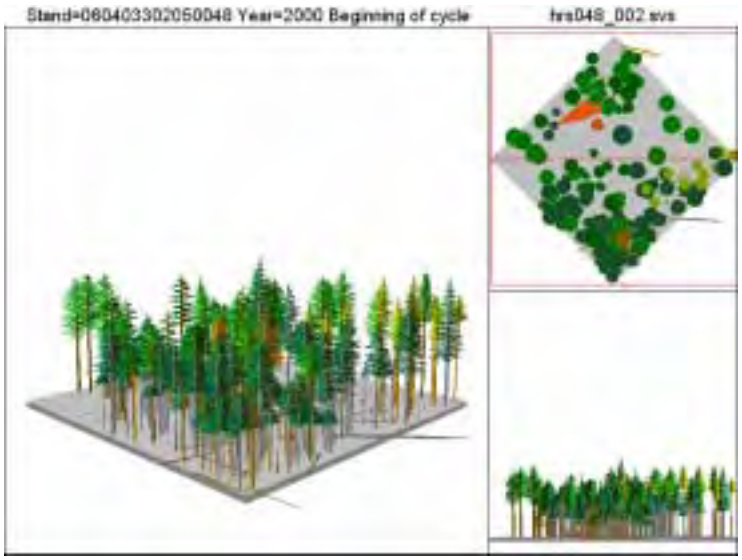

Figure 7 No Treatment

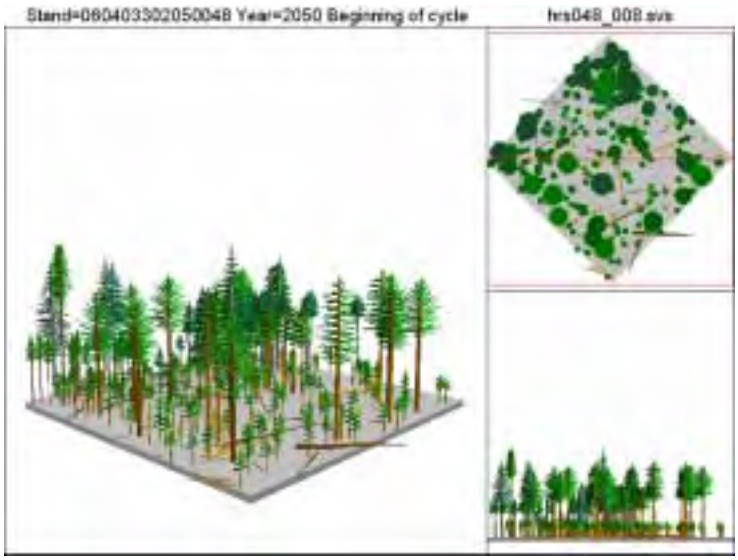

Figure 8—HSH Treatment after 50 years

Table 24—HSH Prescription per Subwatershed

Subwatershed	ALT 1 Acres	ALT. 2 Acres	ALT. 3 Acres	ALT. 4 Acres	ALT. 5 Acres
Davis/Placer Gulch	0	400	200	0	470
Vinegar	0	260	210	0	850
Vincent	0	150	100	0	400
Little Boulder/ Deerhorn	0	280	120	0	280
Tincup/L. Butte	0	290	260	0	290
Butte	0	310	310	0	310
Granite Boulder	0	0	0	0	0
TOTAL	**0**	**1,690**	**1,200**	**0**	**2,600**
NOTES: These acres are approximate					

Salvage—HSV

Dead or down trees would be removed to reduce fuel levels. Areas stocked below recommended levels would be planted and seedlings would be protected from vegetation competition to insure adequate survival. The objective is to remove trees killed as a result of a 1998 wind event in the Vinegar and Vincent Creek subwatersheds and revegetate unstocked areas. As in all treatments for this project, down woody material and other *Land and Resource Management Plan* standards would be met.

Table 25—HSV Prescription per Subwatershed

Subwatershed	ALT. 2 Acres	ALT. 3 Acres	ALT. 4 Acres	ALT. 5 Acres
Davis/Placer Gulch	0	0	0	0
Vinegar	250	250	0	250
Vincent	0	0	0	0
Little Boulder/ Deerhorn	0	0	0	0
Tincup/L. Butte	0	0	0	0
Butte	0	0	0	0
Granite Boulder	0	0	0	0
TOTAL	**250**	**250**	**0**	**250**

NOTES: These acres are approximate

Understory Removal—HUR

Immature trees such as grand fir and Douglas-fir that have grown in underneath larger ponderosa pine or western larch would be removed. The larger tree component would be retained and natural regeneration would be allowed to restock these units. The objective is to convert these stands into single-story stands of large trees that would withstand the reintroduction of fire. After treatment, these stands would resemble the historical open forest stands of large trees.

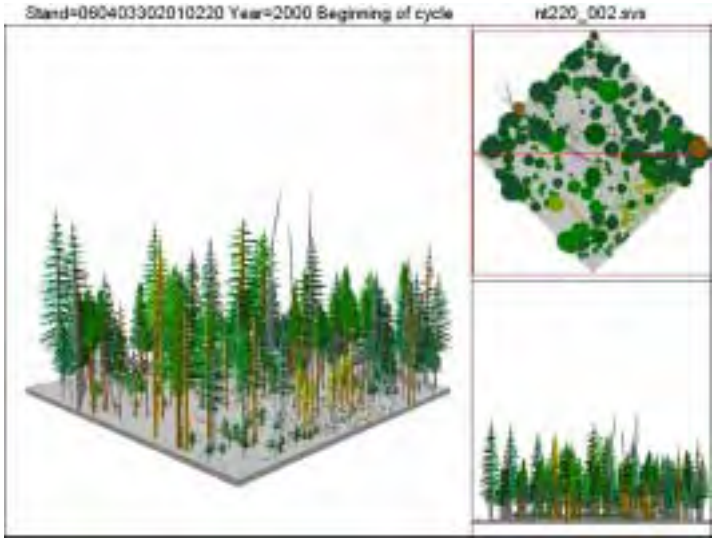

Figure 9—No Treatment

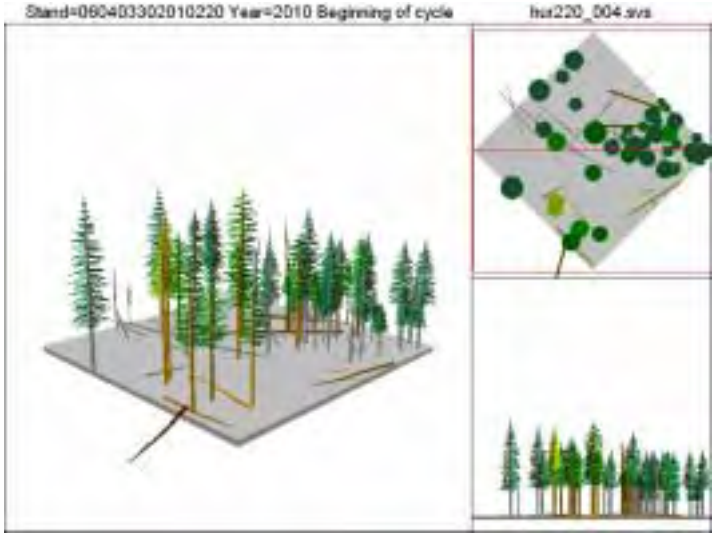

Figure 10—HUR Treatment

Table 26—HUR Prescription per Subwatershed

Subwatershed	ALT. 2 Acres	ALT. 3 Acres	ALT. 4 Acres	ALT. 5 Acres
Davis/Placer Gulch	330	250	0	380
Vinegar	220	220	0	290
Vincent	0	0	0	170
Little Boulder/ Deerhorn	60	0	0	120
Tincup/Little Butte	210	30	0	210
Butte	60	60	0	60
Granite Boulder	0	0	0	0
TOTAL	**880**	**560**	**0**	**1230**
NOTE: acres are approximate				

Pre-commercial Thin—SPC

This treatment would thin small trees that are not economical to remove with commercial harvest. The trees cut may have value as other forest products such as chips, post and poles, or firewood and could be utilized as such in order to reduce slash disposal costs and to reduce risk of severe fire. This prescription is designed to reduce the competition among these smaller trees for sunlight, water, and nutrients. The expected result is a vigorous, healthy forest stand similar to those produced by the HTH prescription described above. The objective is to reduce stocking levels and in some cases to select younger ponderosa pine and larch for retention. This treatment would be applied to areas within and outside of harvest units.

Pre-commercial Thin in Connectivity Stands—SPC1

This prescription is a modification of SPC in response to the *Land and Resource Management Plan* Amendment #2 to establish old growth connectivity corridors (LRMP2 corridors) and the *2000 Canada Lynx Conservation Assessment and Strategy* to establish key linkage areas (KLAs) for wide-ranging carnivores. A similar philosophy for wildlife connectivity has been incorporated into the HTH1 prescription (see Commercial Thinning in Connectivity Corridors—HTH1, page 59). This prescription retains additional trees per acre compared to that of SPC, to provide denser forest stands for security. LRMP2 corridors and KLAs provide vegetation in quantity and arrangement to provide wildlife species with sufficient habitat for dispersal and movement across the landscape. Connected forests allow animals to easily move long distances in search of food, cover and mates. This application varies across the alternatives.

Table 27—SPC & SPC1 Prescription per Subwatershed

Subwatershed	ALT. 2 Acres		ALT. 3 Acres		ALT. 4 Acres		ALT. 5 Acres	
	SPC	SPC1	SPC	SPC1	SPC	SPC1	SPC	SPC1
Davis/Placer Gulch	630	0	630	0	630	0	660	0
Vinegar	330	390	330	390	330	310	640	0
Vincent	20	430	20	340	20	210	250	0
Little Boulder/ Deerhorn	790	40	530	0	720	40	1,010	40
Tincup/L. Butte	90	90	20	90	90	90	170	0
Butte	310	0	310	0	310	0	350	0
Granite Boulder	0	0	0	0	0	0	0	0
TOTAL	**2,160**	**950**	**1,840**	**820**	**2,100**	**640**	**3,080**	**40**
NOTE: These acres are approximate								

Acres Treated and Volumes by Harvest System

In implementing the mechanical prescription described above, the following harvest systems and outcomes would occur:

Table 28—Alt. 2 Harvest System Acres/Volumes

Subwatershed	Tractor			Skyline			Helicopter		
	Acres	Volume MBF	Volume CCF	Acres	Volume MBF	Volume CCF	Acres	Volume MBF	Volume CCF
Davis/Placer Gulch	1,530	6,140	11,810	210	1,280	2,460	80	510	980
Vinegar	800	3,670	7,060	450	2,200	4,230	460	2,380	4,580
Vincent	960	4,010	7,710	460	1,690	3,250	180	1,200	2,310
Little Boulder/ Deerhorn	960	4,310	8,290	320	1,760	3,380	630	3,250	6,250
Tincup/Little Butte	740	3,320	6,380	400	910	1,750	1,010	5,520	10,620
Butte	100	480	920	270	1,400	2,690	310	930	1,790
Granite Boulder	0	0	0	0	0	0	0	0	0
TOTAL	**5,090**	**21,930**	**42,170**	**2,110**	**9,240**	**17,760**	**2,670**	**13,790**	**25,530**
NOTES: MBF = Thousand Board Feet **CCF =** Cubic Feet									

Table 29—Alt. 3 Harvest System Acres/Volumes

Subwatershed	Tractor			Skyline			Helicopter		
	Acres	Volume MBF	Volume CCF	Acres	Volume MBF	Volume CCF	Acres	Volume MBF	Volume CCF
Davis/Placer Gulch	1,300	5,110	9,830	190	1,150	2,210	30	190	370
Vinegar	750	3,430	6,600	450	2,300	4,420	460	2,370	4,560
Vincent	880	3,520	6,770	390	1,680	3,230	170	1,180	2,270
Little Boulder/ Deerhorn	710	3,170	6,100	250	1,440	2,770	190	1,060	2,040
Tincup/Little Butte	840	3,170	6,100	210	700	350	120	580	1,120
Butte	100	480	920	230	1,250	400	120	460	880
Granite Boulder	0	0	0	0	0	0	0	0	0
TOTAL	**4,580**	**18,880**	**36,320**	**1,720**	**9,520**	**16,380**	**1,090**	**5,840**	**11,240**
NOTES: MBF = Thousand Board Feet **CCF =** Cubic Feet									

Alternative 4 does not propose any harvest prescriptions; therefore, tractor skidding, skyline skidding, or helicopter yarding are not within the design of the alternative.

Table 30—Alt. 5 Harvest System Acres/Volumes

Subwatershed	Tractor			Skyline			Helicopter		
	Acres	Volume MBF	Volume CCF	Acres	Volume MBF	Volume CCF	Acres	Volume MBF	Volume CCF
Davis/Placer Gulch	1,540	6,170	11,870	250	1,580	3,040	190	1,040	2,000
Vinegar	1,090	5,910	11,370	780	1,680	9,000	480	2,480	4,770
Vincent	1,120	5,670	10,900	610	2,740	5,270	230	1,250	2,400
Little Boulder/ Deerhorn	1,270	5,550	10,670	360	2,050	3,940	550	3,240	6,230
Tincup/Little Butte	1,200	5,640	10,850	340	1,360	2,620	690	3,300	6,350
Butte	100	480	920	270	1,400	2,700	430	1,570	3,020
Granite Boulder	0	0	0	0	0	0	0	0	0
TOTAL	**6,320**	**29,420**	**56,580**	**2,610**	**13,810**	**26,570**	**2,570**	**12,880**	**24,770**
NOTES: MBF = Thousand Board Feet **CCF =** Cubic Feet									

Biomass Opportunities

The following tables show estimates for biomass between 5 and 7 inches dbh within recommended tractor units that could be skidded to landings. Since these sizes are less than the commercial utilization standards, the skidding can be done as a through other contract types after the timber sale or skidded during the sale. This material could provide biomass for sale in the form of decks, or as a biomass sale. Stand exam info was used to estimate the amount of material and a reduction of 25% was used due to

losses that can occur from skidding and decay. An average of 4 cubic feet per tree was used. There may be other opportunities in pre-commercial thin units; however, this analysis only included potential harvest tractor areas.

Table 31 Biomass volume estimates

ALT. 1			ALT. 2			ALT. 3			ALT. 4			ALT. 5		
Acres	CCF	MBF	Acres	CCF	MBF	Acres	CCF	MBF	Acres	CCF	MBF	Acres	CCF	MBF
0	0	0	511	133	69	242	26	14	0	0	0	873	193	100
NOTES: ALT. = Alternative **CCF =** Thousand Cubic Feet **MBF =** Thousand Board Feet														

Connected Actions

Other management-connected actions include removal of undesired trees, hand line, machine line, prescribed burn, hand pile and burn, sub-soil, competing vegetation control, plant, pocket gopher control, ungulate browse control, and stocking surveys. These actions are included to reduce harvest produced slash and to ensure areas are reforested within 5-years.

New Roads

Construction of a new road begins by determining the clearing needed to build the road, which include what trees and brush need to be cut and removed.

After the brush and trees have been cut, a dozer is typically used to construct a rough or "pioneer" road within the clearing limits, which includes removal or "grubbing" out stumps within the roadway. Once the pioneer road is constructed, the merchantable trees are cut to specific log lengths and decked and remaining slash is disposed of, this includes stumps, limbs, and brush. The slash is treated by being piled and burned, buried, chipped and scattered, removed, or simply scattered.

The remaining road excavation and embankment is usually done with a large dozer or excavator. This excavates the cut slope materials and compacts the fill materials in layers until the road is roughly finished to grade and specified width.

Construction of or installation of drainage structures, as well as any other specified items (such as French drains, etc.) would take place next. Once the road surface is finished to grade and specified width and is compacted as specified, any spot rocking or aggregate surfacing that is needed is placed and compacted.

Once construction is completed, any disturbed ground is seeded and fertilized.

Table 32—New Road

Subwatersheds	ALT. 2	ALT. 3	ALT. 4	ALT. 5
	Miles	Miles	Miles	Miles
Davis/Placer Gulch	2.7	2.6	0.5	2.7
Vinegar	4.5	4.3	0.0	5.3
Vincent	3.9	4.1	0.0	4.8
Little Boulder/ Deerhorn	3.8	3.4	1.7	5.8
Tincup/Little Butte	2.4	2.2	0.0	3.2
Butte	0.3	0.3	0.0	0.3
Granite Boulder	0.1	0.1	0.0	0.1
TOTAL	**17.7**	**17.0**	**2.2**	**22.2**

Removal of Undesirable Trees

Trees of less than merchantable size and not desired for retention would be removed, reducing competition among the remaining trees, resulting in a healthier, vigorous forest stand.

Table 33—Removal of Undesirable Trees

Subwatershed	ALT. 2 Acres	ALT. 3 Acres	ALT. 4 Acres	ALT. 5 Acres
Davis/Placer Gulch	730	490	0	850
Vinegar	480	430	0	1,130
Vincent	150	100	0	570
Little Boulder/Deerhorn	340	120	0	390
Tincup/Little Butte	500	290	0	500
Butte	370	370	0	370
Granite Boulder	0	0	0	0
TOTAL ACRES	**2,570**	**1,790**	**0**	**3,810**

Treatment of Slash Resulting From Harvest

Yard Tops

Where sufficient nutrient recycling material is available, tops from felled trees would be skidded to landing to help reduce fuel levels. This would prepare the areas for a more controllable, safer reintroduction of fire to the ecosystem. These landing piles would then be available for other products e.g. firewood or burned.

Hand Line

Hand crews dig a holding fire line down to bare mineral soil about 18 inches wide. This line is used to help contain prescribed fire within a given area and is typically used on skyline or helicopter ground. Hand lines are mostly used in mechanical treatment units where slash is to be burned. This same method is also used to protect unique or sensitive resources from prescribed fire.

Machine Line

A bulldozer is used to develop a fire line removing vegetation down to mineral soil generally at about 7-foot wide. This line is used to help contain prescribed fire within a unit that has been mechanically treated and is typically used on tractor ground.

Reserve Tree Protection

In reforestation units, reserve trees would be protected by: 1) pulling material away from the reserve tree, 2) material around trees would be burned prior to the prescribed fire ignition, or 3) a hand line would be scratched around the tree. This application would help protect these trees from mortality.

Prescribed Burn

The use of prescribed burning is for reducing accumulations of natural and activity generated fuels; and for general landscape use which uses low intensity fire to mimic a natural historic role. Prescribed fire reduces the risk of an uncontrolled fire. This effort would be accomplished by using a combination of drip torches, fusees, flare guns, ATVs with mounted drip torches, and helicopters to ignite these burns.

Hand Pile

Hand piling is used to pile logging slash before burning. This is used in areas where the level of slash is too high to ignite a prescribed burn safely without the risk to loss to residual trees. Typically this is applied to skyline or helicopter areas due to steepness of ground but can be applied to tractor ground for other resource reasons.

Table 34— Slash Disposal with Prescribed Fire Alternatives 2 and 3

Subwatershed	ALT. 2				ALT. 3			
	Handline Miles	Mach.Line Miles	Rx Burn Acres	Handpile Acres	Handline Miles	Mach.Line Miles	Rx Burn Acres	Handpile Acres
Davis/Placer Gulch	9.0	6.3	730	0	6.5	4.3	490	0
Vinegar	7.0	1.1	480	307	7.3	1.0	430	307
Vincent	1.5	2.2	150	364	1.5	1.2	100	284
Little Boulder/Deerhorn	5.6	0.1	320	304	1.1	0.1	120	146
Tincup/Little Butte	6.5	1.1	500	67	3.6	1.1	290	0
Butte	8.0	0.8	370	206	8.0	0.8	370	206
Granite Boulder	0.0	0.0	0	0	0.0	0.0	0	0
TOTALS	**37.6**	**11.6**	**2,550**	**1,248**	**28.0**	**8.5**	**1,800**	**943**

NOTES: ALT. = Alternative **Mach**. = Machine **Rx** = Prescribed Rx Burn Acres includes both brush disposal and silvicultural funded site preparation.

Table 35— Slash Disposal with Prescribed Fire Alternatives 4 and 5

Subwatershed	ALT. 4				ALT. 5			
	Handline Miles	Mach.Line Miles	Rx Burn Acres	Handpile Acres	Handline Miles	Mach.Line Miles	Rx Burn Acres	Handpile Acres
Davis/Placer Gulch	0	0	0	0	11.6	6.6	850	34
Vinegar	0	0	0	290	15.3	7.4	1,130	290
Vincent	0	0	0	168	10.1	4.6	570	192
Little Boulder/Deerhorn	0	0	0	324	5.6	0.1	390	488
Tincup/Little Butte	0	0	0	67	6.5	1.1	500	67
Butte	0	0	0	206	8.0	0.8	390	249
Granite Boulder	0	0	0	0	0.0	0.0	0	0
TOTALS	**0**	**0**	**0**	**1055**	**57.1**	**20.6**	**3,830**	**1,320**

NOTES: **ALT. =** Alternative **Mach. =** Machine **Rx =** Prescribed Rx Burn Acres includes both brush disposal and silvicultural funded site preparation.

Dozer Treatment

For areas with slash generated by service or stewardship contracts including removal of undesired trees and in areas per-commercially thinned on slopes permitting ground based equipment. Slash in these areas would be treated mechanically using one or a combination of: skidding material to landings for utilization or to be burned, masticated, or crushed.

Table 36a—Additional Actions in Acres

Subwatershed	ALT. 2				ALT. 3			
	Yard Topes	Protect Trees	Mech. Treat Pre-commercial thinning slash	Mech. Treat Undesired thinning slash	Yard Topes	Protect Trees	Mech. Treat Pre-commercial thinning slash	Mech. Treat Undesired thinning slash
Davis/Placer Gulch	1,090	3,600	625	355	1,030	3,110	625	183
Vinegar	900	4,300	417	48	900	4,300	417	0
Vincent	1,290	820	87	69	1,220	820	77	20
Little Boulder/Deerhorn	1,260	3,210	523	0	840	1,160	381	0
Tincup/Little Butte	750	5,020	106	0	700	2,850	106	0
Butte	80	3,280	101	39	40	3,280	101	39
Granite Boulder	0	0	0	0	0	0	0	0
TOTAL ACRES	**5,370**	**20,230**	**1,859**	**511**	**4,730**	**15,520**	**1,707**	**242**

NOTES: ALT. = Alternative Mech. Treat = Mechanical Treatment

Table 37b—Additional Actions in Acres

Subwatershed	Alternative 4				Alternative 5			
	Yard Topes	Protect Trees	Mechanical Treatment Pre-commercial Trees	Mechanical Treatment Undesired Trees	Yard Tops	Protect Trees	Mechanical Treatment Pre-commercial Trees	Mechanical Treatment Undesired Trees
Davis/Placer Gulch	0	0	625	0	1,090	5,350	625	355
Vinegar	0	0	350	0	870	8,390	350	340
Vincent	0	0	54	0	1,190	4,290	54	139
Little Boulder/Deerhorn	0	0	438	0	1,350	3,210	558	0
Tincup/Little Butte	0	0	115	0	1,060	5,020	115	0
Butte	0	0	101	0	80	3,280	101	39
Granite Boulder	0	0	0	0	0	0	0	0
TOTAL ACRES	**0**	**0**	**1,683**	**0**	**5,640**	**29,540**	**1,803**	**873**

Sub-Soil

Areas that have past or expected compaction exceeding 20% of the area would be sub-soiled with a winged type ripper. This application is generally applied on skid trails and landings to reduce soil compaction, increase water infiltration, and reduce runoff.

Competing Vegetation Control

In Alternatives 2 and 5 sod-forming grasses in certain units would be reduced with herbicides and manual methods, while Alternative 3 would reduce competing vegetation by manual control methods to reduce competition with tree seedlings for space, water, and nutrients. Possible herbicides that may be used include glyphosate and hexazinone which would be spot applied in a four foot diameter circle around the tree seedlings. Manual control methods may include scalping, mulching mats, grubbing, clipping, or pulling. These applications would increase the ability of tree seedlings to grow and survive.

Reforestation (planting of seedlings)

Seedlings would be planted in areas that are understocked due to harvest or natural disturbances. This would help meet NFMA requirements that all suitable forested lands in the National Forest System would be reforested within 5 years to maintain appropriate forest cover.

Table 38—Acres of Site Preparation and Regeneration

Subwatershed	Alternative. 2			Alternative 3			Alternative 4			Alternative 5		
	Sub-Soil	Competing Vegetation Control	Plant	Sub-Soil	Competing Vegetation Control♠	Plant	Sub-Soil	Competing Vegetation Control	Plant	Sub-Soil	Competing Vegetation Control	Plant
Davis/Placer Gulch	0	140	400	0	140	200	0	0	0	0	140	470
Vinegar	80	140	500	80	140	460	0	0	0	160	350	1,090
Vincent	0	130	150	0	80	100	0	0	0	0	340	400
Little Boulder/Deerhorn	0	130	280	0	20	120	0	0	0	0	130	280
Tincup/Little Butte	50	200	290	50	200	260	0	0	0	50	200	290
Butte	60	160	310	60	160	310	0	0	0	60	160	310
Granite Boulder	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL ACRES	190	900	1,930	190	740	1,440	0	0	0	270	1,320	2,840
NOTE: ♠ Hand methods only												

Pocket Gopher Control

Where pocket gophers are damaging and killing trees in reforested areas, poison baits, fumigation, or trapping would be used to reduce the numbers of pocket gophers in the planted shelterwood areas of Alternatives 2 and 5. Only trapping would be used in Alternative 3 for gopher control. This would help ensure NFMA required stocking levels.

Deer/Elk/Cattle Browse Control

Where ungulate are browsing the planted seedlings and reducing tree-survival, protective netting would be used to help meet the NFMA requirement for tree stocking levels in shelterwood units.

Stocking Surveys

Periodic examinations of planted and natural seedlings would be conducted to determine survival, tree stocking levels, damage, and the need for additional protection in shelterwood, salvage, and understory removal units.

Table 39—Seedling Protection Alternatives 2 and 3

Subwatershed	Alternative 2			Alternative 3		
	Pocket Gopher Control	Browse Control	Stocking Surveys	Pocket Gopher Control ♦	Browse Control	Stocking Surveys
Davis/Placer Gulch	400	400	730	200	200	490
Vinegar	260	260	720	210	210	680
Vincent	150	150	150	100	100	100
Little Boulder/Deerhorn	280	280	340	120	120	120
Tincup/Little Butte	290	290	500	260	260	290
Butte	310	310	370	310	310	370
Granite Boulder	0	0	0	0	0	0
TOTALS	**1,690**	**1,690**	**2,810**	**1,200**	**1,200**	**2,040**
NOTE: ALT. = Alternative ♦Trapping only						

Table 40—Seedling Protection Alternatives 4 and 5

Subwatershed	Alternative 4			Alternative 5		
	Pocket Gopher Control	Browse Control	Stocking Surveys	Pocket Gopher Control	Browse Control	Stocking Surveys
Davis/Placer Gulch	0	0	0	470	470	850
Vinegar	0	0	0	850	850	1,380
Vincent	0	0	0	400	400	570
Little Boulder/Deerhorn	0	0	0	280	280	390
Tincup/Little Butte	0	0	0	290	290	500
Butte	0	0	0	310	310	370
Granite Boulder	0	0	0	0	0	0
TOTALS	**0**	**0**	**0**	**2,600**	**2,600**	**4,060**

2.5.4.2 Implementation Tool—Fire Treatment

Fire prescriptions would be applied primarily to Dry Forests. There are inclusion of Moist Forest types within the prescribed burning area

Objectives in applying prescribed fire in many of these areas may be a combination of the following:

- Decrease high fuel loadings which would protect soil productivity and water quality from uncharacteristically severe wildfires,
- Remove excess small tree stocking and favor retention of fire tolerant species;
- Remove lower crown branches by scorching, reducing chances of future torching;
- Encourage sprouting of aspen clones;
- Improve ground vegetation vigor by removal of excess woody material which causes nutrient release, small trees which reduces light and moisture competition;
- Protect and enhance riparian areas;
- Maintain or improve visual quality of units within visual corridors; and
- Maintain live and dead vegetation needed to meet wildlife habitat needs.

In the past, fuel reduction treatments included thinning of conifers, regeneration harvesting and treatment of slash, and prescribed burning. However, these past actions had not treated large enough areas to reduce the hazard of an uncharacteristically severe wildfire.

In this project, prescribed fire would be used either in the spring of fall depending on burning conditions. Implementation of this action would reduce future wildfire intensity.

The desire is to manage fire more frequently over the long-term in a fire dependent ecosystem naturally or by prescription. This periodic fire favors native vegetation, and increases forest stand resilience to wildfire. Frequent, low intensity fires also maintain fuel loadings at levels where wildfires can be suppressed safely and economically.

The following table displays prescribed burn acres outside mechanically treated units, within thinning and pre-commercial thinning units, and within reforestation and understory removal units. There is no overlap among these acres.

Table 41—Acres of Prescribed Fire

Subwatershed	ALT. 2			ALT. 3			ALT. 4		ALT. 5		
	Acres Outside Treated Units	Acres within Commercial & Pre-commercial Thin Units	Acres within Reforestation & Understory Removal Units	Acres Outside Treated Units	Acres within Commercial & Pre-commercial Thin Units	Acres within Reforested & Understory Removal Units	Acres Outside Treated Units	Acres within Pre-commercial Units	Acres Outside Treated Units	Acres within Commercial & Pre-commercial Thin Units	Acres within Reforested & Understory Removal Units
Davis Creek/ Placer Gulch	410	1,620	730	310	1,490	490	370	592	250	1,780	850
Vinegar	940	1,720	480	925	1,720	430	2,580	640	980	1,610	1,130
Vincent	1,420	1,930	150	1,290	1,720	100	3,500	220	1,550	1,630	570
Little Boulder/ Deerhorn Ck	4,380	2,250	320	3,480	1,560	120	4,640	0	3,930	2,700	390
Tincup/ Little Butte	2,690	1,460	500	1,020	1,920	290	3,490	170	2,430	1,720	500
Butte	450	850	370	680	400	370	1,070	310	560	740	370
Granite Boulder	1,080	0	0	880	0	0	1,080	0	1,080	0	0
TOTAL	11,370	9,830	2550	1,0640	8,810	1,800	1,7230	1,930	10,780	10,180	3,810
GRAND TOTAL			**23,750**			**19,190**		**19,160**			**24,770**
Rounded to the nearest 10 acres Alternative3 does not include RHCA acres, all others do.											

2.5.4.3 Old Growth Habitat and Connectivity

2.5.4.3.1 Modifying DOG/ROG/PWFA Boundaries

The *Land and Resource Management Plan*, Management Area 13 (MA-13) provides for the management of old growth habitat through a system of dedicated old growth (DOG) units and replacement old growth (ROG) units. In SE Galena, thirteen DOG units and two ROG units have been delineated for pileated woodpecker, pine marten, or a combination of both species see Appendix E, Map 19—Dedicated and Replacement Old Growth For Action Alternatives.. Table 42 shows species designation and acres for each DOG unit and ROG unit.

The *Land and Resource Management Plan* directs that pileated woodpecker areas will be 600 acres, composed of a 300-acre DOG and a 300-acre pileated woodpecker feeding area (PWFA). ROGs are intended to be ½ the size of DOGs, i.e., 150 acres. ROGs may overlap with the feeding areas. Pine marten units are to be 240 acres, composed of a 160-acre DOG and an 80-acre ROG. Again, ROGs are

intended to be ½ the size of their corresponding DOG. DOGs managed for both species should be managed at the 600-acre home range recommended for pileated woodpeckers. Management requirements are derived from the US Forest Service 1986 Minimum Management Requirements.

Existing DOGs and ROGs do not always meet minimum size requirements, and they are not always tied to logical stand or topographical boundaries. ROGs have not been established for 11 out of 13 DOGs. Pileated woodpecker feeding areas have not been established for 4 out of 5 pileated woodpecker DOGs.

Alternatives 2, 3, 4 and 5 propose changes to the DOGs, ROGs and PWFAs to meet management requirements. See Appendix E, Map 19—Dedicated and Replacement Old Growth For Action Alternatives

Existing DOG and ROG boundaries would be adjusted to match topographical features such as streams and roads and/or existing stand boundaries (see Table 42). DOG/ROG units may be increased or decreased in size to match features/boundaries, and to meet minimum *Land and Resource Management Plan* standards. In comparison to the existing condition, DOG unit acres increase by 115 acres. Acres in existing ROGs increase by 154 acres.

ROG units 129, 243, 245, 248, 249, 250, 252,330,332, 433 and 533 are recommended where no ROG units currently exist for their respective DOG units (see Table 42). Added acres of new ROG units total 1,438 acres.

PWFAs are recommended for DOGs 129, 330, 332, 333 and 433. Recommended ROG units for pileated woodpeckers provide 863 acres of feeding habitat. Action alternatives propose an additional 747 acres. Total feeding acres would be 1,610 acres.

In some instances, DOG/ROG size exceeds minimum *Land and Resource Management Plan* standards. This can be attributed to several reasons:

- The Forest must meet Forest-level acre targets for MA-13 (72,690 acres across the Forest) as well as management requirements for individual DOGs/ROGs as described previously.
- DOG/ROG areas have been increased in size when areas include acres of non-forest.
- DOG/ROG areas have been adjusted in size to meet logical boundaries as described previously.

A non-significant *Land and Resource Management Plan* Amendment would be needed to modify existing DOG/ROG boundaries.

Table 42—Old Growth implementation—Dedicated Old Growth (DOG) Replacement Old Growth (ROG Pileated Woodpecker Feeding Area (PWFA).

Dedicated Old Growth unit #	Habitat requirements for indicator species	Minimum Acres♠	Existing DOG acres	Recommended DOG acres	Existing ROG acres	Recommended ROG acres2	Additional Feeding acres2	Total Recommended . Acres
DOG 129	Pileated Woodpecker	600	397	4434	0	193 (46) ♥	137	773 (46) ♥
DOG 242	Pine Marten	240	249	268	47	142 (10) ♥	---	410 (10) ♥
DOG 243	Pine Marten	240	204	208 (22) ♥	0	109 (5) ♥	---	317 (27) ♥
DOG 245	Pine Marten	240	214	235	0	132	---	367
DOG 248	Pine Marten	240	149	161	0	124	---	285
DOG 249	Pine Marten	240	168	191	0	87	---	278
DOG 250	Pine Marten	240	169	170	0	97	---	267
DOG 252	Pine Marten	240	153	152	0	89	---	241
DOG 330	Woodpecker/Marten	600	340	337	0	160	173	670
DOG 332	Woodpecker/Marten	600	302	298 (6) ♥	0	171	140	609 (6) ♥
DOG 333	Woodpecker/Marten	600	366	332 (14) ♥	134	193 (8) ♥	137 (7) ♥	66♣ (29) ♥
DOG 433	Pileated Woodpecker	600	171	1684	0	146	160	474
DOG 533	Pine Marten	240	217	251	0	130 (8) ♥	---	381 (8) ♥
TOTALS		4,920	3,099	3,214 (42) ♥	181	1,773 (77) ♥	747 (7) ♥	5,734 (126) ♥

♠ Old-growth Management Area (MA-13) Minimum Management Requirements:
Pileated Woodpecker Areas = 300-acre DOG + 300-acre feeding area = 600 acres. ROGs = 150-acres and overlap with feeding areas.
Pine Marten = 160-acre DOG + 80-acre ROG = 240 acres
♣ ROG acres also contribute towards pileated woodpecker feeding acres. "Recommended ROG Acres" and "Additional Pileated Feeding Acres" fields should total at least 300 acres for each DOG.
♥ Non-forested or unsuitable inclusions (acres) are displayed in parentheses.
♦ Recommended DOG 433 at 168 acres falls short of minimum size requirements for a pileated woodpecker DOG (300 acres); however DOG 129 is immediately adjacent to DOG 433 and includes 143 surplus acres. Combined, the two DOGS contain 611 acres, a sufficient number of acres to meet requirements (600 acres).

Current scientific literature (Bull and Holthausen 1993) indicates habitat needs for pileated woodpeckers may not be adequately met by current *Land and Resource Management Plan* direction. *Land and Resource Management Plan*, Appendix G, p. G-19, recommends reviewing additional data on home range size as it becomes available and adjusting management area size accordingly. Alternative 3 increases the size of pileated woodpecker areas from 600 or more acres to 900 or more acres to reflect home range size recommended by Bull and Holthausen (1993). DOGs 129, 330, 332, 333, and 433 would be expanded (see Table 43). The additional 300+ acres would not be officially added to DOGs or ROGs, but rather, these acres would be mapped and harvest treatment would be deferred until the next round of Forest planning determines appropriate management strategies. The 900-acre areas would include acres designated as DOG, ROG, and feeding areas plus the additional 300 treatment-deferred acres. Pine marten areas will remain as described in Table 42.

Under Alternative 3, a non-significant *Land and Resource Management Plan* Amendment would be needed to expand DOG/ROG/PWFAs from about 600 acres to 900 acres.

Table 43 Expanded Pileated Woodpecker areas(Dedicated Old Growth (DOG) Replacement Old Growth (ROG Pileated Woodpecker Feeding Area (PWFA)

Dedicated Old Growth Unit #	Desired home range acres[1]	Recommended DOG acres	Recommended ROG acres[2]	Additional PWFAs. acres[2]	Total Recommended Acres—current LRMP direction	Home range additions	New total acres
DOG 129	900	443[4]	193 (46)[3]	137	773 (46)[3]	302	1,075 (46)[3]
DOG 330	900	337	160	173	670	285	955 (6)[3]
DOG 332	900	298 (6)[3]	171	140	609 (6)[3]	303	912
DOG 333	900	332 (14)[3]	193 (8)[3]	137 (7)[3]	662 (29)[3]	306	968 (29)[3]
DOG 433	900	168[4]	146	160	474	309	783
TOTALS	4,500	1,578 (20)[3]	863 (54)[3]	747 (7)[3]	3,188 (81)[3]	1,505	4,693 (81)[3]

[1] Home range size recommended by Bull and Holthausen (1993)
[2] ROG acres also contribute towards PWFAs. "Recommended ROG Acres" and "Additional PWFAs Acres" fields should total at least 300 acres for each DOG.
[3] Non-forested or unsuitable inclusions (acres) are displayed in parentheses.
[4] Recommended DOG 433 at 168 acres falls short of minimum size requirements for a pileated woodpecker DOG (300 acres); however DOG 129 is immediately adjacent to DOG 433 and includes 143 surplus acres. Combined, the two DOGS contain 611 acres, a sufficient number of acres to meet requirements (600 acres).

2.5.4.3.2 Timber Harvest/Prescribed Fire within Old Growth Habitat and Connectivity Corridors

Timber harvest and prescribed fire can be used to help restore historic stand structure and fire regimes, in particular, on Dry Forest types. *Land and Resource Management Plan*, Amendment 2 and the *Galena Watershed Analysis* recommend conversion of OFMS stands back to historic conditions of OFSS, where appropriate. *Land and Resource Management Plan*, Amendment 2 directs that younger stands should be managed towards OFMS or OFSS.

The Action Alternatives treat old-growth habitat and LRMP2 wildlife corridors at varying levels. Table 44 summarizes these recommended treatments by alternative. Treatments are prescribed where current vegetation conditions do not meet historic conditions, and stands are considered at risk. All recommended management actions are consistent with *Land and Resource Management Plan* standards for maintaining DOG and ROG habitat. Treatments, where recommended, are considered beneficial to related old growth dependent species in the long-term (25+ years). Mitigation measures for large diameter trees, wildlife snags, down woody debris, LRMP2 corridors and prescribed burning are described in 2.5.6 MITIGATION, page 90.

Table 44 Summarizes treatment within old growth habitat by alternative.

Alternative	Harvest Acres in DOGs	Harvest Acres in ROGs	Harvest Acres in PWFAs	Harvest Acres in 300-acre Additions[1]	Harvest Acres in Old Growth Outside DOGs/ROGs	Harvest Acres in LRMP, Amendment 2 Corridors
Alternative 1	0	0	0	0	0	0
Alternative 2	0	131	195	257	313	220
Alternative 3	0	0	0	0	223	0
Alternative 4	0	0	0	0	20	38
Alternative 5	0	192	195	257	326	220

[1]Only Alternative 3 expands pileated management areas by 300 acres. Harvest activities are deferred. Alternatives 2 and 5 treat these areas as General Forest MA-1.

2.5.4.4 Aspen Restoration

The Malheur *Land and Resource Management Plan* has identified stands of quaking aspen[44] (*Populus tremuloides*) as unique and sensitive habitat that should be maintained and enhanced. The *Galena WA* (Issue Statement #3) described aspen stands as generally decadent, heavily encroached by conifers, declining in health and vigor, and over-browsed by big game and livestock.

Experience in the Blue Mountains has shown that a combination of conifer competition reduction, prescribed fire, and fencing from grazing provides the most effective strategy for regenerating aspen stands (see Decision Memo Geary Aspen Stand Improvement, March 1993). Conifer removal increases sunlight to shade-intolerant aspen, prescribed fire kills the above ground stems, stimulating root suckering (Schier *et al*, 1985), and fencing protects new suckers from browsing animals. This approach would be applied in all action alternatives.

To reduce competition with aspen by encroaching conifers, the conifers will be felled, or girdled and left as wildlife snags, according to the following guidelines:

Within aspen groves, conifers of 21" and greater dbh will be evaluated on a site specific basis for adverse impacts on the clone. These trees may be considered for snag creation by topping , girdling, or inoculation. They will not be removed by timber harvest.

Up to 100 feet from the outside edge of each aspen grove would have competing conifers felled to encourage expansion of the aspen grove.

Any conifers within 25 feet of stream channels, springs, or wetlands would be girdled and left as snags.

Larger diameter conifers less than 21" dbh and more than 25 feet from wet areas and still within RHCAs, would be felled and removed during harvest if other riparian objectives are being met.

Smaller diameter trees and slash from larger trees would be bucked, hand piled, and burned.

Any conifers located outside RHCAs may be removed also.

In aspen groves encroached upon by lodgepole pine, felled lodgepole would be used on site to build protective buck and pole fences.

As noted in the table below, several aspen groves are associated with potential harvest units. Where this is true, removal of encroaching conifers would occur in conjunction with harvest of the rest of the unit, while any burning and fencing would be accomplished after the harvest is completed.

In aspen sites not associated with a commercial sale, or if the harvest units with associated aspen stands are not implemented, treatment of these groves may occur as soon as funding allows. Fences would be built as soon as practical after all other treatments have been finished, with the goal of protecting new suckers.

[44] Malheur National Forest *Land and Resource Management Plan* (Forest Plan) Forest Wide Standard—57 Maintain or enhance quaking aspen stands.

Aspen site A-17 currently has no aspen, although site conditions closely resemble those of nearby groves in aspect, slope, and vegetation. This site has been selected for experimental re-introduction of aspen by hand-planting of nursery-propagated material from a nearby grove, and fencing to allow the new trees to establish. The development of hardwood root systems and the dense groundcover associated with an aspen overstory and grazing exclosures would compliment planned channel rehabilitation just below the site.

Photo 10—An example of Plastic Aspen fence from nearby Summit area.

The following priority aspen groves would be treated across all action alternatives as described (see Appendix E, Map 27 Aspen Enhancement Sites for Action Alternatives).

Table 45—Aspen Sites and Recommended Treatments

Site	Vegetation Treatment	Slash Treatment	Fence Type	Fence Acres	RHCA &Stream Category	Commercial Product ♦
A-1A	SRL	Handpile/Burn	Buck/Pole	5.0	Yes; 2	No
A-1B	SRL	Handpile/Burn	Buck/Pole	0.75	Yes; 2	No
A-2A	SRL	Handpile/Burn	Buck/Pole	2.0	Yes; 2	5000♣
A-2B	SRL	Handpile/Burn	Buck/Pole	0.75	No	No
A-2C	SRL	Handpile/Burn	Buck/Pole	0.75	No	No
A-3A	SRL	Handpile/Burn	Buck/Pole	0.75	Yes; 4	2250♣
A-3B	SRL	Handpile/Burn	Buck/Pole	2.0	Yes; 1	6000♣
A-3C	SRL	Handpile/Burn	Buck/Pole	0.75	partial	2000♣
A-3D	SRL	Handpile/Burn	Plastic	0.75	Yes; 4	2000
A-3E	SRL	Handpile/Burn	Plastic	0.75	Yes; 4	500
A-3F	SRL	Handpile/Burn	Plastic	0.75	Yes; 5	1500
A-3G	SRL	Handpile/Burn	Plastic	0.75	Yes; 1	2250
A-4A	none	Handpile/Burn	Plastic	0.75	No	No
A-4B	SRL	Handpile/Burn	Plastic	0.75	Yes; 2	No
A-5	SRL	Handpile/Burn	Buck/Pole	0.75	Yes; 1	No
A-6A	SRL, RPL	Handpile/Burn	Buck/Pole	3.0	Yes; 4	9000
A-6B	SRL	Handpile/Burn	Buck/Pole	0.75	Yes; 4	1000
A-6C	SRL	Handpile/Burn	Plastic	0.75	Yes; 4	1000
A-7	none	N/A	Plastic	0.75	Yes; 1	No
A-13	SRL	Handpile/Burn	Buck/Pole	1.0	Yes; 1	No
A-14	SRL	Handpile/Burn	Buck/Pole	3	Yes; 4	No
A-15	SRL	Handpile/Burn	Buck/Pole	0.75	Yes; 4-5	No
A-16	SRL	Handpile/Burn	Plastic	0.75	No	No
A-17	SRL, RPL	Handpile/Burn	Plastic	0.75	Yes; 5	No
A-18	SRL	Handpile/Burn	Buck/Pole	0.75	Yes; 2	3000♣

NOTES: Numbers in the RHCA column indicate category of the associated stream.
SRL = stand release of aspen (girdling and/or felling of conifers)
RPL = replant aspen
SWS = Subwatershed
♦ in board feet
♣Product included in estimates of larger associated harvest unit.

2.5.4.5 Noxious Weeds

Since the Forest *Noxious Weed Environmental Assessment (*Malheur National Forest 1999*)* was written, 10 new weed populations have been located, with 6 of those populations (total of 1.5 acres) recommended for possible chemical treatment, as listed in the following table. Also see Appendix E, Map28 Noxious Weed sites—Existing Condition. Just these new sites are analyzed in this document.

Table 46—Southeast Galena Restoration—Weed Treatment Acres

Treatment	Number of Sites	Acres
Manual—Total Area	4	0.4
Chemical—Total Area	6	1.5
Total Area	10	1.9
Chemical—RHCAs Only	4	1.3
Manual—RHCAs Only	3	.3
Total—RHCAs Only	7	1.6

In most of the new sites recommended for manual treatment, numbers of plants are small and the populations are located in riparian zones. Six infestations are recommended for possible chemical treatment as well, in case initial manual removal is ineffective and the populations prove to be persistent or increasing. The total area to be treated with herbicide within RHCAs is 1.3 acres, with 0.2 of the chemical treatment acres occurring outside of RHCAs.

Table 47—New Noxious Weed Sites

SWS	SITE #	SPECIES	COMMON NAME	ACRES	RHCA	TREATMENT
30213	300700	*Cirsium arvense*	Canada thistle	0.1	Yes	manual
30209	300726	*Centaurea diffusa*	diffuse knapweed	0.1	Yes	manual/glyphosate
30211	300728	*Centaurea maculata*	spotted knapweed	1.0	Yes	manual/ glyphosate
30211	300729	*Senecio jacobea*	tansy ragwort	0.1	Yes	manual
30211	300730	*Centaurea maculata*	spotted knapweed	0.1	Yes	manual/ glyphosate
30211	300732	*Hypericum perforatum*	St. Johnswort	0.1	No	manual/ glyphosate
30209	300733	*Linaria vulgare*	common toadflax	0.1	Yes	manual
30213	300800Q	*Cynoglossum officinale*	houndstongue	0.1	No	manual
30215	300801Q	*Cirsium arvense*	Canada thistle	0.1	No	manual/ glyphosate
30217	300802Q	*Centaurea maculata* *Hypericum perforatum*	Spotted knapweed St. Johnswort	0.1	Yes	manual/ glyphosate
"Q" *following a site number indicates the site is in a quarry pit. See following discussion of quarry treatments.*						

Diffuse knapweed (site number 300726) is growing at the junction of the 4550 Road and Highway 20. Because of its proximity to the highway roadbed, the knapweed is especially likely to be spread by passing vehicles and needs to be eradicated as quickly as possible. It covers less than 0.1 acre. Because the 4550 Road site is within 50 feet of standing water and 150 feet of the Middle Fork John Day River, only direct wick application or spot application of herbicide using a backpack sprayer will be allowed. (Malheur NF *Noxious Weed Environmental Assessment* 2001).

The St. Johnswort (site number 300732) is in the uplands of the Butte Creek drainage. It is small enough to hand-pull, however access is difficult. To be effective, hand-pulling should be done two or three times during the growing season. One or two applications of herbicide are far more likely to eradicate the plants if they are already well established. Because the population includes fewer than 20 plants, manual treatment in 2002 may prove effective. If not, glyphosate could be used the following year.

Scattered plants of spotted knapweed have been found in a meadow along lower Butte Creek (site number 300728), covering about an acre of ground at low density. They would be treated with spot application of glyphosate. A nearby population of spotted knapweed (site #300730) occurs above a culvert that carries a

small intermittent tributary to Butte Creek under the 072 Road. Plants at this site would be treated with herbicide if hand pulling is not effective in eliminating the population.

The total acreage being recommended for chemical treatments is 1.5 acres, with 0.1 acres in the Tincup/Little Butte subwatershed (30209), 1.2 acres in Butte (30211), and 0.1 acres in each of Beaver/Ruby (30215), and Dry/Sunshine (30217) subwatersheds. The other new sites are not recommended for herbicide treatment due to their proximity to active stream channels (within 5 feet of flowing water), or because of the ease of hand treatment as in number 300800Q. In the case of number 300730, the knapweed is growing in a seasonally dry channel above a culvert, about 75 feet from Butte Creek.

Fifteen quarry sites have been identified as potential sources of rock for surfacing of roads within this project. Quarry sites, or rock pits, not only pose high risks for noxious weed occurrence due to their own continuously disturbed surfaces, but also present high potential for widespread dissemination of weed seeds into susceptible roadside habitats through the spreading of road surfacing materials during project work. Ten out of 15 of the rock pits have been surveyed for the presence of noxious weeds during the growing season, 2001, and at this time three contain infestations in need of treatment. Any quarries to be used for road work will be monitored annually for noxious weeds.

The quarry pit in riverside Gulch (site number 300802Q) contains two noxious weed species, spotted knapweed and St. Johnswort. Only three plants of each species were present in 2001, and because the pit is within an RHCA, glyphosate would be used if manual pulling proves ineffective, and herbicide treatment would be solely by wick application. Site number 300800Q, on the 4557 Road west of Granite Boulder Creek contains a small infestation of houndstongue that can be effectively pulled by hand. Site number 300801Q along the 4555 Road in the upper Dry Creek drainage harbors a small patch of Canada thistle of fewer than 50 stems, which will be most effectively eliminated by spot herbicide application.

Due to the high risks of infestation and of inadvertent seed spread with road surfacing materials, the 15 potential quarries to be used with this project need to be closely monitored throughout the implementation. Whether done manually or with herbicides, timely treatment of new infestations before any plants can set and disperse seeds can eliminate the possibility of any weed increases from these susceptible sites. Location of each of these quarries is listed in Table 58, page 86 and in Map 28—Noxious Weed Sites—Existing Condition.

The total acres column below shows the final projected size of each rockpit. Sites #2, 9, 14, and 15 are new sites that have not been previously developed, and will require space for stockpiles and crusher set-ups, hence the relatively large acreages involved. The three sites that currently harbor weeds have only a few plants each, requiring hand pulling or spot spraying with glyphosate. Although the total acreage that is at risk for weed infestation is 42 acres, it should be noted that only 0.3 acres are currently infested.

Alternatives 2 and 5 propose that 1.5 acres would be subject to wick or spot application of the herbicide glyphosate to noxious weed plants, with the expectation that all of the six populations involved would be eliminated in 2 to 5 years. Glyphosate is recommended because it is effective on all noxious weed species to be treated, but is the least toxic to aquatic organisms. Several of the weed treatment locations are within RHCAs. Four tenths of an acre of weeds would be treated manually, with the expectation that the four populations involved would be reduced in size, and prevented from setting and dispersing seed during all years that they are treated. These populations may not be completely eliminated, and would likely require long-term monitoring. Very small areas of ground disturbance would accompany the pulling or grubbing of weeds at the four manual treatment sites.

Alternatives 3 and 4 would continue monitoring and containment by hand of newer noxious weed sites as funding allows. Populations of noxious weeds included in the noxious *Noxious Weed Environmental Assessment* would be treated as analyzed in that document.

2.5.5 Infrastructure

Infrastructure is divided into elements of Roads, Trails and Trailheads, and Dispersed Campsites. Identified in the *Galena Watershed Analysis* Issue Statements #1, #4, and #5 relate to these Infrastructure elements in context of sediment delivery to nearby drainages and hydrologic concerns.

The Infrastructure projects below were brought forward from the *Galena Watershed Analysis* recommendations and were designed to improve or enhance the hydrologic function, fisheries habitat, and safe access needs for the *Southeast Galena Restoration* analysis area's multiple uses. These projects help to address all undesired conditions, outlined in **1.2.1 Undesired Conditions**, beginning on page 8, at different intensities and levels.

Roads

The following road projects were designed to improve hydrologic and fish habitat conditions while providing safe and affordable roads.

Alternatives 2, 3 and 4 would not reopen the isolated transportation system within the Deerhorn and Little Butte drainages. These roads would be decommissioned and removed from the Forest Transportation System. In the past, this area was accessed by a ford crossing the Middle Fork of the John Day River, which is a Category 1 fish-bearing stream containing bull trout and steelhead. The Forest has previously eliminated use of this ford due to sediment concerns and past degradation on fisheries habitat by ATV and four-wheel truck recreational use.

Alternative 5 would utilize the existing Deerhorn and Little Butte transportation system by constructing a tie through road off the end of forest road 2614452.

Access Area Plan Per Alternative

The following tables display the results as if the access plan were implemented. The results are divided into the alternatives by item per subwatershed per management area. Brief descriptions of the columns follow these tables.

Table 48—Alternatives 2 Roads and Densities

SUBWATERSHED	Total miles	Total road density (miles of road per square mile)	Open miles	Closed miles	Open road density (miles of road per square mile)
Davis/Placer Gulch	37.9	3.3	17.8	20.1	1.7
Vinegar	37.4	3.2	20.4	17.0	1.4
Vincent	29.3	5.0	10.2	19.1	3.3
Little Boulder/Deerhorn	33.4	1.9	14.7	18.6	1.1
Tincup/Little Butte	29.3	2.5	9.5	19.7▲	1.7
Butte	20.4	2.7	7.2	13.2	1.7
Granite Boulder	31.3	2.7	11.1	20.2▲	1.8
GRAND TOTAL	**207.0**		**99.5**	**107.6**	
NOTE:▲ Includes about 12.5 miles of seasonal closures					

Table 49—Alternatives 3 Roads and Densities

SUBWATERSHED	Total miles	Total road density (miles of road per square mile)	Open miles	Closed miles	Open road density (miles of road per square mile)

SUBWATERSHED	Total miles	Total road density (miles of road per square mile)	Open miles	Closed miles	Open road density (miles of road per square mile)
Davis/Placer Gulch	37.9	3.3	17.8	20.0	1.7
Vinegar	37.4	3.2	20.4	17.0	1.4
Vincent	29.3	5.0	10.2	19.1	3.3
Little Boulder/Deerhorn	33.4	1.9	14.7	18.2	1.1
Tincup/Little Butte	29.3	2.5	9.5	19.7▲	1.7
Butte	20.4	2.7	7.2	13.2	1.7
Granite Boulder	31.3	2.7	11.1	20.2▲	1.8
GRAND TOTAL	**207.0**		**99.5**	**107.1**	
NOTE:▲ Includes about 12.5 miles of seasonal closures					

Table 50—Alternatives 4 Roads and Densities

SUBWATERSHED	Total miles	Total road density (miles of road per square mile)	Open miles	Closed miles	Open road density (miles of road per square mile)
Davis/Placer Gulch	35.6	3.1	17.8	17.7	1.5
Vinegar	33.0	2.8	20.4	12.5	1.7
Vincent	25.4	4.3	10.2	15.3	1.7
Little Boulder/Deerhorn	30.9	1.8	14.7	16.2	0.9
Tincup/Little Butte	26.9	2.3	9.5	17.3▲	0.8
Butte	20.1	2.6	7.2	12.9	0.9
Granite Boulder	31.2	2.7	11.1	20.1▲	1.0
GRAND TOTAL	**203.1**		**90.9**	**112.0**	
NOTE: ▲ Includes about 12.5 miles of seasonal closures					

Table 51—Alternatives 5 Roads and Densities

SUBWATERSHED	Total miles	Total road density (miles of road per square mile)	Open miles	Closed miles	Open road density (miles of road per square mile)
Davis/Placer Gulch	38.8	3.3	30.3	8.5	2.6
Vinegar	38.4	3.2	28.9	9.6	2.4
Vincent	29.9	5.1	21.5	8.4	3.7
Little Boulder/Deerhorn	36.9	2.1	27.5	9.4	1.6
Tincup/Little Butte	32.5	2.8	22.1	10.4	1.9
Butte	20.5	2.7	14.9	5.6	2.0
Granite Boulder	31.4	2.7	18.9	12.5	1.6
GRAND TOTAL	**228.4**		**164.1**	**64.4**	

Total Miles

The total transportation system miles may be open or closed. System roads are used by Forest managers to gain access for the protection, administration, and utilization of its resources and by the public for use, recreation, and pleasure for personal needs and values.

Total Road Density

This density represents the total transportation system miles, open and closed, compared to the amount of acres they access (by subwatershed) displayed as miles of road per square mile. This density helps managers to determine potential concerns relating to hydrologic function and fish and wildlife habitat.

Open Miles

This is a road, or segment thereof, that is open to the public without restrictions other than general traffic control or restrictions based on size, weight, or class of vehicle. An open road may be closed during scheduled periods, extreme weather conditions, or emergencies. Routine maintenance of road and ditch blading, drainage structure cleaning and maintenance, some brushing, some rocking and adding cross ditches would be performed. Along these open roads, hazard trees would be dropped and may be removed for the safety of the user. Prior to removal of these hazard trees, other resource needs would be met e.g. RHCA down woody needs.

Closed Miles

These are roads which motorized traffic has been excluded by regulation, barricade blockage, or by obscuring the entrance. Short-term closed roads remain on the Forest Road Transportation System and are still operational but are closed to use, yearlong or seasonal. These roads are expected to be needed on an occasional or intermittent basis, and require periodic monitoring and basic custodial maintenance.

Where management has determined a road would not be needed for an interval of at least ten years, they would be inactivated. Motorized traffic would be excluded for an indefinite period by regulation, barricade blockage, or by obscuring the entrance. Along inactivated roads, all stream crossing structures would be removed, and the stream crossing areas reshaped to resemble a natural condition. Ditches or ruts would be removed, and road surface drainage reshaped so that no segments have a continuous surface flow path to a stream channel. An inactivated road is left in a condition such that basic custodial maintenance is not needed, but the road remains on the Forest Road Transportation System. If a later decision determines the road should be decommissioned, no additional work would be needed.

Along all closed roads(other than inactivated roads) due to potential administrative or permittee use, hazard trees would be dropped and may be removed, to reduce safety concerns. Prior to removal of these hazard tress, other resource needs would be met e.g. RHCA down woody needs.

Open Road Density

This density represents the amount of open roads compared to subwatershed area displayed as miles of roads per square mile. Open road density was established by the *Land and Resource Management Plan* in response to road management policy in relation to big game habitat and hunting. By closing certain roads, this would provide escapement areas for big game in addition to providing areas for non-motorized hunting experience (*Land and Resource Management Plan* ROD p. 23). Use of closed roads would not physically be evident and trips would not average more than one per week (*Land and Resource Management Plan* p. IV-28).

Along these open roads due to potential administrative, permittee, or public use, hazard trees would be dropped and may be removed, to reduce safety concerns. Prior to removal of these hazard trees, other resource needs would be met e.g. RHCA down woody needs.

Road Work Per Alternative

The next set of tables display the work that would be applied per alternative and the amount that would impact each subwatershed. The three types of projects include constructed road miles, reconstructed road

miles, and decommissioned road miles. All numbers are rounded to the nearest tenth of mile. Description and definitions describing the columns follow these tables.

Table 52 Alternatives. 2 Road Work to be Accomplished

Subwatershed	Constructed miles	Reconstructed Miles		Decommissioned Miles
		Minor	Major	
Davis/Placer Gulch	2.7	12.8	15.5	10.0
Vinegar	4.5	26.9	3.4	12.0
Vincent	3.9	22.6	1.2	5.7
Little Boulder/Deerhorn	3.8	19.7	6.3	12.1
Tincup/Little Butte	2.4	17.2	3.3	10.2
Butte	0.3	13.5	2.8	8.1
Granite Boulder	0.1	15.2	4.7	8.9
Analysis area Total	17.7	127.9	37.2	67.0
Outside Analysis area	0.0	6.0	6.6	0.0
GRAND TOTAL	**17.7**	**113.9**	**43.8**	**67.0**

Table 53 Alternatives. 3 Road Work to be Accomplished

Subwatershed	Constructed miles	Reconstructed Miles		Decommissioned Miles
		Minor	Major	
Davis/Placer Gulch	2.6	12.8	15.5	10.0
Vinegar	4.5	26.9	3.4	12.0
Vincent	3.9	22.6	1.2	5.7
Little Boulder/Deerhorn	3.4	19.7	6.3	12.1
Tincup/Little Butte	2.4	17.2	3.3	10.2
Butte	0.3	13.5	2.8	8.1
Granite Boulder	0.1	15.2	4.7	8.9
Analysis Area Total	17.2	127.9	37.2	67.0
Outside Analysis Area	0.0	6.0	6.6	0.0
GRAND TOTAL	**17.2**	**113.9**	**43.8**	**67.0**

Table 54 Alternatives. 4 Road Work to be Accomplished

Subwatershed	Constructed miles	Reconstructed Miles		Decommissioned Miles
		Minor	Major	
Davis/Placer Gulch	0.5	12.8	15.5	10.0
Vinegar	0.0	26.9	3.4	12.0
Vincent	0.0	22.6	1.2	5.7
Little Boulder/Deerhorn	1.7	19.7	6.3	12.1
Tincup/Little Butte	0.0	17.2	3.3	10.2
Butte	0.0	13.5	2.8	8.1
Granite Boulder	0.0	15.2	4.7	8.9
Analysis Area Total	2.2	127.9	37.2	67.0
Outside Analysis Area	0.0	6.0	6.6	0.0
GRAND TOTAL	**2.2**	**113.9**	**43.8**	**67.0**

Table 55 Alternatives. 5 Road Work to be Accomplished

Subwatershed	Constructed miles	Reconstructed Miles		Decommissioned Miles
		Minor	Major	
Davis/Placer Gulch	2.7	14.4	14.9	9.2
Vinegar	5.4	26.2	4.1	11.4
Vincent	4.8	23.1	1.2	5.9
Little Boulder/Deerhorn	5.8	19.4	7.7	10.6
Tincup/Little Butte	3.3	17.1	5.5	7.9
Butte	0.3	13.9	2.9	8.0
Granite Boulder	0.1	16.2	4.7	8.9
Analysis Area Total	22.4	130.3	41.0	61.9
Outside Analysis Area	0.0	6.0	6.6	0.0
GRAND TOTAL		**136.3**	**47.6**	**61.9**

Photo 11 Roads constructed would include clearing excavation, drainage and surfacing of roads, including the relocation of roads currently located in RHCAs.```

Constructed Miles

These miles consist of clearing, excavation, drainage, and possible surfacing of roads that would be added to the Forest Transportation System. These miles include those roads constructed to replace roads poorly located, i.e. in RHCAs.

Reconstructed Miles

Minor Reconstruction: Includes brushing out of encroaching vegetation, blading and shaping the existing roadbed, turnouts, and turnarounds, hazard tree removal, cleaning and repair of existing drainage structures and spot rocking.

Major Reconstruction: Includes the work listed for minor reconstruction but also one or more of the following: substantial removal of brush and trees from the roadbed, adding new drainage structures, adding new turnouts or turnarounds, widening of the roadbed, and substantial surface rock placement or replacement.

Decommissioned Miles

Decommissioned Roads are permanently removed from service and the Forest Transportation System. These roads have no reasonably foreseeable need for use, and/or continued use is not compatible with other resource protection needs. The objective is to restore the roadway to other resource uses

established for the area, and to leave it in a condition that would not require custodial maintenance. All stream crossing structures would be removed and the stream crossing areas reshaped to the natural surrounding area. All culverts, roadside ditches, and ruts would be removed, and the road surface shaped so that no segments of the roadbed provide a continuous surface flow to a stream channel. Revegetating of decommissioned roads could be natural or accomplished by other methods to recover vegetation within ten years after the last activity.

Road Work Per Alternative Specific To RHCAs

The next set of tables display the work accounted for in the previous tables but specific to RHCAs. This helps to determine what direct short-term impacts may occur for the intent of a long-term benefit.

Table 56 Alternative. 2, 3 & 4 Roads in RHCAs

SUBWATERSHED	OPEN MILES	CLOSED MILES	DECOMMISSIONED MILES	RECONSTRUCTED MILES	
				Minor	Major
Davis/Placer Gulch	3.6	1.5	4.9	1.6	1.4
Vinegar	4.0	1.0	3.8	3.7	0.4
Vincent	3.2	1.4	2.5	3.6	0.0
Little Boulder/Deerhorn	4.0	1.7	4.2	3.6	0.3
Tincup/Little Butte	4.8	1.5▲	1.8	1.4	0.6
Butte	2.1	0.9	2.8	2.2	0.5
Granite Boulder	2.0	3.9▲	3.9	3.6	0.4
TOTALS	**23.7**	**11.5**	**23.9**	**19.7**	**3.6**
NOTE: Same definitions as described above ▲ Includes 2.7 miles of seasonal closures					

Table 57 Alternative. 5 Roads in RHCAs

SUBWATERSHED	OPEN MILES	CLOSED MILES	DECOMMISSIONED MILES	RECONSTRUCTED MILES	
				Minor	**Major**
Davis/Placer Gulch	4.9	0.5	4.6	2.0	1.3
Vinegar	4.3	0.6	3.9	3.6	0.5
Vincent	4.4	0.2	2.6	4.1	0.0
Little Boulder/Deerhorn	5.9	0.6	4.0	3.6	0.6
Tincup/Little Butte	5.7	0.6	1.8	1.4	0.6
Butte	2.9	0.1	2.8	2.2	0.5
Granite Boulder	4.3	1.7	3.9	3.9	0.4
TOTALS	**32.4**	**4.3**	**23.6**	**20.8**	**3.9**
NOTE: Same definitions as described above					

Rock Quarries

The table below displays the rock quarries that may be needed, including some located outside of the analysis area.

Table 58—Rock Quarries

SITE #	QUARRY	CURRENT ACRES	PROJECT ACRES	IN/OUT OF ANALYSIS AREA
1♣	Dan's Creek,566 rd	3	4	Out
2♠	Placer Gulch, 453 rd	0	5	In
3	Vinegar Creek,121 rd	2.5	3	In
4	Vinegar Creek, 073 rd	0.5	1	In
5	Upper Morning Creek, 255 rd	1.5	2	In
6	Vincent creek, 2010 rd	2	3	In
7	Vinegar Creek, 959 rd	0.5	1	In
8	Cow Camp Meadows, 2055 rd	1.5	2	In
9	Murdock Creek, 161 rd	0	5	In
10	Granite Boulder Creek, 4557 rd	0.5	1	In
11	Lemon Creek, 4557 rd	0.5	1	In
12	Dry Creek, 350 rd	6	6	Out
13♣	Riverside Gulch, 199 rd	2	2	Out
14♣	Riverside Gulch, 218 rd	1.5	2	Out
15♠	Riverside Gulch, 2050 rd	0	4	In
NOTE: rd = road ♠ New site ♣ RHCA				

Rock quarry sites provide rock and gravel sources for the recommended roadwork. Three new quarry sites (numbers 2, 9 and number 15) would be developed in conjunction with closing quarry site number 14 located in RHCA, and one stockpile site, number 13.

The Riverside Gulch quarry site #14 located within a non-fish bearing RHCA has been heavily used in the past twenty years. A new location has been selected to replace this site. A subsurface investigation would be conducted to determine quality and quantity of materials available at the new location.

One existing quarry site located in Placer Gulch adjacent to Forest Road 2614 is located within the Placer Gulch RHCA. This site has not been utilized since 1984 and was limited to removal of shallow layers of surface materials. The site has healed naturally. It is hydrologically sound and is not in need of further rehabilitation. Due to its location and current condition, this site will no longer be used.

2.5.5.2—Trails and Trailheads

Three trails analyzed in this document are the Blackeye and Tempest Mine Trail, which are non-motorized (hiker, horse, and bicycle) and the Davis Creek Trail (motorized). See Appendix E, Map 31—Recommended Trails, Trailheads, and Campsite Projects—For Action Alternatives. Preliminary concerns include:

Sediment delivery to streams due to current drainage of the trails and trailheads as well as trail drainage crossings; and

Safety for the trail user due to condition of the trail and hazards along these routes.

DESCRIPTION OF TRAIL PROJECTS

Blackeye Trail 243 (Tempest Mine Trail 256)

A new trailhead would be constructed on the east end of this trail system at Forest road 2010 about 0.25 mile north of the existing trailhead adjacent to Forest Road 2010. The trailhead would be a size to accommodate four vehicles with horse trailers. Information signs would be placed at this trailhead.

To access this new trailhead location, about 1 mile of the 2010 road would need to be reconstructed. The existing access road is native surface and is rutting. Forest Road 2010219 is steep in places and has some 12-inch ruts that make access to the existing trailhead with a horse trailer and most other vehicles quite

difficult and dangerous and a sediment source concern. This road would be decommissioned and removed from the transportation system.

In addition, about 1 mile of new trail would need to be constructed from the existing trailhead to the new one along the 2010 road. This trail would accommodate both foot and horse traffic.

The existing trailhead near Lemon Cabin on the west side of the Tempest Mine and Blackeye Trails would be eliminated (decommissioned) along with about 1 mile of Forest road 4559. Road 4559 was the access to this west end trailhead.

A storm event washed out the 4559 road at the Lemon Creek drainage cutting off access to the trailhead. In addition, from near Lemon Cabin to the existing trailhead (about 1 mile), the 4559 road contains ruts and is rilling and eroding causing sediment concerns to the nearby drainages.

This closure would be located at intersection of 4559283 and 4559. Decommissioning would occur from the closure to a former trailhead near the scenic area boundary. Portions of the roadbed would be scarified, planted with trees, and grass seeded to help stabilize the soil and reduce potential sediment delivery. Culverts and gates would be removed. In connection with this decommissioning, a bridge on the 4559 road that crosses Granite Boulder Creek near Lemon Cabin would be removed. This bridge is currently closed to traffic due to unsafe conditions; it would no longer be used as a trail bridge.

About 1.3 miles of a hiker/horse connector trail would be constructed. This connector would create a lollipop-shape loop trail with the Blackeye and Tempest Mine Trails. It would allow the trail users a return route to the eastside trailhead with minimum overlap. Construction of this trail would have minimal impact since it uses an existing jeep trail. This approach opens up future management options for accessing the Princess Trail system if an easement through private land is no longer allowed on this trail. The remaining trail is in fairly good condition and would require normal maintenance of clearing, grubbing, water bars, and removal of hazard trees.

Davis Creek Trail 244

The Davis Creek Trail is designated for motorized use. However, it originally was constructed to accommodate two-wheeled traffic (motorcycle). Due to the popularity of four-wheelers, the demands on this trail have expanded to include wider-based motorized vehicles or four-wheel all terrain vehicles (ATV). This trail and surrounding resources are sustaining damage resulting from inadequate width for the vehicles currently using it. Several sections of the trail are also unsafe for ATV use due to the narrow nature of the trail and steep slopes. Nine drainage crossings are too narrow for ATV use, so users drive their ATVs around the bridges, fording the streams, thus creating sediment.

In Alternatives 2, 3, and 5, the project would widen the trail to a minimum width of 62 inches, using small-motorized equipment to reconstruct the 8.3 miles of trail. Trail crossings at Placer Gulch, Deerhorn, Gorge, East and West Little Butte, and Butte Creeks would be widened, including culverts, bridges, and rock. Hazard trees along the route would be felled for safety reasons. Alternative 4 would reclassify this trail to non-motorized use. Therefore, reconstruction would not occur, however, hazard tree would still be felled.

In all action alternatives, a new trailhead would be constructed on the west end, which would eliminate three crossings of Butte Creek and one trailhead within a RHCA. The new location would be on Forest road 2050072 on the ridge east of Butte Creek. About 1/2 mile of new trail would be constructed to connect the new trailhead location to the existing trail. Information signs would be installed at the trailhead location. This trailhead would accommodate a minimum of four vehicles with ATV or horse trailers.

Signing indicating this new trailhead location would be placed along County Road 20. An existing horse stall on Forest road 2050, which is presently in a riparian area, would be moved to the new trailhead location. The old horse stall location and parking area would be scarified, reshaped, seeded, and closed to access.

Access to the recommended Davis Creek Trailhead on the west end would need to be upgraded to accommodate the expected use. About 1.6 miles of roads 2050032 and 2050666 would be reconstructed.

In addition, the Davis Creek Trail would include numerous improved channel crossings to reduce sediment input.

These trail projects include decommission, reconstruction, construction, and trailhead work. These projects are designed to contribute to the overall purpose of improving the hydrologic function, enhancing fish habitat, and providing a safer use of these facilities. Definitions follow these tables.

Table 59 Alternatives 2 & 3 Trails and Trail Head Work

TRAIL NAME	DECOMMISSION MILES	RECONSTRUCTION MILES	CONSTRUCTION MILES	TRAIL HEADS	
				New	Removed
Blackeye Trail	0.7	0	0.5	1	2
Tempest Mine Trail	0	0	1.3	0	0
Davis Creek Trail	1.0	8.3	0.5	1	2
Totals	**1.7**	**8.3**	**2.3**	**2**	**4**

Table 60 Alternative 4 Trails and Trail Head Work

TRAIL NAME	DECOMMISSION MILES	RECONSTRUCTION MILES	CONSTRUCTION MILES	TRAIL HEADS	
				New	Removed
Blackeye Trail	0.7	0	0.5	1	2
Tempest Mine Trail	0	0	1.3	0	0
Davis Creek Trail	1.0	0	0.5	1	2
Totals	**1.7**	**0**	**2.3**	**2**	**4**

Alternative 4 eliminates the recommended reconstruction on Davis Creek as displayed on Alternative 2 and 3 due to a proposal to change the use designation from motorized to non-motorized (a *Land and Resource Management Plan* Amendment would be needed). The reconstruction would no longer be needed, however, hazard tree would still be felled.

Table 61 Alternative. 5 Trails and Trailhead Work

TRAIL NAME	DECOMMISSION MILES	RECONSTRUCTION MILES	CONSTRUCT MILES	TRAIL HEADS	
				New	Removed
Blackeye Trail	0.7	0	0.5	1	2
Tempest Mine Trail	0	0	1.3	0	0
Davis Creek Trail	1.0	8.3	6.1	1	2
TOTALS	**1.7**	**8.3**	**7.9**	**2**	**4**

Alternative 5 would also see an addition of 6.1 miles of delineated trail on the Davis Creek Trail to create a loop for users to enjoy minimal overlap. This addition is contingent upon recommended new road construction connecting the existing Deerhorn and Little Butte drainage transportation system.

Decommissioned Miles

Trails removed from the trail system with no anticipated future use. The trail would be obscured by re-contouring or re-shaping the trail back to the conotour of the surrounding landscape or allowed to just re-vegetate.

Reconstructed Miles

The trail would be reshaped and widened to meet today's standards for the appropriate use. Reconstruction would improve safety for the user, hydrologic function of the drainages, and habitat for the fish.

Constructed Miles

New trail construction consist of clearing, excavating, and installing of proper drainage to trails that would be added to the Forest Trail System. Existing road or jeep trails would be upgraded and used where feasible.

Trailheads

New trailheads would be constructed to accommodate vehicles depending on the designation of the trail use. The sites would be hydrologically sound and properly signed for information purposes. The removed trailheads would be obliterated to match the lie of the surrounding landscape and revegetating to reduce risk of erosion.

2.5.5.3 Description of Dispersed Campsite Projects

All action alternatives would discourage use of some dispersed sites and enhance others located within the RHCA of the Middle Fork John Day River. The following sites were identified as the priority sites to improve or relocate:

Three Relocation Dispersed Sites

Three dispersed sites: Tincup Relocation dispersed sites (Tincup Creek/Little Butte Creek subwatersheds), Flat Plantation dispersed sites (Little Boulder/Deerhorn SWS), and Vincent dispersed sites (Vincent Creek SWS), all would be constructed to replace dispersed sites currently located in riparian areas.

Four new graveled camp pads would be constructed to accommodate vehicle/trailer camping in Vincent Creek SWS. No other amenities are planned at this time. An approach would be constructed and graveled to access these pads about 0.2 miles up Forest road 2010072 from the 2010 intersection. This action would replace the campsite locations adjacent to Forest road 2010243 (Vinegar Creek) which were closed previously. Treatment of the Tincup Relocation dispersed sites would be the same as the Vincent dispersed sites. Access to these sites is near the junction of County Road 20 and Forest Road 4550. The locations in Flat Plantation dispersed sites (Little Boulder/Deerhorn SWS), would construct six graveled camp pads. These sites would be located west of Flat Creek off County Road 20 (see Appendix E, Map31—Recommended Trails, Trailheads, and Campsite Projects-for Action Alternatives).

Middle Fork Day Use Sites

The three dispersed sites mentioned previously (Tincup, Flat and Vincent), are being created to replace camping near the Middle Fork John Day River which have been causing impacts along the river's edge (see **Recreation Affects in RHCAs**, page 136). The Middle Fork areas where overnight prolonged camping has occurred would be converted to day use areas by being scarified, reshaped, seeded, and blocked where feasible. While access to these areas would remain for day use, the Middle Fork day use sites would be hardened and have boulders placed along the river's edge to prevent vehicle access to the river's edge (see Appendix E, Map31—Recommended Trails, Trailheads, and Campsite Projects-for Action Alternatives).

Murdock Dispersed Site

Dispersed site in the Tincup/Little Butte Creek subwatershed (historically known as Murdock) would be improved rather than removed. The access road is native surface and is deeply rutted in places and widened in areas where users have driven around these ruts. Soil compaction and loss of vegetation has occurred. the access road and camp sites are within 100 feet of the river, therefore this proposal would harden the site by placing rock in the access and three camp pads to minimize future soil damage and

subsequent sediment delivery (see Appendix E, Map31—Recommended Trails, Trailheads, and Campsite Projects-for Action Alternatives).

Dispersed Sites in Vincent Creek subwatershed

Another set of dispersed sites in the Vincent Creek subwatershed near Forest road 2010987 is currently blocked by pole barricade. This barricade would be relocated back about 500 feet, which would open up five or six dispersed sites. This location does not have any known resource concerns, yet would help provide dispersed sites, especially during hunting season (see Appendix E, Map31—Recommended Trails, Trailheads, and Campsite Projects-for Action Alternatives).

Deerhorn Forest Camp (Campground)

The Deerhorn Forest Camp (Campground), in Little Boulder/Deerhorn SWS, is another site to be improved rather than eliminated. Access to this site is rutting and has potholes, the camp sites are scattered, and foot access to the river is not controlled. Consequently, vegetation is being trampled and compacted due to this uncontrolled use. The proposal for this site is the installation of flat native boulders in a step design to encourage use of one area to access the river. Camp pads and the access road would be rocked to reduce rutting and sediment delivery. Boulders would be placed around camp pads and the dispersed site to control traffic and to keep vehicles away from the Middle Fork of the John Day River (see Appendix E, Map31—Recommended Trails, Trailheads, and Campsite Projects-for Action Alternatives).

2.5.6 Mitigation

2.5.6.1—Mitigation Common to All Action Alternatives

The following mitigation would be applied in all action alternatives to avoid, or reduce the risk of undesirable effects during or after implementation or restorative treatments.

2.5.6.1.1—Mitigation for Visuals (County Road 20 & Forest Service 2010 Road)

- Apply a harvest prescription within harvest units for the first 300 feet or what is visible from the road within this 300-foot area. These prescriptions would vary tree spacing up to 50% to create a visually diversified stand and tree spacing. The large tree component would be retained and thinning regimes would open up the forest stand to emphasize view of these larger trees. Paint bands on the trees would be marked on the side away from the road to reduce short-term visibility concerns.
- Cut stumps of trees harvested in the immediate foreground (300 feet or what can be seen from road) at a height <6 inches to reduce visual impacts.
- Treat logging slash in the immediate foreground (300 feet or what can be seen from road) using methods such as piling and burning, mechanical crushing, or yard tops attached to reduce impacts that detract from the natural character of the view.
- Seed areas in accordance with botany restoration standards where there are areas >200 square feet of soil disturbance in the immediate foreground (300 feet or what can be seen from road).

2.5.6.1.2—Mitigation for Noxious Weeds

- Incorporate the Best Management Practices (BMPs) identified in the PNW Region USDA-Forest Service Noxious Weed Strategy (1999).
- Remove mud, dirt, and plant parts from off-road equipment before it is moved into the analysis area. Cleaning must occur off National Forest lands (This does not apply to service vehicles that will stay on the roadway, traveling frequently in and out of the analysis area).
- Minimize ground disturbance with all activities.

- Inquire about all noxious weed sites before implementing ground disturbing activities (harvest, precommercial thinning, prescribed fire, stream channel work, trail construction, and any off road ATV use for Forest Service, or contract work, etc.). Actions or timing of actions may be modified to avoid these sites or avoid spreading noxious weeds.
- Modify timing of vegetative management (harvest or burn) in units with known noxious weed sites.
- Treat all noxious weed sites in rock sources before removal of rock is allowed for project work to reduce potential noxious weed spread. Monitor all rock sources annually.
- Apply native or non-persistent non-native seed to soils bared by ground-disturbing activities.
- Apply only certified weed-seed-free straw if used for soil stabilization and erosion control.

2.5.6.1.3—Mitigation for Hazard Tree Removal

- Remove felled hazard trees outside of RHCAs unless needed for woody debris standard for wildlife habitat and long-term site productivity.
- Remove portion of felled hazard trees within RHCAs that lies within the road prism. The portion of the felled tree outside the road prism will be left for terrestrial and fish habitat.

2.5.6.1.4—Mitigation for Working Within RHCAs

- In RHCAs work using heavy equipment would be completed when soil moisture is 10% or less. Accomplish actions recommended within stream channels (e.g. in-stream structure placement, culvert removal), from July 15 through August 15 reducing possible stress on fish populations due to potential sediment delivery (*Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources,* 1997). By accomplishing project work during this time, when stream flows are at their lowest levels, sediment input to streams would be minimized. This time is outside fish spawning periods, reducing possible impacts to spawning adults and their eggs. Exact timing may be altered depending on stream conditions, fish movement, and depth of water flow. Changes in timing will require a recommendation by a fisheries biologist or hydrologist, consultation with appropriate agencies and approval of the Responsible Official.

2.5.6.1.5—Timing Restrictions

- Adhere to seasonal restrictions for specified wildlife species as identified in Table 62. Prohibited management activities include all Forest Service and contracted activities, including but not limited to, such activities as timber harvest, precommercial thinning, prescribed fire, and roadwork. A restriction may be waived based on a District biologist's recommendation and the Responsible Official's approval.

Table 62—Timing Restrictions for wildlife

Species	Restriction
Bull Trout, Steelhead, and Chinook Salmon (applies to in-channel activities in fish-bearing streams)	Activities can occur: July 15 to August 15
Lynx Denning Habitat (within ¼ mile of denning habitat)	Activities can occur: September 1 to April 30
Bald Eagle Winter Roosts (within ½ mile)	Activities can occur: March 16 to November 30
Occupied▲ Goshawk Sites: Within post-fledgling areas (PFA's) Within ½ mile of nests or 30-acre nest areas	Activities can occur: October 1 to March 31
Other Occupied▲ Accipiter Nest Sites (Sharp-shinned Hawk and Cooper's Hawk)	Activities can occur: September 1 to February 1
Other Occupied▲ Raptor Nest Sites (within ½ mile)	Activities can occur: August 1 to February 1
Big Game Winter Range∆	Activities can occur: April 1 to November 30
Big Game Winter Range – Seasonal Road Closure Restricts Vehicular Traffic On Forest Roads: 4559-000, -283, -284, 592, 642 and –956.	Activities can occur: April 1 to November 30
Identified Calving and Fawning Areas	Activities can occur: July 1 to April 30
▲Nests need to be occupied for restriction to apply. ∆Restriction may be waived during mild winter conditions.	

2.5.6.1.5—Mitigation for Burn Prescriptions

Silvicultural Mitigation

- Maintain a low intensity ground fire with average flame lengths less than 4 feet. The objective is to reduce the amount of material less than 3 inches in diameter, which is the prime carrier of fire.
- Limit tree scorch from fire to no more than 30% of the live crown of the dominant and co-dominant trees.
- Keep tree mortality to less than 10% for trees greater than 7-inch dbh. For trees less than 7-inch dbh, mortality should not exceed about 85% with a minimum of 15% of the understory trees retained in patches of at least one acre for wildlife hiding cover. In some locations, mortality thresholds would be set lower; see Soils, Hydrology Fishery Section, Wildlife Section and remainder of this section for details.
- Avoid young plantations.
- Limit mortality to 10% or less in areas where natural regeneration is needed to stock site in one quarter acre area (or larger) where feasible;
- Avoid burning of mountain mahogany patches greater than one-quarter acre and carefully ignite around individuals and patches to minimize mortality from fire.
- Reduce risk of damage of crown scorch or bole scorch which may kill genetic trees by a combination of one, or more of the following: 1) reduce excessive flammable material 50 feet around genetic trees; 2) adjust ignition pattern by starting ignition at base of genetic tree;3) burn a strip around the genetic tree, 4) wet down the area around the genetic tree; or 5) rake duff from base of trees if needed in combination with options above.

- In reforestation units, protect reserve trees during site preparation burning by: 1) pulling material away from the reserve tree, 2) burning material around trees prior to the prescribed fire ignition, or 3) building a hand line around the tree, as needed.

Soils, Hydrology, Fishery Mitigation

- Avoid ignition in all RHCAs, except where handpile burning is prescribed in aspen stands.
- Avoid building fire lines unless needed for suppression. If fire lines are constructed, use best management practices such as water bars and seeding to minimize possible sediment delivery to stream channels.
- Use water for fire suppression within RHCAs; no retardants will be allowed.
- Limit mortality of trees to no more than 5% of all sizes of trees in RHCAs.
- Retain a minimum of ¼" duff layer over 90% of the area for soil protection.

Wildlife

- Retain higher levels of wildlife cover within *Land and Resource Management Plan Amendment 2* (LRMP2) corridors and the *Key Linkage Area* (KLA). Retain crown closure at the upper 1/3 of site potential. Retain trees 8 feet tall or greater at a minimum of 180 trees per acre. Management of the KLA differs from management of the LRMP2 corridors in that only 1/3 of the KLA needs to meet this mitigation at any point in time. See District biologist to identify stands which require mitigation.

  In Alternative 2, 3 and 4, this prescription will be applied to treatments within all LRMP2 corridors and the KLA. In Alternative 5, only the crown closure mitigation will apply and only in LRMP2 corridors.
- Maintain down logs for wildlife habitat and long-term site productivity as described under harvest mitigation. Fire prescription parameters would ensure that consumption does not exceed three-inches total diameter reduction on the required large logs.
- Retain wildlife snags at levels to provide for 100% population levels of primary cavity excavators as described under harvest mitigation. Avoid ignition within 100 feet of snags 15 inches dbh to 20 inches dbh. Use of helicopters may result in ignitions closer than 100 feet, so if used, monitoring will be needed to determine of snags are being retained as needed.

  Larger snags can be of greater value to some primary cavity excavators and less easily replaced if destroyed. For snags 21 inches dbh or greater, reduce risk of damage by a combination of one or more of the following: 1) building fire line around snag; 2) rake duff from base of trees; or 3) wet down area around snag. Protections will be suited to the specific area.
- Avoid prescribed fire activities within 30-acres goshawk nest areas. Protect all other known raptor nests with a buffer of 100 feet around the nest tree.
- Prohibit prescribed fire in Dedicated Old Growth (DOG) areas. Permit prescribed fire in Replacement Old Growth (ROG) areas and Pileated Woodpecker Feeding Areas (PWFAs); however, limit mortality of trees to no more than 5% of all sizes of trees.
- Provide blue grouse winter roosts, large mistletoe infested or large limbed Douglas-fir trees retained at 5 to 8 trees per acres. Apply along ridge tops and large scab openings, where available.
- Protect "identified" calving and fawning areas using the seasonal restriction identified in Table 62. In areas not specifically identified for calving and fawning, burning crews will watch for lone elk or deer. If crews see lone animals, they will search the immediate area for calves or fawns and avoid lighting where young animals are discovered. Burning crews do not need to monitor elk and deer outside the May 1st to June 30th window.

Air Quality

- Adhere to the Oregon Smoke Management Program to minimize smoke impacts and to protect air quality. These conditions will be met from July 1 to September 15 in Class 1 areas (Strawberry Mountain Wilderness is the closest Class 1 area).

Noxious Weeds

- Treat populations of noxious weeds that can be stimulated from a burn prior to applying prescribed fire or do not allow the infested site to burn e.g. tansy ragwort, common toadflax. Inquire about possible new noxious weed sites before applying prescribed fire.

Public Safety and Private/Federal Property

- Protect improvements such as private land, range fences, survey monuments, bearing trees, dispersed campsites, and aspen fences.

2.5.6.1.6—Mitigation for Heritage Resource

- Protect cultural resource sites in accordance with the National Historic Preservation Act of 1966 and the Programmatic Agreement among the Forest Service, Advisory Council on Historic Preservation, and Oregon State Historic Preservation Officer. There are two different types of cultural resource values present in the Southeast Galena Analysis area. 1) Some sites in the planning area are valued because they can potentially yield scientific or scholarly information through the study of their artifacts, features, and sediments. 2) Other sites are valued because they can visually convey an association with important patterns of historic events or display distinctive architectural or engineering characteristics. Many of these latter sites are associated with broad historic patterns such as the development of the western mining frontier, homesteading, or railroad logging.

  1) For sites that possess potential scientific data potential, we are primarily concerned with mitigating ground disturbance. In the vast majority of cases, sites of this type will be totally avoided by management activities. However, 15 sites of this type are within recommended harvest units. Mitigation that will be used in all action alternatives for activities within the perimeter of this site type include:

     1a) Allow only low intensity prescribed fire within the boundaries of most archaeological sites. Concentrated heavy fuels such as piles of slash will not be allowed to burn within these sites.

     1b) Avoid prescribed fire in archaeological sites that are known to hold fire sensitive material such as wood.

     1c) Avoid construction of mechanical fire line within the boundaries of this site type.

  2) For heritage sites that visually illustrate an association with important episodes of history or display distinctive architecture or engineering design, we are primarily concerned with mitigating damage to the visual appearance. Most of the activities set forth in the action alternatives will not significantly alter the visual appearance of this site type. Mitigation that will be used in all action alternatives for activities within the perimeter of this type of site include:

     2a) Reclamation of sites to a state that is as a near as practical to its original condition. An example includes re-contouring landscape features at the close of the activity.

2.5.6.1.7—Mitigation for Aspen

- Within aspen groves, conifers of 21 inches and greater dbh will be evaluated on a site specific basis for adverse impacts on the clone. These trees may be considered for snag creation by topping, girdling, or inoculation. They will not be removed as timber harvest.

- Prohibit skidding within 25 feet of stream's channel, spring, or wetlands. Within these 25-foot zones, conifers greater than 8" dbh and less than 21" dbh are to be girdled and left standing as snags. Permit skidding outside these 25-foot zones within RHCAs when ground is dry or frozen to prevent compaction and the formation of ruts or furrows.
- Permit use of ATVs for delivery of fence materials to the site, but prohibit ATV within 25 feet of stream channel.
- Avoid skidding across adjacent non-forested lands, where feasible, to minimize displacement, erosion, and irreversible damage to soils.

2.5.6.1.9—Mitigation for Dispersed Campsites

- Avoid implementation of these projects within RHCAs from July 15 through August 15 reducing possible stress on fish populations due to potential sediment delivery. This is the time of year when stream flows are at their lowest, reducing the chance of sediment reaching the stream. This time is outside fish spawning periods, reducing possible impacts to spawning adults and their eggs. Exact timing could be altered depending on stream conditions, fish movement, and depth of water flow. The responsible official would make this decision with consultation of appropriate specialists and agencies.

2.5.6.2 MITIGATION COMMON TO ACTION ALTERNATIVES 2, 3, & 5

2.5.6.2.2—Mitigation for Harvest Operations

Human Utilization and Aesthetic Consideration

- Retain all live trees 21 inch dbh or larger except for those determined to be hazardous to logging operations or other forest users, or if they need to be removed for roadwork.
- Cut stumps no more than six-inches high for 75 feet on both sides of Forest Service established trails. Post signs at trail heads, closing them to public use during logging operations. Remove hazard trees along trails. Identify opportunity to remove trees to open up views along the trails.

Soils, Hydrology, Fishery Mitigation

- Prohibit the use of mastication/crushing machines on soils during wet conditions when prone to compaction.
- Avoid skidding on unsuitable, non-forested land such as scab flats, where feasible, to minimize displacement, erosion and irreversible damage to soils. Cover skid trails on unsuitable land after use with enough slash to slow water movement and prevent soil movement. Designate and approve skid trail locations before logging, to minimize soil impacts.
- Use water, or lignin sulfate dust palliative or similar approved material for dust abatement.
- Prior to use, all water sources for road construction, reconstruction, and dust abatement will be reviewed by the fisheries biologist or hydrologist to ensure that no adverse alterations to the stream channel or bank stability occur.
- Rehabilitate pre-designated points where crossing may occur across ephemeral draws. Once harvest activities are complete, use slash and large wood to reduce potential erosion concern at these crossings.
- Use native surface roads for log haul only when dry or frozen.
- Reduce risk of erosion on road construction and reconstruction with measures determined on a site-specific basis including but not limited to season of road work to be accomplished, sediment fences, and hay bales.

- Minimize soil compaction in tractor units by not allowing skid trails to exceed about 14 feet in total width over 90 percent of the length except where otherwise authorized. Skid trails spacing will not generally be closer than 120 feet, center-to-center. Exceptions will exist where the skid trails approach the landing site.
- Minimize soil compaction in skyline units by locating cable corridors at intervals of about 150 feet. Corridor width will be kept to about 4 feet on either side of the center line. Exceptions will exist where corridors approach the landing site.
- Locate landings outside of draw bottoms. Where a conflict arises between landing location and the use of existing skid trails, it may be acceptable to trade off additional skid trails against draw bottom landings.
- Water bar and seed skid roads and skyline corridors that are >20 percent slope and areas of soil disturbed by harvest activities within 200 feet of stream for erosion control.
- Alleviate areas determined to exceed or is close to 20 percent detrimental compaction. A winged subsoil ripper will be used to help reverse this trend. Subsoiling should occur when soil moisture conditions are less than 20 percent.

Heritage Resources

- Utilize previously constructed skidding and decking patterns during skidding operations. This activity will be closely monitored by archaeologists or certified cultural resource technicians.
- Allow over snow tractor skidding within heritage site boundaries only under certain conditions. This activity will only occur if there is 20" of snow or more on the ground and temperatures are less than 35 degrees F. It will be closely monitored by archaeologists or certified cultural resource technicians.
- Allow skyline yarding over Cultural Resource sites with full log suspension.
- Applying operating techniques that do not result in visually conspicuous disturbance to sites or landscapes. This may include filling historic mining ditches with logs in order to bridge equipment crossings, or flush cutting stumps that are on historic sites or landscapes.

Noxious Weeds

- Treat weed-infested landings, skid trails, and helibases before logging activities occur.

Wildlife

- Develop structural diversity for wildlife habitat across each commercial thin (HTH) unit by varying tree density up to 50%. Patches should be 0.25 acre to 1 acre in size to replicate historic patch size (Agee 1993). Higher tree density areas should provide higher levels of cover in the short-term. Lower density areas will open up forest stands dramatically, permitting natural regeneration to occur; which in turn should provide patches of hiding cover in about 20 years.
- In understory removal (HUR) and pre-commercial thin (SPC) units, modify treatments to retain a minimum of 15% of each stand in untreated patches scattered throughout the unit to provide hiding cover. Each untreated area will be ¼ to 1 acre in size. Patches would be located adjacent to open roads, meadows, and natural openings. Where complimentary, these patches may be located to protect retained snags.
- Retain wildlife snags at levels to provide for 100% population levels of primary cavity excavators. Within the ponderosa pine, mixed conifer, and true fir communities, retain a minimum of 2.39 dead trees per acre, 21 inches dbh or greater. If 21-inch dbh trees are not available, retain 2.39 dead trees per acre of the largest representative diameter. Apply these guidelines unless these snags are considered to be a safety hazard during logging operations or if they need to be removed for roadwork. Under Alternative 3 exclusively, retain 4.0 wildlife

snags 21 inches dbh or greater, where available, to provide additional foraging opportunities for pileated woodpeckers. If 21-inch dbh trees are not available, retain 4.0 dead trees per acre of the largest representative diameter.

- Retain trees damaged during logging operations in harvest areas lacking in snag habitat, unless determined to be a safety hazard.
- Do not thin live trees around snags 12 inches dbh and greater to prevent the need to fall snags as hazard trees during tractor logging operations. The width of the unthinned band should be equivalent to the height of the snag.
- Retain 15 to 20 trees per acres and greater or equal to 12 inch dbh within recommended shelterwood (HSH) or understory removal (HUR) silvicultural prescriptions for future green tree replacements.
- Maintain down logs for wildlife habitat and long-term site productivity by maintaining the levels indicated below.

Table 63 Down Logs for wildlife

SPECIES	PIECES PER ACRE	MINIMUM DIAMETER @ SMALL END	MINIMUM PIECE LENGTH	TOTAL LENGTH FEET/ACRES
Ponderosa Pine	3-6	12 inch	>6 feet	20-40
Mixed Conifer	15-20	12 inch	>6 feet	100-140

- Retain higher levels of wildlife cover within *Land and Resource Management Plan* Amendment 2 (LRMP2) corridors and the Key Linkage Area (KLA). Retain crown closure at the upper 1/3 of site potential. Retain trees 8 feet tall or greater at a minimum of 180 trees per acre. Management of the KLA differs from management of the LRMP2 corridors in that only 1/3 of the KLA needs to meet this mitigation at any point in time. See District biologist to identify stands which require mitigation. In Alternative 2, 3 and 4, this prescription will be applied to treatments within all LRMP2 corridors and the KLA. In Alternative 5, only the crown closure mitigation will apply and only in LRMP2 corridors.
- Maintain concentrations of blowdown in lynx habitat to provide denning opportunities for Canada lynx. In salvage harvest (HSV) units and in RHCAs where blowdown is designated for removal, 10% of total acres will be retained in untreated patches of 2 to 5 acres. Patches will be located to meet the best conditions for denning habitat, i.e., concentrations of blowdown located over a variety of topographical types including ridges, saddles and riparian areas. A District wildlife biologist will assist in identifying concentrations of blowdown to leave untreated.
- Provide blue grouse winter roosts, large mistletoe infested or large limbed Douglas-fir trees retained at 5 to 8 trees per acres. Apply along ridge tops and large scab openings, where available.
- Avoid timber harvest and precommercial thinning within 30-acres goshawk nest areas. Protect all other known raptor nests with a buffer of 100 feet around the nest tree.

2.5.6.3 Mitigation Common to Action Alternatives 2 and 5

2.5.6.3.1—Mitigation for Noxious Weed Prevention & Competing Vegetation—Herbicide Use

- Restrict herbicide use in RHCAs to the chemical glyphosate, and only use to treat noxious weeds. Do not spray directly onto water, or where soils are saturated. Apply with a wick applicator or spot sprayer.
- Avoid applying herbicides when wind speed exceeds 5 mph, or when weather forecasts predict rain within 48 hours.
- Apply herbicide to appropriate period of plant development to maximize effectiveness.
- Prohibit herbicide mixing, and filling and cleaning of spray equipment within RHCAs.
- Carry only enough herbicides daily to be used that day. Mix only enough to use that day.
- Secure herbicide containers and prevent them from tipping during transport.
- Develop spill plans and protocols prior to treatment. Emergency spill equipment must be on hand and sufficient to deal with herbicide amounts in transport.
- Use manual control methods as follow-up treatments to target plants that survive the herbicide application within any given growing season (i.e. use chemical treatment only once per year on a given site) to prevent seed set.
- Precautions will be taken to assure that equipment used for storage, transport, mixing, or application would not leak herbicides into water or soil.
- The burning of vegetation in the same year in which it has been treated with herbicides is prohibited.

2.5.6.3.2—Mitigation for Pocket Gopher Control—Pesticide Use

- Collect or promptly dispose of dead carcasses when discovered during routine inspections of strychnine treatments, to reduce chance of secondary poisoning of raptors or scavengers.
- Prohibit strychnine baiting within ½ mile of Canada lynx denning habitat, and at distances in excess of ½ mile, where lynx plant associations are continuous between denning habitat and a reforestation unit. Trapping and fumigation would be permitted in these areas.
- Prohibit strychnine baiting within ½ mile of dedicated and replacement old-growth areas managed for American pine marten; trapping and fumigation will still be permissible control measures for these areas.
- Prohibit strychnine baiting and fumigation within RHCAs; trapping would be permissible.

2.6 Alternative Relationship to Key Issues:

The following tables briefly describe how each alternative does or does not respond to the key issues as described in Chapter 1.0.

2.6.1 Alternative 2 and Key Issues

Table 64—Alternative 2 and Key Issues

ISSUE #1 Restricted Access	**ISSUE #2** Effects of ATV Use	**ISSUE #3** Effects of Ground Based Systems	**ISSUE #4** Effects of Heavy Equipment in RHCAs	**ISSUE #5** Effect of Prescribed Fire in RHCAs	**ISSUE #6** Inadequate RHCA Size
An access plan was developed that included constructing, reconstructing, decommissioning, and closing of roads. The existing closed road system in Deerhorn and Little Butte Creek drainages would be decommissioned.	This alternative proposes to improve ATV use on Davis Creek Trail due to current RHCA impacts and safety concerns. Educational signs about off trail ATV use would be posted at Trailheads.	Tractor skidding and connected actions such as new roads, pre-commercial thins, and prescribed fire with associated mitigation is included in the alternative.	This alternative proposes to use heavy equipment with mitigation to help minimize anticipated impacts.	Ignition would not occur within RHCAs, however, fire backing or creeping into these areas at low intensity would be allowed, if within prescription.	Standard PacFish buffers are included in this Alt.
ISSUE #7 Blow down Harvest in RHCAs	**ISSUE #8** Effects of Toxic Chemicals	**ISSUE #9** Inadequate Amount of Treatment	**ISSUE #10** Insufficient Pileated Habitat	**ISSUE #11** Manage KLAs & LRMP 2 Corridors	**ISSUE #12** Effects of Managing Roadless Areas
50 to 80% of the blowdown trees in the outer ½ of the RHCAs in Vinegar Creek would be removed if above *LRMP* Standards. This Alt. has one new stream crossing and proposes to remove conifer from aspen groves located within RHCAs.	This alternative proposes to use chemicals with mitigation for controlling competing vegetation, noxious weeds, and pocket gopher populations.	Of the total area identified as needing silvicultural treatment, about 50% would be mechanically treated.	This Alt. would retain 2.4 large snags per acre, where available and adjust DOGs, ROGs and PWFAs (600 – acres) meeting LRMP standards.	This Alt. applies a harvest prescription retaining additional trees per acre for both KLAs and wildlife corridors.	This Alt. would harvest, pre-commercial thin, and prescribe fire in Dixie Butte Roadless Area and prescribe fire in Greenhorn Mountain Roadless Area. Trail projects would occur in both Roadless Areas.

2.6.2 Alternative 3 and Key Issues

Table 65—Alternative 3 and Key Issues

ISSUE #1 Restricted Access	**ISSUE #2** Effects of ATV Use	**ISSUE #3** Effects of Ground Based Systems	**ISSUE #4** Effects of Heavy Equipment in RHCAs	**ISSUE #5** Effects of Prescribed Fire in RHCAs	**ISSUE #6** Inadequate RHCA Size
Similar to Alt. 2. An access plan was developed that included constructing, reconstructing, decommissioning, and closing of roads. The existing closed road system in Deerhorn and Little Butte Creek drainages would be decommissioned.	This alternative addresses this issue in the same manner as Alt. 2. Improvements are recommended on Davis Creek. Trail and due to RHCA impacts and safety concerns. Educational signs about off trail ATV use would be posted at Trailheads..	Same approach as Alt. 2 but with less tractor skidded acres and fewer new roads needed to implement this alternative. Other actions of pre-commercial thin and prescribed fire would continue.	In this alternative, no heavy equipment would be used within RHCAs. Where practical, hand-crew would be used to accomplish some of the work.	Ignition would not occur within RHCAs. If prescribed fire from the upland areas approach RHCAs, it would not be allowed to burn into RHCAs.	An additional 25' on each side of the RHCA would be applied to the Category IV streams located on identified sensitive soils. This additional 25' would be a no equipment buffer; trees may still be removed.
ISSUE #7 Blow down Harvest in RHCAs	**ISSUE #8** Effects of Toxic Chemicals	**ISSUE #9** Inadequate Amount of Treatment	**ISSUE #10** Insufficient Pileated Habitat	**ISSUE #11** Effects on Connectivity for Wildlife	**ISSUE #12** Effects of Managing Roadless Areas
No harvest or removal of trees would occur within blowdown area of Vinegar Creek RHCAs. This Alt. has one new stream crossing and would girdle or drop and leave conifer in aspen groves located within RHCAs.	This alternative would not use chemicals to control competing vegetation, noxious weeds, or pocket gophers.	Of the total area identified as needing silvicultural treatment, about 38% would be mechanically treated.	This Alt. would retain 4 large snags per acre, where available and increase PWFAs to 900-acres.	This Alt. applies a harvest prescription retaining additional trees per acre in KLAs. Wildlife corridors would not be treated in this Alt.	This Alt. would not manage the forest stands or apply prescribed fire in both Dixie-Butte or Greenhorn Mountain Roadless areas. Trail work would continue as recommended in Alt. 2.

2.6.3 Alternative 4 and Key Issues

Table 66—Alternative 4 and Key Issues

ISSUE #1 Restricted Access	**ISSUE #2** Effects of ATV Use	**ISSUE #3** Effects of Ground Based Systems	**ISSUE #4** Effects of Heavy Equipment in RHCAs	**ISSUE #5** Effect of Prescribed Fire in RHCAs	**ISSUE #6** Inadequate RHCA Size
Similar to Alts. 2 & 3 but with less construction due to no recommended harvest. The existing closed road system in Deerhorn and Little Butte Creek drainages would be decommissioned.	Davis Creek Trail would be reclassified to accommodate foot and horse traffic only. Motorized use would not be allowed, eliminating RHCA impacts from ATV use.	No harvest is recommended in this alternative, pre-commercial thins and prescribed fire would still occur.	Same as Alt. 3. No heavy equipment would be used within RHCAs but where practical, hand-crew would be used.	Same approach as in Alt. 2. Ignition would not occur within RHCAs, however, fire backing or creeping into these areas at low intensity would be allowed, if within prescription.	This issue is not a factor in this Alternative due to no skidding equipment being used, therefore the standard PacFish buffers would remain.
ISSUE #7 Blowdown Harvest in RHCAs	**ISSUE #8** Effects of Toxic Chemicals	**ISSUE #9** Inadequate Amount of Treatment	**ISSUE #10** Insufficient Pileated Habitat	**ISSUE #11** Manage KLAs & Connective Corridors	**ISSUE #12** Effects of Managing Roadless Areas
No harvest or removal of trees would occur within blowdown area of Vinegar Creek RHCAs. This Alt. has no new stream crossing and would girdle or drop and leave conifer in aspen groves located within RHCAs.	As with Alt. 3, this alternative would not use chemicals to control competing vegetation, noxious weeds, or pocket gophers.	Of the total area identified as needing silvicultural treatment, about 13% would be mechanically treated.	No harvest is recommended in this alternative. Some reduction may occur forest user safety. Some may be loss due to prescribed fire but others are expected to be created due to the same action.	This Alt. applies a pre-commercial thin prescription retaining additional trees per acre for both KLAs and connective corridors.	This Alt. would pre-commercial thin in Dixie Butte Roadless Area and prescribe fire would be applied in both Dixie Butte and Greenhorn Mountain Roadless Areas. Trail projects would be applied in both Roadless areas.

2.6.4 Alternative 5 and Key Issues

Table 67—Alternative 5 and Key Issues

ISSUE #1 Restricted Access	**ISSUE #2** Effects of ATV Use	**ISSUE #3** Effects of Ground Based Systems	**ISSUE #4** Effects of Heavy Equipment in RHCAs	**ISSUE #5** Effect of Prescribed Fire in RHCAs	**ISSUE #6** Inadequate RHCA Size
Similar to Alt. 2 except with more land accessed by additional roads increasing tractor skidding and decreasing helicopter yarding. More roads would be left open compared to the other action alternatives. Plus, the existing, closed road system in Deerhorn and Little Butte Creek drainages would be reconstructed and left opened.	This issue would be addressed in the same manner as with Alts. 2 and 3. Improvements would occur to Davis Creek Trail due to RHCA impacts and safety of trail use. Educational signs discussing off trail ATV use concerns would be posted at the trailheads. Plus, an additional ATV loop trail would be added to the Davis Crk Trail.	Same approach as Alts. 2 & 3, however, there would be more tractor skidded acres and more miles of new roads needed to implement this alternative. Proper mitigation would be applied.	Same approach as in Alt. 2. Mitigation is included to help minimize impacts from projects within RHCAs recommended to use heavy equipment.	Same approach as in Alts. 2 and 3. Ignition would not occur within RHCAs, however, fire backing or creeping into these areas at low intensity would be allowed, if within prescription.	Standard Pac-Fish buffers are included in this Alt.
ISSUE #7 Blowdown Harvest in RHCAs	**ISSUE #8** Effects of Toxic Chemicals	**ISSUE #9** Inadequate Amount of Treatment	**ISSUE #10** Insufficient Pileated Habitat	**ISSUE #11** Manage KLAs & Connective Corridors	**ISSUE #12** Effects of Managing Roadless Areas
Same approach as Alt. 2. 50 to 80% of the blowdown trees in the outer ½ of the RHCAs in Vinegar Creek would be removed if above *LRMP* Standards. This Alt. has two new stream crossing and proposes to remove conifer from aspen groves located within RHCAs..	Same as Alt. 2. Chemicals with mitigation for controlling competing vegetation, noxious weeds, and pocket gopher populations would be used..	Of the total area identified as needing silvicultural treatment, about 57% would be mechanically treated..	Same as Alt. 2. This Alt. would retain 2.4 large snags per acre, where available and adjust DOGs, ROGs and PWFAs (600-acres) meeting LRMP standards.	This Alt. applies the standard harvest prescription within KLAs to address Silvicultural concerns. The connective corridors would receive the prescription retaining additional tree as in Alt. 2.	Same as Alt. 2. This Alt. would harvest, pre-commercial thin, and prescribe fire in Dixie Butte Roadless Area and prescribe fire in Greenhorn Mountain Roadless Area. Trail projects would occur in both Roadless Areas.

2.7 Comparison Summary of the Alternatives

This section compares the alternatives in a summary form of the information presented throughout this document.

2.7.1 Project Comparison Table

The following table presents summaries of the projects per alternative in a side-by-side comparison. This table displays the values and numbers of each project across the range of alternatives arranged by the major categories of Aquatics, Vegetation, and Infrastructure.

Table 68—Project Comparison Table(see notes at end of table page 105).

PROJECT	ALT 1	ALT. 2	ALT. 3	ALT. 4	ALT. 5
AQUATICS					
Hydrology					
Streamside/Riparian Hardwood Protection	0	4 Miles 12 Acres	4 Miles 12 Acres	4 Miles 12 Acres	4 Miles 12 Acres
Streamside/Riparian Planting and Protection	0	16 Miles 16 Acres	16 Miles 16 Acres	16 Miles 16 Acres	16 Miles 16 Acres
Channel/Streamside Projects	0	90 Miles	90 Miles	90 Miles	90 Miles
Area Projects	0	1,450 Acres	1,450 Acres	1,450 Acres	1,450 Acres
Channel/Floodplain Rehabilitation	0	3 Miles 14 Acres	0 Miles 0 Acres	0 Miles 0 Acres	3 Miles 14 Acres
Fisheries					
New Instream Structures	0	79 Structures	0 Structures	0 Structures	79 Structures
Improve Existing Instream Structures	0	36 Structures	36 Structures ♠	36 Structures ♠	36 Structures
Riparian Planting ♣	0	5.5 Miles	5.5 Miles	5.5 Miles	5.5 Miles
Culvert Removal, Improvement or Replacement on Fish Bearing Streams	0	2 Removal 22 Improve or Replace	2 Removal 22 Improve or Replace	2 Removal 22 Improve or Replace	2 Removal 22 Improve or Replace
Old Growth					
Additional Replacement Old Growth Areas	0	1,592 Acres	1,592 Acres	1,592 Acres	1,592 Acres
Additional Dedicated Old Growth Acres	0	115 Acres	115 Acres	115 Acres	115 Acres
Delineated Pileated Feeding Areas	0	747 Acres	1,505 Acres	747 Acres	747 Acres
Expanded pileated home ranges	0	0	0	1505	0
Conifer and Associated Vegetation					
Commercial Thin	0	5,720 Acres	4,390 Acres	0 Acres	7,060 Acres
Commercial Thinning in Connectivity Corridors	0	1,230 Acres	900 Acres	0 Acres	220 Acres
Shelterwood	0	1,690 Acres	1,200Acres	0 Acres	2,600 Acres
Salvage	0	250 Acres	250 Acres	0 Acres	250 Acres
Understory Removal	0	880 Acres	550 Acres	0 Acres	1,230 Acres
Precommercial Thin	0	2,160 Acres	1840 Acres	2,100 Acres	3,080 Acres
Precommercial Thin in Connectivity Corridors	0	950 Acres	820 Acres	640 Acres	40 Acres
Total Mechanical (incl. Harvest & Precommercial)	0	12,880 Acres	8,210 Acres	2,730 Acres	1,220 Acres
Tractor Skid	0	5,090 Acres	4,580 Acres	0 Acres	6,320 Acres
Skyline Skid	0	2,110 Acres	1,720 Acres	0 Acres	2,610 Acres
Helicopter Yard	0	2,670 Acres	1,090 Acres	0 Acres	2,570 Acres
Volumes Associated with a Timber Sale	0	44 MMBF	33 MMBF	0 MMBF	55 MMBF
Mechanically Treated Acres in Roadless Areas	0	930 Acres (Harvest & SPC)	0 Acres	203 Acres (SPC Only)	1370 Acres (Harvest & SPC)
Other Wood Products ♥	0	69 MBF	14 MBF	0 MBF	100 MBF
New Roads	0	17.7 Miles	17.0 Miles	2.2 Miles	22.2 Miles

PROJECT	ALT 1	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Undesirable Small Tree Removal	0	2,570 Acres	1,790 Acres	0 Acres	3,810 Acres
Hand Line needed for Prescribed Burn	0	37.6 Miles	28 Miles	0 Miles	57.1 Miles
Machine Line needed for Prescribed Burn	0	11.6 Miles	8.5 Miles	0 Miles	20.6 Miles
Prescribed Burn Associated with Mech. Treatment	0	2,550 Acres	1,800 Acres	0 Acres	3,830 Acres
Hand Pile and Burn Associated with Timber Sale	0	1,250 Acres	940 Acres	0 Acres	1,320 Acres
Sub-Soil	0	190 Acres	190 Acres	0 Acres	270 Acres
Competing Vegetation Control	0	900 Acres	740 Acres ▲	0 Acres	1,320 Acres
Conifer Plant	0	1,930 Acres	1,440 Acres	0 Acres	2,840 Acres
Pocket Gopher Control	0	1,690 Acres	1,200 Acres ▲	0 Acres	2,600 Acres
Ungulate Browse Control	0	1,690 Acres	1,200 Acres	0 Acres	2,600 Acres
Yard Tops	0	5,370 Acres	4,730 Acres	0 Acres	5,640 Acres
Reserve Tree Protection ♦	0	20,230 Trees	15,520 Trees	0 Trees	29,540 Trees
Prescribed Fire ◄	0	23,750 Acres	19,190 Acres	19,160 Acres	24,770 Acres
Roadless Prescribed Fire	0	1500 Acres	720 Acres	720 Acres	1500 Acres
Total Upland Acres Treated ◊	0	22,010 Acres	18,850 Acres	19,950 Acres	23,000 Acres
Aspen Stands					
Conifer Treatment	0	25 Sites	25 Sites	25 Sites	25 Sites
Associated Volume	0	35.5 MBF	0 MBF	0 MBF	35.5 MBF
Hand Pile and Burn	0	25 Sites	25 Sites	25 Sites	25 Sites
Buck & Pole Fence	0	13 Sites @ 19 Acres	13 Sites @ 19 Acres	13 Sites @ 19 Acres	13 Sites @ 19 Acres
Plastic Fence	0	12 Sites @ 11 Acres	12 Sites @ 11 Acres	12 Sites @ 11 Acres	12 Sites @ 11 Acres
Noxious Weeds					
Manual Treatment	0	4 Sites @ 0.4 Acres	10 Sites @ 1.9 Acres	10 Sites @ 1.9 Acres	4 Sites @ 0.4 Acres
Chemical Treatment	0	6 Sites @ 1.5 Acres	0 Sites	0 Sites	6 Sites @ 1.5 Acres
Treat Quarry Sites	0	Treat 15 Sites Chemically @ 42 Acres	Treat 15 Sites Manually @ 42 Acres	Treat 15 Sites Manually @ 42 Acres	Treat 15 Sites Chemically @ 42 Acres
Roads					
Total Road Miles	267	219 Miles	218 Miles	202 Miles	228 Miles
Total Road Density	3.5 mi/sq.mi	2.8 mi/sq.mi.	2.8 mi/sq.mi	2.6 mi/sq.mi	2.9 mi/sq.mi
Reconstructed Roads	0	165 Miles	165 Miles	165 Miles	171 Miles
Decommissioned Roads	0	67 Miles	67 Miles	67 Miles	62 Miles
RHCA Decommissioned Roads	0	23.9 Miles	23.9 Miles	23.9 Miles	23.5 Miles
RHCA Reconstructed Roads	0	23.2 Miles	23.2 Miles	23.2 Miles	24.7 Miles
Trails and Trailheads					
Decommissioned Trails	0	1.7 Miles	1.7 Miles	1.7 Miles	1.7 Miles
Reconstructed Trails	0	8.3 Miles	8.3 Miles	0 Miles	8.3 Miles
Constructed Trails	0	2.3 Miles	2.3 Miles	2.3 Miles	7.9 Miles
New Trail Heads	0	2	2	0	2
Removed Trail Heads	0	4	4	4	4
Dispersed Camp Sites					
New Dispersed Camp Areas	0	3	3	3	3
Improved Dispersed Camp Areas	0	2	2	2	2
Removed Dispersed Camp Areas	0	3	3	3	3

PROJECT	ALT 1	ALT. 2	ALT. 3	ALT. 4	ALT. 5

NOTE: ♠ Would not be implemented if heavy equipment is needed to improve structures

♣ Plus work associated with instream structure projects

MMBF = Million Board Feet BF = Board Feet CCF = Cubic Board Feet

♥ Other wood products may include post & poles, firewood, chips, etc. from tractor ground only. An estimate of 2,000 BF per acre was used

♦ Is an average and doesn't necessarily include all reserved wildlife trees

◄ Includes prescribed fire in and out of harvest units

◊ Includes harvest not Associated with Timber Harvest, and Prescribed Fire acreage outside the mechanically treated units.

▲ No herbicides or rodenticides to be used in Alt.3 only hand methods & trapping

2.7.2 Aquatic Project Comparisons—Equivalent Roaded Area (ERA)

The results of the ERA model are shown for each subwatershed in the following tables. The ERA model represents the disturbance on soils and vegetation in regard to sediment and runoff, which has a direct correlation to the health of fish habitat. The Threshold of Concern (TOC) is also displayed and varies by subwatershed. The TOC is calculated for each subwatershed from interpretations of the Malheur National Forest's Soil Resource Inventory (SRI) based on surface erosion hazard, compaction hazard, water infiltration rates in wetted soil, and amount of vegetation. Subsequently, these factors also have direct influence on the conditions of fish habitat. The consequences greater than the TOC are interpreted as increasing the risk of causing potential significant adverse effects. However, it must be considered that these numbers are not absolutes but become a "red flag" as an indicator of potential concern.

Table 69—ERA: Davis/Placer Subwatershed (TOC = 16)

Alternative1	2002	2004	2008	2012
(No Action)	4.7	4.5	4.2	3.9
Alternative 2 (Recommended Action)	8.8	8.2	7.4	6.7
Alternative 3	8.1	7.6	6.9	6.2
Alternative 4	4.7	4.4	4.1	3.8
Alternative 5	9.1	8.5	7.8	7.0

Table 70—ERA: Vinegar Subwatershed (TOC = 14)

Alternative1	2002	2004	2008	2012
(No Action)	6.8	6.5	5.8	5.1
Alternative 2 (Recommended Action)	10.5	9.7	8.6	7.5
Alternative 3	10.4	9.6	8.5	7.5
Alternative 4	6.8	6.4	5.7	5.0
Alternative 5	12.2	11.3	10.1	8.9

Table 71—ERA: Vincent Subwatershed (TOC = 14)

Alternative1	2002	2004	2008	2012
(No Action)	7.6	7.2	6.4	5.7
Alternative 2 (Recommended Action)	14.4	13.5	11.9	10.4
Alternative 3	13.9	12.9	11.5	10.0
Alternative 4	7.6	7.2	6.4	5.7
Alternative 5	16.5	15.4	13.8	12.1

Table 72— ERA: Little Boulder/Deerhorn Subwatershed (TOC = 14)

Alternative1	2002	2004	2008	2012
(No Action)	6.9	6.5	5.9	5.3
Alternative 2 (Recommended Action)	9.6	8.9	8.0	7.2
Alternative 3	8.7	8.1	7.3	6.5
Alternative 4	6.9	6.4	5.8	5.2
Alternative 5	10.2	9.5	8.6	7.6

Table 73—ERA: Tincup/Little Butte Subwatershed (TOC = 12)

Alternative 1	2002	2004	2008	2012
(No Action)	4.3	4.1	3.9	3.7
Alternative 2 (Recommended Action)	8.2	7.6	6.9	6.2
Alternative 3	6.6	6.2	5.7	5.1
Alternative 4	4.3	3.9	3.7	3.4
Alternative 5	8.8	8.3	7.6	6.8

Table 74— ERA: Butte Subwatershed (TOC = 12)

Alternative1	2002	2004	2008	2012
(No Action)	5.1	4.9	4.5	4.2
Alternative 2 (Recommended Action)	6.9	6.4	5.8	5.2
Alternative 3	6.5	6.0	5.5	4.9
Alternative 4	5.1	4.8	4.4	4.0
Alternative 5	7.2	6.7	6.1	5.5

Table 75— ERA: Granite Boulder Subwatershed (TOC = 18)

Alternative 1	2002	2004	2008	2012
(No Action)	7.6	7.2	6.5	5.7
Alternative 2 (Recommended Action)	7.7	7.1	6.3	5.5
Alternative 3	7.7	7.1	6.3	5.5
Alternative 4	7.6	7.1	6.3	5.5
Alternative 5	7.7	7.1	6.3	5.5

2.7.3 Vegetation Project Comparisons

Harvest Treatments

The following table displays the percent of the total forest stands needing management per prescription per to restore resiliency and sustainability through mechanical treatment. Areas not included are Dedicated Old Growth, RHCAs, Scenic Area, and Wildlife emphasis.

Table 76— Percent of Priority Forest Stands Being Mechanically Treated

TREATMENT	ALT. 1 Identified Needs ♠	ALT. 2 Recommended Action	ALT. 3	ALT. 4	ALT. 5
Commercial Thin	9,249 acres	75%	57%	0	79%
Pre-commercial Thin	3,345 acres	93%	79%	82%	93%
Shelterwood/Commercial Thin	9,322 acres	18%	13%	0	28%
Understory Removal	1,614 acres	54%	34%	0	75%
TOTAL ♣	**23,530 acres**	**50%**	**38%**	**13%**	**52%**

NOTE:♠ ALT. 1 identifies the priority areas needing treatment based on existing forest stand structure, composition, and density.
NOTE:♣ Weighted Average per Alternative

Effects Of Treatments On Crown Fire Hazards

The following table demonstrates the expected results of the mechanical treatments on crown fire hazards by Potential Vegetation Group of Dry, Moist, Lodgepole, and Cold Forest Types.

Table 77 -Percent Hazard Remaining

CROWN HAZARD	ALT. 1 EXISTING	ALT. 2	ALT. 3	ALT. 4	ALT. 5
DRY FOREST					
High	66%	44%	50%	61%	40%
MOIST FOREST					
High	60%	55%	56%	59%	54%
LODGEPOLE PINE					
High	98%	No Change	No Change	No Change	No Change
COLD FOREST					
High	84%	No Change	No Change	No Change	No Change

NOTE: Crown hazards were determined by using stand densities based on the following assumptions:

* For the Dry Forest and Moist Forest Type's, the stands indicated for treatment plus dense stands that were not recommended for treatment due to other resource objectives such as Dedicated Old Growth stands. However, information was not available on all stands and these stands were not put in the high level. Therefore, the crown fire hazard may be underestimated.

* For the Lodgepole Pine and Cold Forest Type's, the stand initiation stage was rated as low. All other stages were rated as high due to the high densities of the stands based on field observations and aerial photo interpretations.

Reduced Ground and Ladder Fuels

This next table displays amount of acres recommended for prescribed fire and the percentage of the analysis area it effects. Prescribed fire is designed to reduce ground and ladder fuels to lower chance of fire climbing into overstory crowns. The biggest difference among the alternatives is in Alt. 4, which does not propose any prescribed fire in Little Butte or Deerhorn drainages due to lack of safe access for fire control personnel and lack of fire control points. The majority of these acres occur on the lower elevation Dry Forest Types.

Table 78—Recommended Acres for Prescribed Fire outside mechanically treated units

ALT. 1 NO ACTION		**ALT. 2** RECOMMENDED ACTION		**ALT. 3**		**ALT. 4**		**ALT. 5**	
Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
0	0	11,370	23	10,640	22	17,230	35	10,780	22

Balancing Old Structure Forests

One of the emphasis items in this project is the need to balance old structure characteristics in variability and sustainability for wildlife habitat needs, forest visitor intrinsic values, and products. The following table displays the existing percent of forest stands in the Old Forest Single Strata (OFSS[45]) and Old Forest Multi-Strata (OFMS) under Alternative 1 and the expected change from Alternative 1 in about 125 years from implementation. These projections include only the recommended treated areas and consider that no additional treatments or large events such as an uncharacteristically severe wildfire would occur. The alternatives change due to natural growth is not shown, only the net change directly due to treatment is shown. These figures represent all treatment areas with about 90% located in the Dry Forest category (predominately ponderosa pine and larch).

Table 79—Percent Change in OFSS and OFMS in about 125 Years

FOREST STAND STRUCTURE	**RANGE OF VARIATION**	**ALT. 1** EXISTING	**ALT. 2**	**ALT. 3**	**ALT. 4**	**ALT. 5**
OFSS	30-55%	2%	+20%	+15%	0	+24%
OFMS	5-15%	17%	-2%	-1%	0	-2%

Chemical Treatment

This next table compares the number of acres recommended for treatment under both the Malheur National Forest *Weed Environmental Assessment*(Decision 2000) and this project with the maximum acres allowable for the herbicide glyphosate. "Allowable acres" refers to the number of acres within a subwatershed that could be treated with glyphosate at a rate of 2 pounds per acre and still show no observable effects on aquatic species within the watershed. The *Southeast Galena Restoration Project* proposes a rate of 1 pound per acre, which reduces potential impacts.

[45] See stand structure definitions page 17

Table 80—Acres of Chemical Treatment Action Alternatives

Chemical Treatment	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Glyphosate/Hexazinone Competing Vegetation	897	0	0	1318
Glyphosate: Noxious Weeds	1.5 (1.3 in RHCAs)	0	0	1.5 (1.3 in RHCAs)
Strychnine/aluminum phosphide: Gopher Control	1689	0	0	2865

Roadless Treatments

The following table displays roadless acres recommended for treatment by both mechanical and prescribed fire. Mechanical includes harvest and pre-commercial thins. Alternatives 3 and 4 do not propose harvest treatments within these designated roadless areas.

Table 81—Acres of Treatment in Roadless Area (LRMP Schedule C) Action Alternatives

ITEM	DIXIE-BUTTE				GREENHORN			
	Alt.2	Alt.3	Alt.4	Alt.5	Alt.2	Alt.3	Alt.4	Alt.5
Commercial & Pre-commercial Thin (HTH/SPC)	232	0	0	514	0	0	0	0
Commercial Thin (HTH)	530	0	0	577	0	0	0	0
Understory Removal (HUR)	108	0	0	167	0	0	0	0
Pre-commercial Thin (SPC)	0	0	173	0	0	0	0	0
Prescribed Fire	496	296	254	496	716	716	716	716

2.7.4 Infrastructure Project Comparisons

Total Transportation System Miles

This table displays the total transportation system as if recommended decommissioned roads are implemented. These totals include both closed and open roads reflecting possible issue over threatened and endangered fish and their habitats.

Table 82— Total Transportation System Miles

ITEM	ALT. 1NO ACTION	ALT. 2 RECOMMENDED ACTION	ALT. 3	ALT. 4	ALT. 5
Miles	267	219	218	202	228
% Change from Alt. 1	NA	-18%	-18%	-24%	-15%
NA = Not Applicable					

Open Road Density

The following displays the % change in open roads. This responds to road maintenance concerns of available dollars to keep our transportation in a safe and stable condition and that of wildlife harassment concerns. Alternative 5 reflects one of the public issues of closing too many roads for the forest user access.

Table 83—Total Open Transportation System Miles

ITEM	ALT. 1 NO ACTION	ALT. 2 RECOMMENDED ACTION	ALT. 3	ALT. 4	ALT. 5
Miles	132	91	91	89	164
% Change from Alt. 1	NA	-31%	-31%	-33%	+24%
NA = Not Applicable					

Decommissioned Miles

The next table lays out the recommended decommissioned transportation system miles. These roads have been identified as no longer needed in the long-term transportation needs for management activities and would be hydrologically stabilized with the intent to improve hydrologic function and enhance fish and wildlife habitat.

Table 84 Total Decommissioned Miles & Miles within RHCAs

ITEM	ALT. 1 NO ACTION	ALT. 2RECOMMENDED ACTION	ALT. 3	ALT. 4	ALT. 5
Total Decommissioned Miles	0	67	67	67	62
Decommissioned Miles within RHCAs	0	23.9	23.9	23.9	23.5

New Roads

New roads are recommended across the action alternatives; however, some of these miles are recommended due to resource concerns of fish and wildlife habitat. The majority of these road relocations are recommended in order to eliminate road locations within RHCAs.

Table 85—Total New Roads and Relocated Miles

ITEM	ALT. 1NO ACTION	ALT. 2RECOMMENDED ACTION	ALT. 3	ALT. 4	ALT. 5
New Miles	0	12.2	11.6	2.2	14.6
Relocated Miles	0	5.5	5.5	2.2	7.0

2.7.5 Economics

The following table estimates a comparison of alternatives and possible revue from timber sales if they were to be implemented. Market values are subject to change and these should be seen as estimates only.

Table 86—Present Net Value Comparison

	ALT. 1	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Benefits	$0	$4.1 million	$3.4 million	$0	$5.6 million
Costs	$0	$8.1 million	$6.1 million	$3.8 million	$9.3 million
Present Net Value	$0	-$4.0 million	-$2.7 million	-$3.8 million	-$3.7 million
Per cent change	0%	0%	+32%	+5%	+7%

CHAPTER 3.0—REFERENCE AND EXISTING CONDITION(AFFECTED ENVIRONMENT)

This chapter concisely describes the existing condition of relevant resources of the area that would be affected by the alternatives under consideration if any one of them were implemented. This title should not be confused with the effects in Chapter 4 Environmental Consequences. This chapter, Chapter 3, Affected Environment, establishes the scientific baseline which can be compared to the effects of all action alternatives found in Chapter 4.

This Chapter is separated into the following sections:

3.1.0—Overview of Existing Conditions **page 111**

3.2.0—Existing Conditions **page 113**

3.2.1—Early Season Peak Flows **page 113**

3.2.2—Stream Temperatures **page 124**

3.2.3-Aquatic Habitat **page 125**

3.2.4-Vegetation **page 139**

3.2.5-High Wildfire Hazard **page 159**

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3.3.0-Roadless Character **page 204**

3.4.0—Human USE **page 209**

3.1.0—OVERVIEW OF EXISTING CONDITIONS

The John Day River system is the only major tributary to the Columbia River which remains undammed and is the second longest free flowing river in the United States after the Yellowstone River. The Galena Watershed consists of 127,341 acres and is defined hydrologically by a segment of the Middle Fork of the John Day River, with about 35 perennial tributaries, and numerous smaller tributaries. The Analysis Area (Galena WA, Supplement—2002) consists of approximately 49,473 acres within the Galena watershed and includes the Davis/Placer, Vinegar, Vincent, Little Boulder /Deerhorn, Tincup/Little Boulder, Butte, and Granite Boulder Subwatersheds.

Generally, according to the *Galena Watershed Analysis, 1999* the primary hydrological characteristics appear to be stable over the entire Galena watershed. Although during field work conducted after this analysis, erosion and concentrated flows were found in intermittent channels and ephemeral draws and from some hill slopes. Spring peak flows tend to be of smaller intensity and longer duration than other locations due to the pattern of snowmelt. While an appearance of stability exists, a number of stream systems are recovering from heavy impacts ranging from the middle of the 19th century through the 20th century. Parts of the area have revegetated covering up some of the remnant impacts from past activity; full hydrologic function has not recovered. These impacts are the result of hydraulic placer mining, high grade logging of the large tree component of fire-resistant trees, railroad and road construction for logging, grazing, and fire exclusion.

Topography

Topography varies from the nearly flat river bottom to gentle slopes at lower elevations, to steeper slopes at higher elevations. The elevation extremes in the watershed range from 3,700 feet to 8,100 feet. The elevation along the river ranges from 3,700 feet at the west end of the watershed to 4,000 feet at the east end of the watershed, a change in the river's elevation of 800 feet in 8 miles. The topography varies from flat meadows along the Middle Fork of the John Day River to moderately steep side slopes with occasional upland flats. Gentler slopes with abundant depositional features are present in lower portions of the subwatersheds. The streams are moderately to deeply entrenched. The Middle Fork of the John Day River occupies a structurally controlled, alluvial floodplain with moderate valley gradients and river terraces. Aspect is determined generally by the location on either side of the valley, either north or south, although the presence of side slopes modifies an overall trend toward south facing slopes (see Appendix E, Map1 Subwatersheds and Topography).

Climate

The climate is semi-arid and transitional between the maritime and continental regimes. The watershed receives about 25-35 inches of precipitation per year, 80 percent of this is snowfall. Rains in fall, winter, and spring contribute to surface run-off and annual discharge. Classic rain-on-snow events appear rare.

Short duration, high intensity summer storms are common as are gentle spring and fall rains that often become snowfall at higher elevations. Short duration/high intensity convective storms in the summer may release intense rainfall over a small area. The John Day basin is recognized as having some of the most intense two-hour rainfalls in the state of Oregon. Intensity is thought to range from about 0.25 inches in 60 minutes; to 0.4. inches in 9 minutes.

Geology

The analysis area is located in the Blue Mountain physiographic province of Oregon, which lies between two major physiographic provinces, the Deschutes-Columbia Plateau to the north and the High Lava Plains to the south (Orr, Orr and Balwin 1992). The outstanding geological features are its complexity, which is reflected in the distribution of the soils, and the presence of several, very different formations which are normally stable, but can become less stable under different conditions and by different mechanisms. Generally, the south side of the watershed is less complex than the north side, although locally there may be some intermixing of formations. Alluvial deposits are predominant along valley bottoms near the Middle Fork of the John Day River. A large area of stable ancient landslide debris (Quaternary) is found on the north side of the river, primarily in Little Boulder/Deerhorn subwatershed.

Existing Scenic and Ecological Integrity

Currently this area shows very little evidence of recent past logging practices within the past 25 years, other than the clear cut patches on Dixie Butte and the logging/blowdown area on the FS Rd 2010. In foreground views, old stumps are visible. Middle and background views are primarily intact. The dispersed sites show damaged vegetation and bare and compacted soils.

Logging and suppression of fire has resulted in the loss of a large tree component and the current establishment of a dense multi-storied stands of trees. This has reduced the scenic integrity to moderate.

3.2.0—EXISTING CONDITIONS

Ecological integrity is an indication of the sustainability of a landscape, which affects the long term conditions of landscape aesthetics. The existing ecological integrity is determined by considering the current condition of key resources and the current trends. Currently there are trends that indicate that the ecological integrity is in poor condition. Early season peak flows of water now leave the landscape of the analysis area in a much more rapid manner than they once did under historical conditions, this in turn has caused low water levels and a decreased water storage function during dry summer months when aquatic species need it most. An elevation in stream temperatures is a factor vital to these species as well (see 3.2.1—Early Season Peak Flows, below, 3.2.2—Stream Temperatures, page 124 and 3.2.3 Aquatic Habitat, page 125). The Dry Forest and other forest types are overstocked, with excess ground and ladder fuels. The suppression of wildfire and early logging methods have caused a change in the composition of tree species as well as structural stage composition (see 3.2.4 Vegetation by Forest Type, page 139, 3.2.5 High Wildfire Hazard, page 159,and Fire Exclusion Policies and Fire regimes, page 211). The trends described in this chapter are critical to the ecological integrity of this landscape because the condition of the forest and streams affect many other resources. [46]

3.2.1—EARLY SEASON PEAK FLOWS

Duration of peak and near peak stream flows in the early spring is increased in the analysis area streams because of residual effects of past resource utilization. It is believed that the drainage systems (including some uplands and the roadless areas), have been altered in ways that increase duration and volume of peak and near peak flows over at least 70-80% of the area. Additionally, locally intense summer thunderstorm events (causing resource damage in one subwatershed and not in adjacent ones) occur in this part of the State of Oregon. The increase in peak stream flows is due to a combination of factors, two of which are: 1) the loss of channel sinuosity and 2)instream woody debris. Another is the degradation of both upland and riparian vegetation as well as soils. Historic livestock over-grazing (1930s and 1940s and earlier) has led to soil loss and diminished ground cover. Soil compaction on roads, skid trails and landing sites from logging operations contributes to increased runoff of surface water across the landscape. The loss of canopy cover in the greater Galena watershed is primarily from recent uncharacteristically severe wildfire adjacent to the analysis area which has accelerated snowmelt in the spring (see Recent Uncharacteristically Severe Wildfire, page 159).

Roads and associated ditches intercept both overland water flow and groundwater across the landscape, and concentrate runoff which is delivered to stream courses more rapidly than under natural conditions.

Increased peak flows have contributed to stream channel down cutting, which has in some instances disconnected floodplains (generally disconnected 50 or more years ago) from the stream channel and consequently have lowered water tables. These floodplains no longer act as “sponges,” which capture surface flow and store ground water for late season release. Additionally, the removal of beaver from the analysis area has contributed to the decrease of wetlands and other storage areas associated with beaver dams that historically retained water on the landscape year-round. Beaver are beginning to return to the watershed in small numbers. (see Beaver Activity, page 135).

Riparian meadows along the Middle Fork John Day, with the exception of federal land, have been converted to agricultural use (currently cattle grazing on private land). Meadows used by earlier

[46] “Southeast Galena Landscape Aesthetics Report,” specialist report, analysis file by Mattson, D., Landscape Architect, Wallowa-Whitman National Forest

settlers have undergone species conversion through loss of the water table. As a result, moisture-loving species such as tufted hair grass and common camas have been replaced with Kentucky bluegrass, meadow foxtail, and other "pasture" grasses, and weedy increasers such as teasel. Smaller riparian meadows at higher elevations have suffered from on-going overuse, sometimes by large numbers of elk as well as cattle, with a resultant conversion to sedges and rushes, or to Kentucky bluegrass if the water table has dropped.

Overview of Soils in the Analysis Area

Since the *Galena Watershed Analysis* was written in 1999, additional observations and interpretation of local conditions have expanded the understanding of soils, erosion and sedimentation processes, and effects of historic human activities on the soil resource.

The soils in the analysis area, particularly on the north side of the watershed, are variable and the pattern of distribution is complex as described in the *Galena Watershed Analysis* and displayed in Table 87, page 115. This table includes groups of intermingled soils (soil complexes) which are classified according to the predominant soil type; these complexes often include large proportions of clayey or loamy, non-forested soils (described below). The complexity of the natural soil mosaic has been increased by the effects of various kinds of disturbance that have occurred during the last 150 years. The characteristics of some soils will not recover for 50 years. In some places recovery will occur over geologic time. Also, similar soils may respond differently to similar management activities, adding to the complexity.

As a result of past activities, detrimental soil conditions are present in some locations (as defined by FSM 2500, R-6 Supplement 2500-98-1). These are generally areas where either mineral soil has been exposed or where activities have affected the structure of the surface or subsurface soils. Forest-wide Standard 126 states that no more that 20 percent of an activity area may be in detrimental condition following the completion of an activity. A review of the planning area indicates that it meets this standard.

Description of Soils

Surface soils in the analysis area tend to be shallow ranging in depth from about 6 inches to 24 inches and, rarely, up to 36 inches.

Presence or absence of a cap of volcanic ash, usually 8-24 inches deep, causes important variation among soils (see Table 87, page 115).

Ash soils tend to absorb water rapidly; non-ash soils tend to absorb water more slowly, increasing the risk of surface runoff. Ash soils tend to hold more water available for the use of plants, so ash soil tends to have more ground cover.

The combination of rapid absorption of water and more ground cover tends to cause a low to moderate erosion risk on ash soils; non-ash soils tend to have a low to very high erosion risk, depending on ground cover, slope, soil depth, and other factors.

Erosion risk increases on dry ash soils when either of two unusual characteristics develop: 1)when very dry, ash soils tend to be hydrophobic; 2)when moistened, following extremely dry conditions; dry ash soils tend to aggregate into lumps (flocculate). Either condition increases the ease with which overland flows of water are concentrated rather than absorbed, increasing risk of erosion. Ash soils over droughty granitic subsoils, are more susceptible to this hydrophobic process.

Ash soils tend to be found at middle elevations up to the sub-alpine zone throughout the analysis area (see Hydrology report Analysis file).

Non-ash soils are common in numerous places (often intermingled with areas of ash soil). This occurs within the analysis area in the following locations: in a belt about 1.2 miles wide northeast of the Middle Fork. of the John Day River; additionally in most of the Vincent Creek., Caribou Creek. and Flat Creek. Drainages; a belt about 0.9 miles wide southwest of the Middle Fork, southeast of Deerhorn Creek; the northeastern part of the Vinegar Creek Drainage; the lower 2.3 miles of the Butte Creek Drainage; and in Sub-alpine areas.

The distribution and diversity of subsoils is another important source of variation (see Table 87, page 115) that may affect management activities. Clayey subsoils derived from the Clarno, meta-sediment bedrock, and the volcanic bedrock tend to absorb water slowly, to transmit it through the ground slowly, and to hold it longer, tending to cause high erosion and rutting risk in the subsoil. These subsoils are more widely distributed than the similar surface soils as some underlie the ash surface soils.

Other subsoils, derived from less clayey bedrock, tend to either absorb water more rapidly or to transmit it more rapidly, reducing erosion risk to low to moderate in the subsoil. Granitic subsoils tend to be absorb and transmit water rapidly. They tend to erode rapidly into gullies once erosion is initiated because of their easily detached sand particles. They are also droughty soils due to high porosity. At high elevations this tendency combined with a short growing season tends to produce soil conditions that are difficult to revegetate.

Generally, the soils at lower elevations and those too shallow to support trees tend to absorb a smaller proportion of precipitation, with a larger proportion running off. Soils, including parent bedrock, at middle and upper elevations (with the exception of high elevation meadows and locations where soils are shallow) generally absorb more water or transmit it more efficiently.

For instance, clayey surface soils over clayey subsoils and parent bedrock tend to contribute the greatest proportion of precipitation as runoff, to shed water faster than other soils, and to hold what water is absorbed longer. Clayey soils over clayey subsoils with high rock content are difficult to manage because of the large variation in particle size. Ash soils over clayey subsoils can "wet up" quickly following rainfall and then contribute a greater proportion of precipitation to run-off. The clayey subsoil holds water longer than the surface ash, contributing to problems which were caused by previous ground-based activity. Ash soils over granitic subsoils tend to be droughty, generally with relatively few erosion problems, but re-establishing vegetation after loss may be difficult.

Water is the limiting factor for plant growth on most soils in this watershed; it is more limiting on residual soils than on ash soils.

Table 87—Soil Types (acres)— Based on Soil Hydrology and Productivity by Subwatersheds (SWS)[47].

SWS / Soil Type	Butte Creek	Davis Creek/Placer Gulch	Granite Boulder Creek	Little Boulder Creek/Deerhorn	Tincup Creek/Little Butte Ck	Vincent Creek	Vinegar Creek	Grand Total
Ash over clayey forested	1,218			270	2,021	31	1,736	5,276
Ash over granitic			700	667	842	245	84	2,538
Ash over serpentine		164	629	987		945	240	2,965
Clayey forested			187	127	973	280		1,567
Clayey non-0forested	364	1,042	52	2,428	1,314	642	402	6,244
Miscellaneous	1,045	162		1,083	276	1,024	87	3,677

[47] Total acres do not include land within adjoining Forest boundaries (Umatilla NF and Wallowa-Whitman NF).

sensitive								
Other	2,234	6092	5,110	5,111	2,004	503	4,606	25,660
Serpentine - residual				313		97	14	424
Grand Total	**4,861**	**7,460**	**6,678**	**10,986**	**7,430**	**3,767**	**7,169**	**48,351**

Soil Disturbance

Above the continuous forest cover on Vinegar Hill and on Dixie Butte, the soil profile was disrupted by erosion following loss of ground cover around the turn of the century (1900). This was caused by the topsoil layer in high elevation meadows being lost and plant associations modified following the intensive sheep grazing which occurred about 100 years ago (Hall, 1973 and Johnson, 1992). These areas have been described as so degraded that surface soils and productivity will recover only over geological time (Hall, 1973, Johnson, 1992).

Some of the degraded soils , based on the Malheur National Forest Soil Resource Inventory (SRI), coarse mapping, by vegetation specialists, and satellite imagery, are shown in Table 88, below.

Table 88 Historic Soil Disturbance by SWS (Estimated)

SWS Name	Subalpine Steppe (Max Acres)	Total Acres 5000'+ Elev.	Historic Mining (acres)	Historic Mining Miles of Stream
Davis/Placer	Not estimated	Not estimated	1000	10
Vinegar Creek	1,500	5,500	1500	20
Vincent	0	N/A	600	10
Deerhorn/Little Boulder Creek	500	2,900	600	10
Butte Creek	Not estimated	Not estimated	1000	10
Granite Boulder Creek	1,500	5,800	1000	10

Hydraulic placer mining has left large areas of mineral soil, spoils or bedrock exposed locally, or created gullies as displayed in Table 88. While some areas have begun to recover, others are probably not capable of revegetating naturally in human time. In addition it is suspected that historic cattle and sheep grazing may have altered run-off patterns on low and mid-elevation Clarno (clayey) soils in much of the area that was also affected by railroad logging.

Commercial timber harvest, both skyline and tractor, has occurred over the last 80 years. Soils in draw bottoms and along stream channels below about 4800 ft. were altered during railroad logging in the first half of the twentieth century. Surface layers were displaced, compacted or eroded, sometimes exposing subsoils. Railroad logging, with its associated horse and early tractor skidding and rail line activities, occurred primarily on areas with clayey, loamy forested soils, non-forested soils with inclusions of forested soils, and occurred in areas where ash overlays of sensitive, clayey subsoils are found.

These early activities caused subsurface soils to be exposed and erode in some areas. Rills and gullies formed and streams were down cut and expanded headward. Today these areas continue to concentrate overland flow of water and are at risk of further erosion if concentrated flows are channeled to them. This would result in the increasing erosion risk down slope and in stream channels and in riparian areas below the affected areas.

A few of the current erosion problems have been linked directly to recent tractor logging, these however, were primarily where best management practices were not implemented, or where they were poorly implemented before the current *Land and Resource Management Plan* was in effect. Disturbance from tractor logging using best management practices would still expose mineral soils and compact these soils, thus increasing erosion risk over undisturbed conditions.

Compaction from harvest during the last 40 years is still impacting soil. Table 89displays area harvested within about the last 25 years by subwatershed. About half of the area was harvested without Best Management Practices. Generally, tractor harvest occurred on greater than half of the more recently harvested area. Of the areas previously harvested by tractor, it is estimated that a range of about 12 to 17 percent of the harvested area (or up to 2% of the analysis area) may be detrimentally compacted along skid trails and in landings. In skyline units, this percentage is generally under 10% of the harvested area. These percentages meet *Land and Resource Management Plan* standards, even when the adjacent roads are included in the estimate.

Table 89— Harvest Activity during the Past 25 Years by SWS

Soil Type	Subwatersheds Acres							
Subwatersheds	Butte Creek	Davis Creek/Placer Gulch	Granite Boulder Creek	Little Boulder Creek/ Deerhorn	Tincup Creek/ Little Butte Ck	Vincent Creek	Vinegar Creek	Grand Total
Ash over clayey forested	311				67	9	351	738
ash over granitics			216	210	324	8	0	758
ash over serpentine		33	11	446		113	66	669
Clayey forested			153	79	117	38		387
Inclusions clayey non-forested	59	52	43	1092	223	96	79	1644
Miscellaneous sensitive	66			303		74	16	459
Other	290	718	1328	144	244	59	621	3404
Serpentine -residual				40		29	1	70
Grand Total	726	803	1751	2314	975	426	1134	8129

Roads and Other Soil Disturbance

Roads—cause soil disturbance within the road corridor and downslope of any channeled run-off (Gucinski, 2000). Soil is compacted and may become rutted. Soil layers on cut and fill slopes are mixed and often poorly vegetated.

Other activities have exposed mineral soil or caused small areas of compaction commonly throughout the analysis area. These include livestock concentration, commonly due to salting or trailing, such as that found along road 2010-159. Livestock concentration in some riparian areas

such as those along upper and lower Deerhorn, Davis and Placer Gulch creeks is causing localized stream bank disturbance. ATV use, especially on the south side of the river, is creating bare, tracked areas, (see ATV use and Other Sources of Erosion, page 122). Bare soil has been exposed at some dispersed campsites. Commonly, riparian soils have dried out and valley bottom soils have become compacted and eroded by past logging, grazing, and associated activities such as railroad logging camps and work areas.

Soil crusts are believed to have existed on most of the clayey non-forested soils prior to 1860. Grazing and activities associated with logging and other human activities have caused loss of these soil crusts, probably by physical disruption first and then erosion. The process of recovery of soil crusts is not well understood.

Wild fire has not impacted soils in the Southeast Galena analysis area in the last 150 years based on a preliminary evaluation of stand composition and age. Current fuel levels are expected to support an uncharacteristically severe wildfire similar to the Summit Fire which is likely to result in soil damage such as water repellency, a tendency to lump (flocculation), ground cover loss, accelerated erosion, and stream channel modification.

Mycorrhizae and soil macro invertebrate populations are considered to be at natural levels and of natural species composition over most of the area. Past harvest and planting practices may have converted the macro invertebrate populations to ones more typical of grasslands on about 100 acres primarily in Deerhorn/Little Boulder subwatershed.

Erosion Processes—Overview

Much of the analysis area, primarily because of its vegetative cover and distribution of soils, appears to be processing overland flows, including those associated with high intensity, short duration storms, without developing visible rilling, sheet wash, channeling or gullying. Where human disturbance has exposed mineral soil, erosion is increased over natural rates. In isolated places, accelerated erosion is occurring because of the amount or depth of exposure of mineral soil from past activities and subsequent erosion. Both surface erosion and mass slope movements are naturally present. The natural rate of occurrence of these processes is increased by disturbance.

Soil creep is common on exposed, generally shallow or poorly vegetated soils and increases with disturbance. Naturally occurring slumps are rare; slumping increases with disturbance.

The overall trend in erosion risk, since early management activities were implemented, is stable. The degree of recovery of eroded areas is variable, as described in the Soil Disturbance section, depending on the type of impact that occurred and local conditions. Some areas previously disturbed are recovering. Current management activities are implemented with increased erosion controls. In isolated places where ground cover is not measurably recovering, erosion risk remains elevated, and will remain elevated, and may increase as, “accelerated erosion,” through geological time.

Ground cover remains low by definition in some areas (open roads). In others (landings, skid trails, decommissioned roads), it is expected to recover gradually unless initial recovery was delayed and erosion subsequently became concentrated. Some historical activities reduced ground cover and, possibly, the potential to produce ground cover in human time (compared to geologic time).

Management activities have also altered soil structure modifying its ability to absorb, transport and move water.

Surface Erosion

Natural surface erosion risk in the analysis area ranges from low to very high, depending on the soil, according to the SRI, and as displayed in the Galena EAWS. Table 86 page 115 shows soil types by subwatershed.

Naturally thin, clayey or rocky soils with high erosion risk cover about 6200 acres of the analysis area as shown in Table 86 page 115. These are the clayey, loamy, non-forested soils described previously.

Most of these areas are now in a stable condition because overgrazing has been curtailed and logging is conducted with best management practices. These areas continue to produce more overland flow and surface runoff, which may erode downslope areas.

Past erosion has scoured rills, gullies and channels, some of which are still active, at lower elevations, especially on the north side of the Middle Fork John Day River, in Deerhorn/Little Boulder, Little Butte/Windlass, Vinegar and Davis/Placer Gulch subwatersheds, where surface run-off is concentrated due to disturbance of ground cover and soil structure by past activities.

Activities, which exposed mineral soil or modified soil structure, have increased erosion risk on other soils. On the approximately 5300 acres of shallow ash and loamy surface soils, which overlie clayey subsoils, erosion risk is increased when the more erosive subsoils are exposed. Roading is the chief cause of subsoil exposure and is discussed in the Roads subsection (page 120).

Granitic subsoils (about 2500 acres), if exposed, tend to erode, producing sand particles that are easily detached and transported. Past activities (skidding, mining and roading) in Little Boulder/Deerhorn, Little Butte/Windlass, Granite Boulder and Vinegar subwatersheds have left areas where granite particles are raveling down slope, although the subsoils are not fully exposed. Road ditches and culvert intake basins down slope of these areas are at risk of filling with sediment relatively quickly.

Soils classed as miscellaneous have variable erosion risk based on individual soil types and uncommon characteristics. Soils with low to moderate erosion risk show rilling and gullying in limited, disturbed locations associated with roading or logging in Deerhorn/Little Boulder and Little Butte/Windlass subwatersheds

Areas with increased erosion risk are generally limited in size. They are moderately frequent and well distributed across the landscape. Some areas of surface erosion are healing slowly where organic material is accumulating. Some areas are gradually deepening or widening. Erosion is accelerating at a few locations where other disturbances channel concentrated surface flows and concentrated flows become connected. For example, upland rilling, sheet wash, and related processes initiated by grazing a century ago in the sub-alpine steppe became concentrated enough over time cause a debris torrent in Lemon Creek in 1998. Combination of flows from a former salting ground off the 2010-159 road and the road itself caused rilling in an ephemeral swale and eroded an unnamed intermittent channel headward just west of Vincent Creek. Erosion following similar activities have caused gullying in Tincup and Windlass subwatersheds. There are 1450 acres of areas with erosion risk of this type across the analysis area.

Slope Movement

Soil creep is the most common form of slope movement found in the watershed and similarly in the analysis area. Mass slope movements in the form of slumps and earth flows have occurred with at least 4 observed (Galena WA 1999) events in the analysis area and other slumps and earth flows are suspected. Shallow/rapid movements that produce massive impacts over a very short period are uncommon. The only known example is the debris/avalanche chutes on the east and northeast

flanks of Dixie Butte in the Deerhorn drainage. No other similar areas have been identified within the analysis area. Sediment from mass failure is less common than on the west side of Oregon although more common than in the wetter, eastern part of the United States.

Slope movement which has been observed in the analysis area, is most common on the Clarno and similar formations. Elsewhere on the Malheur National Forest, areas of serpentine rocks are noted for instability; instability has not been observed on serpentine areas in Vinegar Creek and Vincent Creek drainages. Generally, other rock types are stable, although each rock type has structural features which could contribute to slope movements.

Four events, in addition to the debris/avalanche chutes in Deerhorn drainage, are documented in the analysis area with about 30 more similar events documented in other parts of the watershed or adjacent watersheds. With the exception of the Lemon Creek debris torrent, the relatively small slope movements in the analysis area have only minor impacts associated with them to date, although larger ones elsewhere in the watershed have had greater impacts. The slope movements in the analysis area are relatively small, ranging from 1000-5000 cubic yards of displacement. The Lemon Creek debris torrent, which occurred in July, 1998, while moving only about 3000-4000 cubic yards of material, substantially altered the channel of a tributary to a stream with threatened species of fish (bull trout). It followed extensive rilling that was initiated over 100 years ago by heavy grazing.

Two of the slumps in the analysis area occur along County Road 20, near Butte Creek and west of Vincent Creek. Road related movements are caused either by undercutting of natural slopes by road construction or where roads or other ground disturbing activities altered natural surface and subsurface drainage. A dry, raveling mass movement in Blue Gulch, the fourth documented in the analysis area, may be natural or it may be related to a nearby mid-slope mining ditch. A second, smaller movement was observed nearby but not documented during survey.

Roads and Erosion

Roads affect geomorphic processes by four primary mechanisms (Gucinski, 2000).

Roads accelerate erosion from the road surface and prism itself by both mass and surface erosion processes. In the analysis area (see Roads page 231), erosion is generally highest on native surface roads with poorly designed drainage, regardless of soil type. Specific mechanisms contributing to erosion on these roads vary with soil type. Concentrated flows, especially in Clarno and volcanic soils, detach particles of clay, silt and, to a lesser extent sand. The clay particles and some of the silt are carried away as turbidity; the remaining silt particles are moved and deposited. On granitic soils, irregularly shaped sand and fine gravel particles are moved.

Road segments with gravel or other rocked surfaces do not usually show signs of rutting after use in inclement weather, although turbid flow among the surfacing particles has been observed. Travel on native surface and inadequately graveled road segments also results in turbid surface flow whenever water flows on the road. When poorly drained conditions occur near streams, ditch relief culverts, or areas with soil disturbance—these flows may reach stream channels causing turbidity in streams.

Photo 12— Travel on native surface and inadequately graveled road segments also results in turbid surface flow whenever water flows on the road.

Most roads, regardless of soil type, produce dust under dry conditions and, especially, during heavy haul, which may enter streams from the air or during runoff. Loss of dust and other fines also contributes to the more rapid degradation of the road surface and increased erosion.

Generally, annual sediment accumulation (primarily silt) in ditches has been observed as a trace to a deposit less than ½ inch deep annually over variable lengths except where water backs up and puddles. Generally 80% of ditches are vegetated, reducing sediment contributions originating from or transported by roadside ditches.

Widely spaced relief culverts promote ditch erosion when vegetation is sparse or when flows increase. Erosion along roads appears to be primarily a seasonal problem. It is directly affected by the condition of the road, drainage design, surfacing, and amount and type of use under wet conditions. Popular periods of use include the wet seasons, during and after snowmelt and during fall and spring rains. Roads directly affect channel structure and geometry.

It has been estimated that currently about 25 percent of the culverts are too small to pass 100 year storm events.

Table 90 reflects a summary of problem road segments from an informal survey of 69 road segments (see Analysis File, Watershed and Soils Report).

Table 90— Summary of Road Segments with Problem Areas

SWS	Davis/ Placer	Vinegar	Vincent	Deerhorn / Little Boulder	Little Butte/ Windlass	Butte	Granite Boulder
Number of problem road segments described	21	10	17	11	1	2	N/A

Table 91 Summary of Road Segments and Miles in RHCAs by Drainage Condition (estimated).

SWS / Drainage Condition	Davis/ Placer	Vinegar	Vincent	Deerhorn /Little Boulder	Tincup/ Little Butte	Butte	Granite Boulder	Total
	# segments/miles							
Currently Decommissioned (drainage self-maintaining)	92/ 4.6	55/ 2.3	84/ 4.8	39/ 2.8	20/ 0.6	52/ 3.0	35/ 1.5	377/ 19.4
Culverts undersized, misaligned, etc. on open or closed roads	58/ 1.4	26/ 0.5	0/ 0	12/ 0.6	20/ 0.6	11/ 0.5	15/ 0.4	142/ 3.9
Flow concentrated at crossing on open or closed roads	76/ 1.9	92/ 3.4	95 4.1	93/ 3.7	47/ 1.3	48/ 2.2	97/ 3.9	548/ 20.5
Currently open or closed with adequate drainage or condition unknown	159/ 6.7	147/ 5.4	67/ 3.1	114/ 5.8	132/ 6.6	79/ 3.2	147/ 5.4	845/ 36.1
Road crossings	121	125	90	113	73	74	102	708
Total	385/ 14.6	320/ 11.6	246/ 12.0	258/ 12.9	219/ 9.1	190/ 8.8	294/ 11.1	1912/ 80.0

ATV use and Other Sources of Erosion

All Terrain Vehicles use of the Davis Creek Motorized Trail is causing erosion at nine stream crossings where the current crossings are too narrow to accommodate All Terrain Vehicles (ATV's). Because these crossings were designed for "trail bike," motorcycles. ATVs are crossing adjacent to the current trail, exposing mineral soil in the stream banks; at some locations there are multiple tracks. ATV use, especially on the south side of the river, is creating bare tracked areas, primarily in the subwatersheds which are traversed by the Davis Creek Motorized Trail and at stream crossings along the Trail.

Mineral soil is exposed in the Murdock dispersed campsite where sediment is being detached and transported. Additional locations are potential sources of erosion and sedimentation as recreation impacts become more concentrated on riparian soils (see 2.5.5.3 Description of Dispersed Campsite Projects page 89).

The Oregon Department of Fish and Wildlife (ODFW) stream survey identified a high percentage of eroding river banks along the Middle Fork of the John Day River. These may be attributed to management along some segments of the river and possibly because of increased peak flows entering the watershed from the flashier—Upper Middle Fork Watershed up river from the analysis area.

Additionally, there is a vulnerability of soils to erosion following high intensity, short duration, storm events. (See Issues 1.4.1,. 1.4.2, and 1.4.3—page 31).

Hydrologic System, Water Quantity, and Water Timing—Departure from Potential

It is estimated that In-and Off-Channel water storage capacity has been reduced on approximately 70-90% of stream channels and on or about 200-500 acres of flood plain, wetlands, seeps, and other riparian areas adjacent to the stream network within the analysis area. The magnitude of in-channel changes may be estimated by how much stream reaches depart from *Land and Resource Management Plan* standards, or from generally accepted geomorphic measures. In the analysis area, preliminary analysis indicates that large woody debris and pool frequencies are at 10-90% of the expected condition, indicating similar percentage losses of water storage areas along these same surveyed streams. Historic logging , mining, and grazing in addition to more recent road building, have contributed to the decrease in storage capacity.

In addition run-off has increased on about half of the ephemeral draws(length not estimated) and on the valley bottoms (about 200 stream miles) along most of the intermittent, perennial , and fish bearing streams over about 35,000 acres (low to id elevations), previously logged by railroad. Accelerated runoff also occurs on about 3000 to 5000 acres of hill slope most commonly found at high elevation (where soils were altered by mining or sheep grazing). Several steam channels (estimated at about 25 to 30 stream miles), including most of Vinegar, Vincent, Placer Gulch, Davis and Granite Boulder Creeks and their tributaries were modified to various degrees by different kinds of mining, accelerating run-off or reducing water storage. Segments of several other streams (estimated at about 10 to 30 stream miles), either at the head waters or at lower elevations were similarly modified by mining activities. Roads and ditches intercept soil water. The effects of roads increased over time proportionately to the miles of road , numbers of crossings, season and amount of use and type of construction. A substantial increase in roading occurred in the 1980s.

These activities resulted in channel down cutting and straightening. Connections to flood plains as a result were reduced. Channels appear to be stable at new elevations during normal peak flows. The channels' ability to handle the energy associated with high flows that accompany rare climatic events[48] is considered reduced.

Watershed processes over much of he area have been altered because of changes in he condition of the components of the hydrologic system. Alteration of natural process began in the early and mid-nineteenth century and continue today. It is believed that summer base flows have been reduced because water runs off faster, generally increasing and extending he duration of peak and near peak flows.

(See also, ***ISSUE 1.4.1—Restricted Access****, page 30 and 327;* ***ISSUE 1.4.2—Effects of All Terrain*** Vehicle (ATV) use*, page 31 and 330;* ***ISSUE 1.4.4—Effects of Heavy Equipment*** in RHCAs*, page 31 and 347; and* ***ISSUE 1.4.7—Blow down in Vincent/Vinegar*** RHCAs*, page 32 and 362.)*

[48] 25, 50, 100-year or greater flood events.

3.2.2—STREAM TEMPERATURES

The listing of a number of streams within the Analysis area on the State 303(d) list has focused attention on this issue. The State 303(d) list is prepared by the State of Oregon's Department of Environmental Quality, which identifies streams in non-compliance with the Federal Clean Water Act.

An important stream attribute in the Analysis Area (Galena WA, Supplement—2002)is water temperatures for bull trout spawning and steelhead rearing. Optimum water temperatures for Bull trout spawning[49] is below 48°F. Rearing temperatures for bull trout are 54ºF or below. Optimum steelhead rearing temperatures are less than 64ºF. Spawning temperatures are rarely an issue for steelhead, as this species spawn in the spring when streams exhibit lower temperatures due to ambient air temperature and runoff from snowmelt (higher levels of cooler water are present).

Some of the current concerns within the Southeast Galena Project are:

- Lower reaches of tributaries (in 8 locations) and the Middle Fork John Day River main stem (in 2 locations) do not meet State Water Quality Standards for summer rearing temperature (64°F);
- All 9 lower tributary segments sampled exceed State Water Quality standards (summer rearing temperature, 64°F) for 6-15 days most years;
- 2 of these segments do not meet standards 16-30 days most years;
- 2 of these segments do not meet standards 46-60 days most years;
- 2 of these segments do not meet standards over 60 days most years;
- Water temperatures at the two Middle Fork of the John Day River locations exceed standards 46-82 days most years;
- Two of the tributary segments in occupied bull trout habitat do not meet the standards for waters that support Oregon Bull Trout (50°F).

The Middle Fork of the John Day River is listed on the Clean Water Act, State of Oregon Section 303(d) List of Water Quality Impaired Bodies for flow modification. Withdrawals made from Forestland within the planning area under privately held, certified water rights totaling about 12.55 cubic feet per second (cfs) and are described in the Galena Watershed Analysis (1999 Galena EAWS). Most of the water withdrawn under water rights is used to flood irrigate riparian meadows along the Middle Fork of the John Day River.

Water temperatures are influenced by several factors and complex physical hydrologic processes including flow modifications (c.f., Section 1.2.3), amount of shade, wetted channel width-to-depth ratios, and channel characteristics (see pages 30-32). Many of these factors and processes have been changed as a result of activities that have occurred in the analysis area (see 3.2.1—Early Season Peak Flows, page 113). Peak and near peak flows occur earlier and are larger than historical conditions. Late season flows are of longer duration and smaller in magnitude. Hill slope and stream channel characteristics promote rapid runoff. Riparian storage capacity is reduced. Other factors and processes which contribute to elevated temperatures include: the total amount of activity and distribution of activities relative to stream channels; the erosion hazard and other soil characteristics of the lands being utilized; and additionally, the extent and magnitude of residual disturbance created by past activities (c.f., 3.2.1 page 113).

Approximately 70 out of 150 miles of fish bearing and perennial streams in the analysis area were surveyed for shade in the early and mid 1990s, a preliminary analysis indicates that about 70% (approximately 50 stream miles) do not meet *Land and Resource Management Plan* standards for

[49] Bull trout spawning occurs from August through November

shade (LRMP Amendment 29). Most of the 30% of the surveyed streams that meet this standard are in Ponderosa pine ecosystems (Dry Forest), not in mixed conifer (Moist Forest) ecosystems. Potential shade in Ponderosa pine ecosystems is believed to be greater than shown in the standard. The Riparian hardwood shrub component that would be expected under an open canopy is not incorporated into the standard. Riparian hardwoods are believed to be reduced in abundance, vigor and diversity due to past resource utilization and changes in stream channel and valley bottom conditions. Consequently shade in ponderosa pine ecosystems (Dry Forests), is reduced. Based on preliminary analysis it is estimated that 50-70% of the analysis area's streams do not meet *LRMP* standards for wetted channel width-to-depth ratios. It is estimated the 70-90% of the areas streams do not meet *Land and Resource Management Plan* standards for pool frequency either.

The condition of small perennial and intermittent streams and ephemeral draws contributes to elevated stream temperatures . It is estimated that of the small perennial streams, 70% do not meet shade standards. About 50% of intermittent streams and ephemeral draws have conditions (see 3.2.1—Early Season Peak Flows, page 113) which contribute to accelerated runoff and thus contribute to elevated stream temperatures.

Streams within the analysis area identified on Oregon's Approved 1998 Section 303(d) List of Water Quality Limited Waterbodies are listed in Table 91 which follows.

Table 92 List of Water Quality Limited Streams

Stream/River Name	Parameter	Criteria	Season	Supporting Data
Caribou Creek	Temperature	Rearing 64°F	Summer	USFS data, site near mouth
Davis Creek	Temperature	Rearing 64°F	Summer	USFS data, site at FSR 2614 crossing
Granite Boulder Creek	Temperature	Bull Trout 50°F	Summer	USFS data, 3 sites
Middle Fork John Day River	Flow Modification		Summer	Spring Chinook, summer steelhead limited by rearing conditions not met due to water withdrawal
Middle Fork John Day River	Temperature	Rearing 64°F	Summer	USFS data, 2 sites
Little Boulder Cr	Temperature	Rearing 64° F	Summer	USFS data, site near mouth
East Fork Little Boulder Creek	Temperature	Rearing 64° F	Summer	USFS data, site near mouth
West Fork Little Boulder Creek	Temperature	Rearing 64° F	Summer	USFS data, site near mouth
Placer Gulch	Temperature	Rearing 64° F	Summer	USFS data, site at FSR 2614, west 1.5 miles
Ragged Creek	Temperature	Rearing 64° F	Summer	USFS data, site at FSR 2045
Vinegar Creek	Temperature	Rearing 64° F	Summer	USFS data, site 15 meters above fish screen on FSR 120

Recent data obtained from these streams have shown elevations above critical temperature and/or below minimum flow for native fish.

*(See also **1.2.1.2 Undesired Condition: High Stream** Temperatures, page 10 **ISSUE 1.4.1—Restricted Access**, pages 30 and 327 ; **ISSUE 1.4.2—Effects of All Terrain** Vehicle (ATV) use, pages 31 and 330; **ISSUE 1.4.4—Effects of Heavy Equipment** in RHCAs, pages 31; and 347 and **ISSUE 1.4.7—Blow down in Vincent/Vinegar** RHCAs, pages 32 and 362.)*

3.2.3 AQUATIC HABITAT

[3.2.3]The United States Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) respectively, have listed the Columbia Basin Bull Trout and Mid-Columbia River summer-run Steelhead as Threatened, under the Endangered Species Act of 1971. These Threatened fish species, which are resident and anadromous respectively, are present in a number of the streams in the Analysis area. Additionally spring Chinook salmon a sensitive species, are present in portions of the analysis area.

The Middle Fork John Day River is a tributary of the North Fork John Day River, which is in turn a tributary to the John Day River that flows into the Columbia at river mile 218. There are three dams in the Columbia below the John Day River: the Dalles, Bonneville, and John Day. The mouth of the Middle Fork John Day River is 435 river miles from the Pacific Ocean. There are no dams in the John Day River system.

Cattle grazing has historically and presently contributed to poor riparian vegetation conditions, (see Grazing page 222).

High water temperatures and high sediment delivery rates are stream elements of concern within the Analysis area. Stream temperatures are outside an optimum range for these threatened fish species (c.f., 3.2.2—Stream Temperatures, page 124). Aquatic habitat conditions which contribute to high water temperature are: low sinuosity (a lack of the natural meandering nature in streams), lack of woody debris (lack of wood that naturally falls into streams from a forest canopy that in many sections of streams has been removed from historic railroad logging) and an associated low frequency of pools(pools have in many cases been removed during historic hydraulic mining), bank instability, reduced base flows and a lack of shade. These conditions, collectively, influence the overall water quality, affecting fish dependent on these areas for food, security, and propagation.

Fish Habitat

Over 90% of the fish bearing, or surveyed non-fish bearing, perennial streams do not meet *Land and Resource Management Plan* standards (Amendment 29) for pool frequency—frequencies are about 10-40 % of the expected number based on stream type and size.

Over 90% of the fish bearing or surveyed and non-fish bearing, perennial streams do not meet *Land and Resource Management Plan* standards. (Amendment 29), for large woody debris. Large woody debris is present at about 25-35% of the *Land and Resource Management Plan* standard.

About 60% of streams do not meet *Land and Resource Management Plan* standards (Amendment 29) for shade/canopy closure in forested ecosystems.

The 2001 supplement to the 1999 *Galena Watershed Analysis* suggests that hardwood shrub ecosystems are underrepresented in the analysis area. It is estimated that over 90% of the streams in the analysis area do not meet *Land and Resource Management Plan* standards for shrub ecosystems.

Cool, late season flows are believed to have been reduced due to the impacts of many historical activities such as grazing and logging and recent activities which reduced riparian water storage along 90% of the stream channels by about 50-75%.

Riparian meadows along the privately owned portion of the Middle Fork John Day have been converted to agricultural use, currently cattle grazing. Plant diversity in these meadows have declined since historic times.

Table 93 Endangered, Threatened, and Sensitive Species

Common Name	Scientific Name	Location	Status	Listing Agency
Columbia Basin Bull Trout	*Salvelinus confluentus*	Middle Fork John Day River, Granite Boulder Creek	Threatened	USFWS
Mid-Columbia River Summer-run Steelhead	*Oncorhynchus mykiss*	Middle Fork John Day River, all tributaries in analysis area.	Threatened	NMFS
Interior Redband Trout	*O. mykiss*	Middle Fork John Day River, all tributaries in analysis area.	Sensitive	USFS
Mid-Columbia River Spring Chinook	*O. tshawytsha*	Middle Fork John Day River, all tributaries in analysis area.	Sensitive	USFS
Blue Mountain Cryptochian Caddisfly	*Cryptochia neosa*	Little Boulder, Little Butte, Beaver Creeks	Sensitive	USFS

Bull Trout *Salvelinus confluentus*

Bull trout, are reduced in both numbers and distribution within the analysis area (see Appendix E Map 5—TES Species and Essential Habitat for Fish) and the United States Fish and Wildlife Service (USFWS) has listed this species as threatened under the Endangered Species Act of 1973. Species listed as Threatened or Endangered species, which periodically utilize the analysis area, or their habitats occur within the analysis area are managed after consultation with USFWS scientists. Currently, bull trout are found in Granite Boulder Creek year-round and in the mainstem Middle Fork John Day River during winter and spring. This population is a portion of the Middle Fork John Day River metapopulation. Currently, Granite Boulder Creek has a small resident populations of Bull trout as well as fish which travel into this creek from the mainstem of the Middle Fork of the John Day River and other Creeks, while the other three Creeks are considered "historic" bull trout habitat with no resident population of this species. Oregon Department of Fish and Wildlife (ODF&W) radio telemetry studies show that some bull trout move into the Middle Fork John Day River (as far as 60 miles downstream) and possibly other tributaries when water temperatures begin to cool during late fall. The extent of this activity is currently unknown—but studies are ongoing. Other salmonid species are the primary forage prey for adult bull trout.

Critical habitat and potential recovery areas have not been identified for bull trout. The most likely potential recovery areas within the analysis area are Granite Boulder Creek, Butte, Davis, and Vinegar Creeks. Bull trout currently inhabit Granite Boulder and historically inhabited Butte, Davis and Vinegar Creeks. A single bull trout was found in Vinegar Creek during electro-shocking surveys conducted by ODF&W during a survey in the summer of 2000, and a bull trout was found in Butte Creek in 1996 during snorkel surveys conducted (Hiram Lee, et al 1997) as part of a Chinook salmon study. It is currently unknown if these were isolated populations or just stray fluvial[50] fish.

A report by ODF&W (Unterwegner and Seals 2000) stated that the habitat and temperatures where the bull trout was found in Vinegar Creek were marginal, but that improved watershed management could contribute to increased numbers in this stream. All four streams mentioned above are in need of greater habitat diversity and lower water temperatures during summer and early fall. Fall is critical as this is when bull trout spawning activities occur. There are many reaches identified in Level II

[50] Fluvial: relating to, or inhabiting a river or stream.

Stream surveys having no pool habitat, degraded banks, and very little, if any, shade. There may be other tributaries having potential for bull trout recovery areas. The John Day Basin bull trout technical group is working in identifying criteria and developing recommendations for critical habitat and recovery areas.

Bull trout are a *Land and Resource Management Plan* Management Indicator Species similar to a keystone species. Managing for a keystone species such as bull trout is beneficial to other species as bull trout require the coldest, cleanest water of all listed fish in the projects area. See Appendix E, Map 5—TES Species and Essential Fish Habitat.

Summer-run Steelhead *Oncorhynchus mykiss,*

Steelhead are the anadromous form of the redband trout (see Appendix E, Map 5—TES Species and Essential Habitat for Fish). The National Marine Fisheries Service (NMFS), a federal agency which regulates anadromous fish concerns, has listed this species as threatened under the Endangered Species Act of 1973. Species listed as Threatened or Endangered species, which periodically utilize the analysis area, (or if their habitat occurs within the analysis area) are managed after consultation with NMFS scientists. In the John Day River the steelhead population is Mid-Columbia summer run steelhead. This indicates the time of year when individual fish from this particular stock enter the Columbia River from the ocean. The time of entry into freshwater from the Pacific Ocean to actually spawn in tributaries of the Middle Fork John Day River takes from 10 to 12 months. Individual steelhead are usually present in the Middle Fork and tributaries in April and May. Spawning throughout the John Day River sub-basin occurs shortly thereafter. Optimal location and conditions for a steelhead redd (or spawning bed, which occurs in gravel) include the upper edge of the break between a pool and a riffle where the water has proper velocity, proper flow, proper oxygen, and proper depth to incubate the eggs from this large trout. Redds may contain gravel sizes from pea size up to three inches in diameter and can vary from 8-15 inches in depth. Many adult steelhead return to the ocean after spawning activities are completed.

Young steelhead thrive in moderate gradient streams with high water quality, plenty of shade, hiding cover, and large woody material (LWM). Large wood that naturally falls into streams from a forest canopy is vital in hiding and rearing functions in different portions of the life cycle of fish. Preferred summer water temperatures range from 50-65°F, although rearing steelhead are routinely observed in warmer waters, in apparent good health and vigor. Warmer waters are however preferred by non-game fish species, many of which can be true competitors to steelhead for food and space. Young steelhead move around depending on the level of competition for rearing habitat. Seasonal redistribution of juveniles occurs during spring and fall, as water flows and temperatures change.

After rearing for two to three years, the majority of juvenile steelhead begin migration from their natal streams and start the processes of “smoltification,” or the change in physiological condition necessary for life in a saltwater environment. After leaving the Middle Fork John Day River and making a 435 river mile journey to the Pacific Ocean the John Day summer steelhead spend anywhere from one to three years at sea before making the journey back to their natal streams in the analysis area to spawn.

Adult summer-run steelhead can spawn in the upper-most second and third order tributaries and in larger rivers. There have been no surveys conducted that specifically identify the upper limits of steelhead within the analysis area. Most of the steelhead habitat areas are in need of habitat diversity. The district Level II stream surveys indicate that riffle habitat is the dominant feature in most areas. This condition is caused from factors relating to past activities (see 1.2.1.3 Undesired Condition: Damaged Aquatic Habitat, page 11). Past activities that have removed a diverse habitat of the right components of riparian vegetation, the proper functioning of a pool to riffle ratio, the proper functioning of a width to depth ratio of streams, the absence of large woody debris, and the lack of a

forest canopy that produces shade and large woody debris. Degraded riparian habitat and hydrologic function, is due to activities such as unbuffered timber harvest areas, the removal of beaver, improper grazing practices, poor road locations, and past mining practices. See Appendix E, Map 5—TES Species and Essential Fish Habitat.

Interior Redband Trout *Oncorhynchus mykiss gairdneri*

Interior redband trout are the resident life history form of steelhead. According to Benke (1992), the native populations of redband trout found east of the Cascade Mountains are part of the Columbia River basin sub-species Oncorhynchus mykiss gairdneri (see Appendix E, Map 5—TES Species and Essential Habitat for Fish). This particular sub-species of redband ranges from, and includes, the Columbia River basin east of the Cascades, to barrier falls in the states and provinces of Idaho, Washington, British Columbia, and Alberta. These fish are found in nearly every stream in the Malheur National Forest that is capable of supporting salmonid fish populations and are the most prevalent species of all game fish in the analysis area. Current conditions have, however, been degraded by past land use practices. This condition is caused from factors relating to past activities (see **1.2.1.3 Undesired Condition: Damaged Aquatic** Habitat, page 11). Past activities that have removed a diverse habitat of the proper components of riparian vegetation, the proper functioning of a pool to riffle ratio, the proper functioning of a width to depth ratio of streams, the absence of large woody debris, and the lack of a forest canopy that produces shade and large woody debris. Degraded riparian habitat and hydrologic function, is due to activities such as unbuffered timber harvest areas, the removal of beaver, improper grazing practices, poor road locations, and past mining practices.

Spring Chinook *Oncorhynchus tshawytsha*

Spring Chinook are the only run of salmon in the John Day River system (see Appendix E, Map 5—TES Species and Essential Habitat for Fish). This name is taken from the time of year the adults enter the fresh water of the Columbia River on their spawning migration. The total migration time usually takes them seven to eight months. They arrive in the Middle Fork John Day River sometime in May. Surveys indicate that adult Chinook hold in pools approximately 5 feet deep with escape cover such as undercut banks, fallen trees, or other debris, boulders, or other vegetation nearby. Spring Chinook are considered a Sensitive species on the Malheur National Forest.

Spawning occurs during late August and early September in the Middle Fork John Day River—on both Forest Service and private land. Spawning ground surveys by Oregon Department of Fish and Wildlife (ODF&W) indicate that runs of adult spring Chinook in the John Day River declined from 1974 through 1985. Since that time numbers have been on the increase in the John Day basin with approximately 4,000 spawners returning in 1993. The results of year 2000 spawning surveys in the North Fork and Middle Fork John Day subbasins by ODF&W estimated 5,931 individuals that accounted for approximately 30% of the return. This was the highest return since 1959.

Stream conditions for a good redd site for spring Chinook include the upper edge of a break between a pool and a riffle where the water has proper velocity, flow, oxygen, and depth to incubate salmon eggs. The redd can vary in size from three to six feet in diameter and can be 12-18 inches deep. No hatchery reared spring Chinook have been released into the John Day River basin. Nearly all Chinook salmon die after spawning.

Spring Chinook fry usually emerge from about mid-March through mid-June. Timing is related to differences in water temperature. Distribution of fingerlings in the John Day River sub-basin is most extensive in late spring/early summer. Chinook fingerling distribution moves upstream and into tributaries as water temperatures increase. Young Chinook thrive in low gradient streams with high water quality and tend to school and feed in side pockets, channels, beaver ponds, and areas where dead and dying organic material, aquatic insects, and drift accumulate. The young Chinook salmon

move around depending on the level of competition for rearing habitat, water flow and temperature, and availability of food. Surveys have indicated that water temperatures appear to limit the distribution of fingerling Chinook in the Middle Fork John Day system. However, stock-recruitment analysis suggests that instream habitat is presently under seeded due to losses of migrating smolts and adults at the John Day, The Dalles, and Bonneville Dams.

Most Chinook spawning occurs in the mainstem on both private and National Forest land. The Malheur National Forest has few records of Chinook spawning in tributaries, except an adult pair found in Vinegar Creek during a stream survey in August 1991. As noted above, juveniles move up the tributaries as water temperatures in the main river warm up during summer conditions. However, they are usually found in the lower reaches of tributaries. The juveniles can rear in fresh water for up to two years prior to smolting and moving into the Pacific Ocean. Most of the juvenile Chinook habitat areas in the analysis area is in need of habitat diversity. The district Level II stream surveys indicate that riffle habitat is the dominant form of habitat in most areas. This condition is caused from factors relating to past activities (see 1.2.1.3 Undesired Condition: Damaged Aquatic Habitat, page 11). Past activities that have removed a diverse habitat of the proper components of riparian vegetation, the proper functioning of a pool to riffle ratio, the proper functioning of a width to depth ratio of streams, the absence of large woody debris, and the lack of a forest canopy that produces shade and large woody debris. Degraded riparian habitat and hydrologic function, is due to activities such as unbuffered timber harvest areas, the removal of beaver, improper grazing practices, poor road locations, and past mining practices.

The Pacific Fisheries Management Council designated Chinook salmon be managed under Public Law 104-267, the Sustainable Fisheries Act of 1996. This amended the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). Section 305(b) of the Magnuson-Stevens Act (16 U.S.C. 1855(b)) for Essential Fish Habitat (EFH) is described as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity in order to support a long-term sustainable fishery (Magnuson-Stevens Act Section 3). This law requires Federal agencies to consult with NMFS on activities that may adversely affect EFH. See Appendix E, Map 5—TES Species and Essential Fish Habitat.

Blue Mountain Cryptochian Caddisfly *Cryptochia neosa*

Larval stages of this invertebrate were identified throughout Granite Boulder Creek and in three tributaries of Little Boulder, Little Butte, and Beaver Creeks. This is one of seven species confined to montane streams of western North America. Few records exist for five of the seven, which include *C. neosa* that are located in northeastern Oregon and southeastern Washington. From a report written by Betts and Wisseman (1995), only one record of *C. neosa*, collected June 21, 1952 on Lunch Creek near Prairie City, Oregon and is published. Several unpublished records have been made since that time however. This species is classified as a Regional Category 2 invertebrate in 1984. Category 2 species included in the Regional Forester's (Region 6) list of sensitive species are to receive special management emphasis on all public lands administered by the USDA Forest Service in order to ensure their viability and to preclude trends toward endangerment that would result in the need for Federal listing (FSM 2672.1). The authors of this paper concluded the *C. neosa* is the only species of *Cryptochia* present in the Blue Mountains. These invertebrates are normally found in low order, high gradient stream containing sediment free, woody debris or bark.

Riparian Habitat

Riparian areas are used disproportionately to their occurrence by many terrestrial wildlife species, and some species are dependent upon these areas. Terrestrial species of concern in the watershed that associate strongly with riparian habitat are listed in the following table. For the location of

Riparian Habitat Conservation Areas see Appendix E, Map 3—Management Areas and Roadless Areas.

Analysis Area Stream Overview

The following table lists all streams in the analysis area and includes the total number of fish bearing miles (Category 1), perennial non fish bearing (Category 2) and intermittent (Category 4) channels.

Table 94 Streams by miles

Category or Class	Middle Fork John Day River	Davis Placer Gulch	Vinegar	Vincent	Deerhorn Little Boulder	Little Butte Tincup	Butte	Granite Boulder
Class 1 Fish Bearing	9.50	12.69	11.15	5.25	14.17	12.43	6.66	8.07
Class 2 Perennial	n/a	10.62	10.39	3.14	16.53	12.42	7.06	12.24
Class 4 Intermittent	n/a	11.67	25.33	9.12	28.76	14.90	10.22	8.54
Class 5 Mapped Ephemeral Draws	n/a	3.09	6.08	2.02	6.53	6.55	4.35	2.89

Middle Fork John Day River

Adult Chinook salmon and steelhead to a lesser degree (due to large substrate) utilize this section of the Middle Fork John Day River for spawning activities. Juvenile rearing takes place in this section, mostly near cold water inputs from tributary streams and springs because water temperatures are high. It is likely that juveniles are utilizing the lower portions of tributaries as temperatures become elevated in the mainstem. Fluvial bull trout use this section of the Middle Fork John Day River as migratory habitat in late winter and spring while traveling from lower sections of the mainstem to smaller tributaries for summer rearing and spawning activities. Adult, fluvial bull trout have been found upstream to Phipps Meadows within the past

Nongame fish such as northern pikeminnow (*Ptychocheilus oregonensis*), mountain whitefish (*Prosopium williamsoni*), suckers (Catostomus spp.), speckled dace (*Rhinichthys osculus*), longnose dace (*Rhinichthys cataractae),* redside shiner (*Richardsonius balteatus*), and sculpin (*Cottus spp.*) as well as pacific lamprey (amocoetes form—*Lampetra* spp.) are found in this section of the Middle Fork John Day River.

Oregon Department of Fish and Wildlife (ODFW) personnel have completed habitat surveys in 1992 and 1996. Stream temperatures ranged from 52-70°F in August and September. Pools frequency ranged from 1.72 to 5.80 per mile. Pool spacing ranged from 9 channel widths distance in Reach 10 to 28.5 in Reach 9. Pools greater than 3 feet deep ranged from 0.13 to 2.28 per mile. Unstable banks ranged from 10% to 32%. Wetted width to depth ranged from 42.2 to 49.8. Shade ranged from 18 to 42%. Large woody debris ranged from 3.2-9.6 per mile. All wood present was movable at peak or near peak flows. . For the location of Riparian Habitat Conservation Areas see Appendix E, Map 3—Management Areas and Roadless Areas; see also Map 1—Subwatersheds and Topography;and Map 5—TES Species and Essential Fish Habitat.

Level II Stream Survey Results

Vinegar Creek

1991 LEVEL II STREAM SURVEY RESULTS

Adult and juvenile redband trout inhabit the lower 5.5 miles of Vinegar Creek. Juvenile steelhead and juvenile Chinook possibly inhabit the same stream habitats. This stream had historic bull trout inhabiting before 1991. August stream temperatures obtained from hand held thermometers ranged from 42° to 72°F. The difference in stream temperatures was observed from the lower (higher temps) to the upper reaches (lower temps). Instream woody debris counts of pieces >12″ dbh ranged from 0 /mile in Reach 1 to 243/mile in Reach 12. Stream sediment was excessive in all reaches. Pools/mile ranged from 0 in Reach 17 to 36 in Reach 10.

2000 HABITAT SURVEY RESULTS

Fisheries personnel conducted a habitat stream survey on the first 4 miles from the mouth in 2000. Results of the survey showed this stream channel is in active recovery on portions with low gradients and wide valley bottoms (expected Rosgen “C” or “E” channel types). Sometime in the past, the stream had down cut 2-3 feet and formed a Rosgen “B” channel type within the old channel. Currently, stream sinuosity is increasing and stream gradient is decreasing. Width to depth ratios are improving but are still high relative to expected for the geomorphology of the stream reaches. Quantity and quality of pool habitat is currently increasing but is not at optimum levels. Some areas are actively cutting new channels where the current channel was entrenched by 2-3 feet. Floodplains are reconnecting and water tables rising in these sections. Shade from deciduous trees and shrubs was still inadequate to maintain temperatures for resident and anadromous fish.

ODF&W BIOLOGICAL Surveys

Oregon Department of Fish and Wildlife detected an individual adult bull trout in Vinegar Creek during electro-shocking surveys completed in 2000. It is currently unknown if there is a population of bull trout in this stream, or if this was a stray or foraging fluvial adult, which may have traveled into Vinegar Creek from another area, or if there are small disjunct population of this species. Populations of threatened steelhead, sensitive redband trout, and sensitive Chinook salmon are also found in this stream.

Currently, Granite Boulder Creek has a small resident populations of Bull trout as well as fish which travel into this creek from the mainstem of the Middle Fork of the John Day River and other Creeks, while the other three Creeks are considered “historic” bull trout habitat with no resident population of this species. However, recent ODFW electro-shocking surveys detected an individual adult bull trout in Vinegar Creek. An individual bull trout was observed during snorkeling surveys in Butte Creek (McIntosh 1995). It is unknown at this time if these fish were stray fluvial adults, which have traveled into Vinegar Creek from another area, or if there are small disjunct populations. Populations of threatened steelhead, sensitive redband trout, and sensitive Chinook salmon are also found in these streams.

Butte Creek

1992 LEVEL II STREAM SURVEY RESULTS

An individual bull trout was observed during snorkeling surveys in Butte Creek (McIntosh 1995). Adult and juvenile redband trout inhabit the lower 4.0 miles of mainstem Butte Creek, the lower 1.5 miles of Sulphur Creek, and the lower 0.5 miles of Bennett Creek. Juvenile steelhead and juvenile Chinook possibly inhabit the same stream habitats. This is also a historic bull trout stream (inhabited prior to 1990). The mainstem showed July stream temperatures obtained from hand held thermometers ranging from 46° to 57°F, instream woody debris counts of pieces >12″ dbh ranged

from 63.1 /mile in Reach 1 to 84.3/mile in Reach 3, stream sediment was excessive in the lowest two reaches and <35% embedded in Reach 3, and pools/mile ranged from 23.0 in Reach 1 to 37.5 in Reach 2.

2000 HABITAT SURVEY

Fisheries personnel conducted additional stream surveys on the first 3.5 miles from the mouth in 2000. Results of the survey showed width to depth ratios are high relative to expected for the geomorphology of the stream reaches. Quantity and quality of pool habitat is still below optimum levels. Most log weir structures created in the 1980s are not creating pools and in many cases are widening stream channels and creating barriers for juvenile fish at low flows. Shade from deciduous trees and shrubs is still inadequate to maintain temperatures for resident and anadromous fish.

Ragged Creek

1991 LEVEL II STREAM SURVEY RESULTS

Adult and juvenile redband trout inhabit the lower 3.0 miles of Ragged Creek. Juvenile steelhead and juvenile Chinook possibly inhabit the same stream habitats. July stream temperatures obtained from hand held thermometers ranged from 50° to 68°F. Instream woody debris counts of pieces >12″ dbh ranged from 26.6 /mile in Reach 1 to 14.8/mile in Reach 3. Stream sediment was excessive in all reaches. Pools/mile ranged from 154.3 in Reach 2 to 70.7 in Reach 3.

Vincent Creek

1991 LEVEL II STREAM SURVEY RESULTS

Adult and juvenile redband trout inhabit the lower 5.0 miles of Vincent Creek. Juvenile steelhead and juvenile Chinook possibly inhabit the same stream habitats. July stream temperatures obtained from hand held thermometers ranged from 54° to 70°F. Instream woody debris counts of pieces >12″ dbh ranged from 0.0 /mile in Reach 1 to 91.6/mile in Reach 3. Reach 1 was a livestock pasture. Stream sediment was excessive in all reaches. Pools/mile ranged from 45 in Reach 1 to 96.6 in Reach 2. Vincent Creek stream survey listed several areas of habitat degradation caused from mining activities.

Granite Boulder Creek

1993 LEVEL II STREAM SURVEY RESULTS

Adult and juvenile redband trout inhabit the lower 4.0 miles up to a barrier falls in Granite Boulder Creek. Juvenile steelhead inhabit the same stream habitats. Bull trout (both resident and fluvial life history forms) were found in the lower 4 miles. Chinook salmon were found in the lower mile of this stream. August stream temperatures obtained from hand held thermometers ranged from 48° to 59°F. Instream woody debris counts of pieces >12″ dbh ranged from 13 /mile in Reach 1 to 33.4/mile in Reach 3. Cobble embeddedness and stream shade did not meet *Land and Resource Management Plan* Standards in reaches 1-3 (reaches 1-2 are fish bearing). Pools/mile ranged from 26 in Reach 1 to 39 in Reach 2. Sparse populations of Blue Mountain cryptochian were found in all reaches.

2000 HABITAT SURVEY

Fisheries personnel conducted additional stream surveys on the first 4.0 miles from the private land boundary in 2000. Results of the survey showed width to depth ratios are high relative to expected for the geomorphology of the stream reaches. Quantity and quality of pool habitat is still below optimum levels. Most log weir structures created in the 1980s are not creating pools and in many cases are widening stream channels and creating barriers for juvenile fish at low flows. Shade from

deciduous trees and shrubs is still inadequate to maintain temperatures for resident and anadromous fish. (Also, see Beaver Activity, page 135.)

Caribou Creek

1993 LEVEL II STREAM SURVEY RESULTS

Adult and juvenile redband trout inhabit the lower 2.0 miles of Caribou Creek. Juvenile steelhead and juvenile Chinook possibly inhabit the same stream habitats. June stream temperatures obtained from hand held thermometers ranged from 49° to 74°F. Instream woody debris counts of pieces >12″ dbh ranged from 23.6 /mile in Reach 1 to 39.8/mile in Reach 2. Stream sediment was excessive in all reaches. Pools/mile ranged from 58 in Reach 1 to 35 in Reach 2.

Deerhorn Creek

1993 LEVEL II STREAM SURVEY RESULTS

Adult and juvenile redband trout inhabit the lower 2 miles of Deerhorn Creek. Juvenile steelhead and juvenile Chinook possibly inhabit the same stream habitats. June stream temperatures obtained from hand held thermometers ranged from 49° to 59°F. Instream woody debris counts of pieces >12″ dbh ranged from 14.3 /mile in Reach 1 to 125.7/mile in Reach 2. Stream sediment was excessive in all reaches. Pools/mile ranged from 28 in Reach 1 to 54 in Reach 2.

Little Boulder Creek

1993 LEVEL II STREAM SURVEY RESULTS

Adult and juvenile redband trout inhabit the lower 2.5 miles of mainstem Little Boulder Creek and the lower 0.5 miles of Tributary 2. Juvenile steelhead and juvenile Chinook possibly inhabit the same stream habitats. June stream temperatures obtained from hand held thermometers ranged from 45° to 55°F. Instream woody debris counts of pieces >12″ dbh ranged from 23.1 /mile in Reach 1 to 54.3/mile in Reach 2. Stream sediment was excessive in all reaches. Pools/mile ranged from 22.5 in Reach 1 to 27.6 in Reach 2. The Blue Mountain caddisfly was also present in this tributary. Tributary 2 had redband inhabiting the lower 0.5 mile of stream. Natural falls and lack of water from this point upstream prevented fish from inhabiting this reach of stream. Blue Mountain caddisfly was not present in this tributary.

Little Butte Creek

1993 LEVEL II STREAM SURVEY RESULTS

Adult and juvenile redband trout inhabit the lower 1.0 mile of mainstem Little Butte Creek and the lower 1.0 mile of Tributary 2. Juvenile steelhead and juvenile Chinook possibly inhabit the same stream habitats. Mainstem June stream temperatures obtained from hand held thermometers ranged from 48° to 65°F. Mainstem instream woody debris counts of pieces >12″ dbh ranged from 33.2/mile in Reach 1 to 61.6/mile in Reach 2. Stream sediment was not excessive in both reaches of the mainstem. Pools/mile ranged from 33 in Reach 1 to 15 in Reach 2. Tributary 2 June stream temperatures obtained from hand held thermometers ranged from 46° to 65°F. Tributary 2 instream woody debris counts of pieces >12″ dbh ranged from 28.1/mile in Reach 1 to 37.6/mile in Reach 2. Stream sediment was excessive in both reaches of the Tributary 2. Pools/mile ranged from 34 in Reach 1 to 32 in Reach 2. The Blue Mountain caddisfly was also present in this tributary.

Davis Creek

1996 STREAM SURVEY RESULTS

Adult and juvenile redband trout inhabit the lower 5.0 miles of Davis Creek. Juvenile steelhead and juvenile Chinook possibly inhabit the same stream habitats. July stream temperatures obtained from hand held thermometers ranged from 48° to 71°F. Instream woody debris counts of pieces >12″ dbh ranged from 29.6 /mile in Reach 2 to 81.0/mile in Reach 4.

2000 HABITAT SURVEYS

Fisheries personnel conducted additional stream surveys in 2000 on the first 3.5 miles from the mouth to a cascade that is a fish barrier. Results of the survey showed quantity and quality of pool habitat is currently increasing but is not at optimum levels. Shade from deciduous trees and shrubs is still inadequate to maintain temperatures for resident and anadromous fish in the lower portion. (Also, see Beaver Activity, page 135.)

Placer Gulch

1997 STREAM SURVEY RESULTS

Adult and juvenile redband trout inhabit the lower 3.2 miles of Placer Gulch Creek. Juvenile steelhead and juvenile Chinook possibly inhabit the same stream habitats. August stream temperatures obtained from hand held thermometers ranged from 48° to 74°F. Instream woody debris counts of pieces >12″ dbh ranged from 0 /mile in Reach 1 to 56.2/mile in Reach 5. Pools/mile ranged from 0 in Reach 1 to 56.5 in Reach 3.

Fish Habitat

Pool habitat is created by areas of high water velocity during peak flows that become depositional areas during low flows (Chamberlin et al., 1991). This habitat is important for all life stages of salmonids as pools during summer when this habitat is important as a slow water sanctuary and temperatures in the deeper section of pools tend to be lower than ambient stream temperatures. Pools are also important for winter rearing habitat when fish move into the interstitial spaces of gravels. Timber harvest activities can increase the supply of fine sediments, which settle in pools and reduce usefulness as fish habitat.

Riffle habitats are locations of sediment deposits with water flowing over them that contain larger substrate such as gravels, cobbles and boulders. These sections produce food for fish but offer few habitats to small fish (Chamberlin et al., 1991). Timber harvest can increase sediment supplies and increase the amount of riffle habitat in streams.

Beaver Activity

A few beaver reside in the analysis area. Formerly, these animals were thought to have been removed from the watershed by trapping. Beaver sign has been recently found in some portions of the headwaters of Davis Creek and Granite Boulder Creek, upstream of Forest Road 4550. Evidence of beaver activity also exists along the Middle Fork John Day River.

Beaver play a crucial role in the maintenance of stream channels and associated RHCAs in the dry, high desert habitat of central Oregon (Lichatowich 1999). Beaver dams raise water tables and connect stream channels with flood plains. Higher water tables allow water to be stored longer and released later in the year increasing base flows. This aids in creating and maintaining riparian vegetation that maintains cooler water temperatures by providing stream shade and eventually recruits instream Large Woody Debris when vegetation falls into the stream channel. Beaver dams

also create hydrologic control structures that trap sediment and buffer the effects of natural disturbances such as floods and droughts.

Beaver activity creates deep pool habitat, which provides excellent summer and winter rearing habitat for salmonids. Beaver dams can create barriers to upstream movement of fish but this is uncommon and tends to only deter migration for a few years at most.

Disturbance Regimes In Aquatic Habitat

Recreation Affects in RHCAs

Field observations have identified a number of dispersed campsites (see page 89) and trail systems located within Riparian Conservation Areas (RHCAs) that are affecting soils through compaction and displacement. This activity is delivering sediment to nearby streams. A recent trend of cross-country use of All Terrain Vehicles (ATV) is causing resource damage. These situations are potentially degrading water quality in the analysis area. Many factors and complex physical hydrologic processes relate to the risk of sediment from activities that occur in the analysis area. These include: the total level of activity relative to stream channels; peak water flows; and erosion hazard and other soil characteristics of the lands being utilized; the manner of utilization and the extent and magnitude of past activity which may have created unstable conditions.

Middle Fork Dispersed Sites

Camping near the Middle Fork John Day River has caused impacts along the river's edge. In these Middle Fork areas camping is affecting soils through compaction and displacement. This activity is delivering sediment to the Middle Fork of the John Day River.

Murdock Dispersed Site

Dispersed site in the Tincup/Little Butte Creek SWS (historically known as Murdock) has an access road with native surface and is deeply rutted in places and widened in areas where users have driven around these ruts. Soil compaction and loss of vegetation has occurred. The access road and dispersed camp sites are within 100 feet of Middle Fork of the John Day River (see Appendix E, Map31—Recommended Trails, Trailheads, and Campsite Projects-for Action Alternatives).

Deerhorn Forest Camp (Campground)

The Deerhorn Forest Camp (Campground), in Little Boulder/Deerhorn SWS, access to this area is rutting and has severe potholes, the camp sites are scattered, and foot access to the river is not controlled. Consequently, vegetation is being trampled and compacted due to this uncontrolled use (see Appendix E, Map31—Recommended Trails, Trailheads, and Campsite Projects-for Action Alternatives).

Davis Creek Trail

All Terrain Vehicles (ATV) currently use the Davis Creek Trail with current use rated as high and increasing. Due to inadequate trail width because the trail was originally designed as a motorcycle trail (trail bikes were popular at the time of design) the current use may not be safe. This safety concern is because the original design conflicts with a change in the use pattern throughout the entire length of this trail and currently does not meet Forest Service trail guide specifications for ATV use. The entire trail length of 11.8 miles is less than standard width and would require major reconstruction to meet the guides for ATV use. The Davis Creek Trail fords Butte Creek three times and has water quality and possible fish concerns at each of these crossings due to ATV use.

Resource damage is occurring in other stream crossings along segments of the trail and at the inadequate bridge crossings which were originally designed for Motorcycle (trail bike) use.

Grazing

Excessive livestock grazing from past management practices earlier in the past century, on-going grazing from present allotments, and heavy browsing by deer and elk have contributed to a reduction in riparian vegetation and upland vegetation composition. These factors have caused a reduction of native shrubs, forbs, and grasses. Losses within the Riparian Habitat Conservation Areas (RHCAs) have reduced the stream shading that helps to maintain low water temperatures. Changes in upland shrub and ground cover have decreased moisture and soil-holding capacity on some portions of the landscape—consequently this has decreased water storage capacity for late season flows.

As a result, the increased speed with which water leaves the landscape and the amount of water delivery to stream channels contribute to the primary concern of decreased late season water flows. This condition has contributed to excessive stream entrenchment prevalent in the Southeast Galena Analysis area.

Both livestock and wild ungulate (deer and elk) grazing has had a major influence on the watershed. Cattle grazing occurs in all subwatersheds within the analysis area.

Livestock concentration due to salting in conjunction with Forest Road 2010-159 is contributing to erosion in an unnamed intermittent stream in Little Boulder Creek subwatershed. Livestock concentration may also be partially responsible for the erosion of stream bank along sections of the mainstem Middle Fork John Day River surveyed by the Oregon Department of Fish and Wildlife. This erosion may also be attributed to increased peak flows entering the mainstem from flashier upstream watersheds.

Grazing impacts within riparian zones have been reduced because of modified management strategies due to the Endangered Species Act. There are several relatively small meadows in the watershed, which provide good forage for ungulates. Most of these are in fair to good rangeland condition. The species composition of many of these meadows has changed from native to non-native plants. Kentucky bluegrass, timothy, orchard grass, intermediate wheat grass and dandelions dominate many of the meadows. There is one exception to this scenario. Privately owned pastures along the upper part of the Middle Fork John Day River, from the town of Bates to Caribou Creek are dominate by tufted-hairgrass which is a native species. These meadows produce an abundance of vegetation, most of which are not being utilized by foraging animals.

A debris torrent occurred in Lemon Creek (a tributary of Granite Boulder Creek). This torrent is believed to have originated from areas eroded 100 years ago following heavy sheep grazing. The debris torrent was triggered by a locally concentrated rainfall event.

Access Travel Management

Roads in uplands outside of RHCAs can impact watersheds and fish habitat but effects are much more subtle in the landscape of the analysis area. Increasing the drainage network and reducing the time water takes to reach live water on the landscape are 2 examples of potential impacts.

Road impacts within RHCAs are especially evident in the subwatersheds of the Southeast Galena Restoration Analysis area. Both closed and open roads located in RHCAs have numerous impacts to riparian and stream function. They commonly constrict flood plains which increases stream energy during high flows. This can increase sediment transport, bank scour and channel down cutting, all of which degrade fish habitat. Roads in RHCAs also contribute chronic sediment input to streams, reduce stream sinuosity, increase stream gradient, reduce stream shade and reduce overall floodplain function. These changes can reduce fish habitat quantity and quality. See

Appendix E, Map 3—Management Areas and Roadless Areas for a view of RHCAs and Map 29—Access Travel Management Plan Alternatives 2, 3, and 4 for current open and closed roads.

The following table shows the total RHCA road miles within each subwatershed of the analysis area. The open asphalt miles include portions of County Road 20.

Table 95 Total RHCA road miles

Road Status	Surface Type	Davis Placer	Vinegar	Vincent	Deerhorn Little Boulder	Little Butte Tincup	Butte	Granite Boulder
Open	Asphalt	1.43	0.11	0.09	2.12	3.07	0.07	0.0
Closed	Asphalt	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Open	Aggregate	0.0	1.05	1.42	0.0	1.25	0.29	2.04
Closed	Aggregate	0.0	1.30	0.21	0.0	0.0	0.68	0.18
Open	Improved	0.0	0.0	0.0	0.96	0.0	0.0	0.63
Closed	Improved	0.0	0.18	0.0	0.22	0.04	1.13	1.68
Open	Native	2.13	0.57	0.0	0.0	0.0	0.0	0.25
Closed	Native	6.24	5.49	5.34	6.88	3.02	3.40	3.78
Percent Road Miles in RHCA♠		22	21	23	24	22	21	24
Total All Roads		9.8	8.70	7.06	10.18	7.38	5.57	8.56
Total Open Roads		3.56	1.73	1.51	3.08	4.32	0.36	2.92
Source: Blue Mountain RD GIS, March 1999								

In 2001 the Malheur National Forest initiated a Forest-wide evaluation of road crossing sites on fish bearing streams to determine where structures exist that could present barriers to fish passage. This includes any water flow level any life stage of the fish. The table below indicates the results for all of the existing crossings evaluated in the analysis area. Data from some culvert surveys were inconclusive and are listed as "Unknown Status" in the table.). At least 25% of these culverts are not designed to handle a 100-year flood event. It is also estimated that as many as 85% of the culverts on fish bearing streams pose a barrier to some life stage of fish migration.

Existing culverts on fish bearing streams

SWS NAME	Total Culvert Crossings on Fish Bearing Streams	Passable to All Life Stages of Fish at All Flows	Unknown Status	Not Passable to all Life Stage of Fish at Some Flow
Davis/Placer Gulch	1			1
Vinegar	7	1	1	5
Vincent	4	1		3
L. Boulder/Deerhorn	4	1	1	2
Tincup/L. Butte	8		2	6
Butte	3	1		2
Granite Boulder	4			4
TOTAL	31	4	4	23

Recreation Interface with Aquatic Habitat

Road development, including those constructed for timber harvesting, have provided increased access for hunting, fishing, hiking, dispersed and developed site camping, and other recreational activities to the watershed in the last 50 years or more. Recreation use is gradually increasing to include year-round activities such as snowmobiling, cross-country skiing, summer camping, and mountain bike riding. Beginning in the middle of May and continuing through November, established campgrounds and stream areas along the Middle Fork John Day River receive continuous moderate to heavy use. Deer and elk hunting are very popular recreation activities within much of the Southeast Galena Restoration analysis area.

There are two Forest Service developed recreation facilities within the analysis area along the mainstem Middle Fork John Day River: The Middle Fork and Deerhorn campgrounds (see page 228). The Middle Fork campground is a fee campground, the Deerhorn campground is not. This has created additional use in the non-fee campground (which users prefer) that occurs throughout the recreational season. Because of this, the non-fee campground receives disproportionate use and impacts, which the fee campground does not.

There are dispersed campsites located within the analysis area that have impacts to aquatic habitat. Use of these sites varies throughout the year, with the majority of sites showing heaviest use during the fall hunting season. This is also the critical time of year for fall spawning of bull trout and Chinook salmon. Dispersed campsites are characterized by primitive structures such as toilets, meat poles, fire rings, and benches built by campers. Campsites are concentrated primarily in flat areas off main transportation systems where water can be accessed. Many are near springs or creeks. Varied degrees of vegetation and riparian zone damage occurs throughout the watershed due to vehicles, sanitation practices, and removal of vegetation for various purposes. In some areas, road closures have been implemented to relocate camping towards the use of developed campgrounds, forest camps, and other dispersed sites.

*(See also **1.2.1.3 Undesired Condition: Damaged Aquatic** Habitat, page 11 **ISSUE 1.4.1—Restricted Access**, pages 30, and 327 ; **ISSUE 1.4.2—Effects of All Terrain** Vehicle (ATV) use, page 31; page 31; **ISSUE 1.4.4—Effects of Heavy Equipment** in RHCAs, page 31; and **ISSUE 1.4.7—Blow down in Vincent/Vinegar** RHCAs, page 32. See also Appendix E, Map 1—Subwatersheds and Topography; Map 5—TES Species and Essential Fish Habitat; Map 31—Recommended Trails, Trailheads, and Campsite Projects—For Action Alternatives, for existing trails and campsites.)*

3.2.4 VEGETATION BY FOREST TYPE

Forest types are descriptive terms being used to group vegetation by similar moisture and temperature environments which result in similar fire regimes. Forest types are also referred to as Biophysical Environments (BEs) or Potential Vegetation Groups (PVGs). This document will use the term Forest types, but the reader should be mindful that Biophysical Environments and Potential Vegetation Groups are terms used interchangeably in resource science.

This document, (Galena WA, Supplement—2002) classifies vegetation groups into the following five Forest types (see also Appendix E, Map 6—Forest Stand Types and Map 7—Forest Stand Structural Stages)

Dry Forest Type: Occupy low to mid elevations and south slopes at higher elevations. Stands are composed of ponderosa pine, Douglas-fir, lodgepole, grand fir, and western larch. Under optimum conditions the fire regime is of a low intensity and high frequency (10-15 years) over most of the area, with small patches of mortality . Dry Forest comprise about 29,000 acres or 59% of the Southeast Galena area. See 3.2.4.1 Dry Forest , page 140.

Moist Forest Type: Occupy mid elevations, northerly aspects and cooler, wetter draw bottoms. Stands are composed of ponderosa pine, Douglas-fir, grand fir, lodgepole pine, western white pine, western larch, and Englemann spruce. Under optimum conditions the Moist Forest fire regime is mixed, with low intensity, high frequency (10-15 years) regime overlaid with a high intensity, low frequency (100-200 years) regime. Patch size for disturbance by fire for this group would under optimum conditions range from 200 to 2,000 acres. Dry Forest group comprise about 11,500 acres or 23% of the Southeast Galena area. See3.2.4.2 Moist Forest Type, page 147.

Lodgepole Forest Type: Occupy a wide range of forest types, usually maintained by fire or frost pockets. Stands are composed of lodgepole pine, often in almost pure stands, with western larch and later grand fir and other shade tolerant species. Fire regime in this group is high intensity, moderate frequency (80-120 years). These areas comprise about 1500 acres (2% of the Southeast Galena area). See 3.2.4.3 Lodgepole Pine Forest Type, page 151.

Cold Forest Type: Occupy high elevation sites, northerly aspects, and cooler, wetter draw bottoms. Stands are composed of Englemann spruce, sub-alpine fir, white bark pine, and lodgepole pine and the fire regime in this group is high intensity, low frequency (50-275+ years) with noticeable susceptibility to torching and crown fires. Cold Forests occupy approximately 2,000 acres (or 4% of the Southeast Galena area). See 3.2.4.4 Cold Forest Type, page 154.

Woodland Type: Occupy dry sites at low to mid elevations, often on south slopes. Stands are historically open ponderosa pine savannahs and with a sparse intermingling of juniper that was maintained historically by frequent fires. Woodlands occupy approximately 1,400 acres (3% of the SE Galena area). See 3.2.4.5 Woodland Forest Type, page 157.

These groups and others (see 3.2.4.6 Other Vegetation, page 158) interact together and overlap ecosystems in the analysis area in a complex range that historically formed fire-adapted forests.

3.2.4.1 Dry Forest Type

Photo 13—Old Forest Single Strata (OFSS) which comprised 30-50% of the analysis area in Dry Forest types is now only 1% (see Table 96 and also Appendix E, Map 7—Forest Stand Structural Stages).

Dry Forests occupy approximately 29,000 acres (59% of the Southeast Galena area). They occur across a range of soils (volcanic ash as well as mixed and residual soils—gravely to cobbly loams, clay loams) and southerly to flat aspects along mid to lower elevations.

Dry Forests are represented by an array of plant associations, indicating the wide range of environments they occupy. Species compositions in Dry Forests range from nearly pure ponderosa pine to mixes of ponderosa pine, Douglas-fir, grand fir, western larch, and lodgepole pine.

In some locations juniper is increasing its range into the Dry Forests in the absence of frequent ground

fires. Also, ponderosa pine is encroaching into meadows that historically were kept free of trees by frequent fire occurrences.

Understory Plants

The alteration of natural fire regimes has resulted in uncharacteristically dense shade from the overstory where late seral species such as Douglas-fir and grand fir are heavily stocked. The shade has altered the understory vegetation and decreased ground cover. Native understory grasses, forbs, and shrubs that are adapted to short fire-return intervals and the high light availability of open, Dry Forest environments, are not as numerous, nor as vigorous as they were in the past. Low intensity burns no longer stimulate common species such as pine grass, blue wild rye, and bitterbrush.

Dry Forest has generally sustained the heaviest use of its understory, and therefore is the most changed from its historic condition. The combination of loss of regular fires, heavy use by cattle for the last 80 to 100 years, and current large populations of wild ungulates (deer and elk) has resulted in severe degradation of the upland shrub component. Native grass and forb species, while still predominating, are widely mixed with exotic species introduced to enhance grazing and/or stabilize soils along roads, skid trails, and landing sites. Some of these same disturbed locations now host populations of noxious weeds (see page 203). Riparian areas have suffered similar losses of streamside shrubs, and exotic grasses such as Kentucky bluegrass (*Poa pratensis*) have largely replaced native species where water tables have dropped. Historic beaver wetlands with species-rich habitats are virtually non-existent, while placer tailings along some streams such as Vinegar and Vincent Creeks provide substrates that support minimal vegetation, much of it exotic.

Disturbance Processes—Dry Forest Type

Dry Forests have been affected by a variety of disturbances. These include: insects; diseases; fire; and human related disturbances such as timber harvest, fire suppression, and grazing. Fire is by far the major disturbance agent in Dry Forests. Other disturbance agents in this forest type include a variety of insects and diseases. In general, these disturbance agents added to the structural diversity of these stands by providing small areas/openings for understory vegetation to establish.

FIRE

Historic fire disturbance regimes in these forest environments can be best characterized as high frequency/low intensity. Fires started by lightning burned in the form of under burns and small areas of lethal fires on a frequency of every 10-35 years in these forest types (Agee 1993, Hall 1977). Before the advent of Euro-American settlement, cultural fire or “Indian burning,” probably supplemented natural fire regimes (Rotell 2001). These fires were agents of stability, helping to maintain stands with high proportions of fire tolerant species and large areas of relatively open park like conditions. Small areas of denser forest patches occurred in areas missed or more resistant to fire (draws, spring seep areas, wetter aspects).

Recent fires however, have been large, stand replacement events that are very out of character with the historical fires that occurred. The Summit Fire is the most recent in the Galena watershed and covered 30,000 acres, of which over half was in the Dry Forest Type. The Summit Fire burned as an uncharacteristically severe wildfire across 75% of the area at an intensity and magnitude much greater than the mostly low intensity historical fires.

INSECTS

The western pine beetle was the primary bark beetle working in the stands historically dominated by larger diameter ponderosa pine. Scattered individual tree mortality created small openings in stands where pockets of understory could establish. Mountain pine beetle and pine engraver were likely

present at low levels due to the overall lack of suitable habitat (i.e. dense thickets of smaller diameter trees).

Bark beetles are the most common insects present in the Dry Forests. Denser stands with a high proportion of sapling to pole sized ponderosa pine have increased levels of mountain pine beetle and Ips beetle activity and associated mortality. Western pine beetle is also present across Dry Forests, keying in on highly stressed larger overstory ponderosa pine. Fir engraver activity is prevalent in Dry Forests due to the combination of high stand densities and increased proportion of grand fir occupying these sites. At endemic levels, these forest insects play an important role in contributing to structural diversity, and providing dead wood habitat important for wildlife and soil productivity. At epidemic levels, they create conditions that can lead to disturbance intensities outside the historic range.

> Epidemic insect or pathogen populations can overcome the defenses of relatively healthy trees. In other words, when outbreaks develop on landscapes populated primarily by stressed trees, even trees growing under favorable conditions are exposed to tree-killing numbers of insects or pathogens. For this reason, budworm and bark beetle outbreaks generated by stressed understory firs on upland sites spread to firs in riparian and high elevation forests and kill trees that would otherwise been resistant to insects and diseases. (Johnson, et al, 1995).

Impacts of the recent (1985-1992) spruce budworm outbreak are found in the moister vegetation types within the Dry Forest group, especially in the multi-strata stand structures. In general, the suppressed tree classes of grand fir, Douglas-fir, and Englemann spruce exhibit poor crowns, reduced growth and varying degrees of mortality because of past repeated defoliation. The band of Dry Forest along the southern boundary of the Vinegar Hill-Indian Rock Scenic Area is at the moist end of the Dry Forest spectrum and it was hit particularly hard by the budworm outbreak in 1991, with heavy defoliation and above average mortality levels. This area has been the location of three severe fires in the mid 1990's, no doubt made worst by the increased fuel levels caused by the budworm infestations. Another area of heavy defoliation and mortality lies just north and east of Ragged Rocks in the heads of the Butte, Ruby, and Ragged Creek drainages.

DISEASES

The primary root diseases in Dry Forests are *Annosus* and *Armillaria* which result in small "centers" of mortality and associated gaps in the forest canopy. These areas provided openings for understory vegetation (grasses, shrubs and seedlings) to establish and added to structural diversity. Overall disease levels were generally low because of the effects of fires maintaining increased abundance of species most tolerant to diseases (ponderosa pine and western larch), and the increased ability of trees to ward off infections due to lower stand densities. Frequent fires also helped keep root diseases at lower levels due to the promotion of soil fungi that competes with pathogenic fungi, and through beneficial effects of fire on soil nutrients and nutrient cycling.

Annosus root disease is most prevalent in stands previously entered with overstory and partial overstory removal harvests. Numerous stands show signs of *Annosus* related mortality associated with large old stumps and harvest related disturbance (skid trails). These past harvests resulted in varying degrees of disturbance to the soils and ground vegetation, facilitating the spread of *Annosus* root disease through wind-borne spores infecting large stumps. Mortality from the disease has been identified in both ponderosa pine and grand fir indicating that both the P-strain (pine strain) and S-strain (true fir strain) of the *Annosus* root disease are present.

Armillaria root disease is also present (often with *Annosus*), resulting in mortality in virtually all sizes and species of trees in areas of heavy infection. *Armillaria* root rot is found in several areas in the Tincup Creek and Little Boulder Creek drainages at fairly high levels. *Armillaria* infected stands show considerable amounts of mortality in virtually all sizes and species of trees. Grand fir and

Douglas-fir are most susceptible while, lodgepole pine, Englemann spruce, ponderosa pine, and the occasional western white pine show varying degrees of tolerance. Western larch is the most resistant to the disease, but can still be infected when subject to overstocking.

Dwarf mistletoe was present in low levels throughout the Dry Forests of the watershed. Dwarf mistletoe is predisposed the occasional tree to bark beetle attack, or torching by fire. Brooms created by mistletoe infections were susceptible to fire, especially brooms in the lower crown. Thus, frequent fires likely helped keep overall levels of mistletoe low due to the "fire pruning" of infected branches and through potential negative impacts of the heat and smoke on developing mistletoe plants. The primary species infected by dwarf mistletoe are ponderosa pine and Douglas-fir. Levels of mistletoe infection vary with more severe infections occurring in Douglas-fir mistletoe centers where stands with an infected overstory spread to susceptible understory trees.

As with insects, these forest diseases play an important role in creating structural diversity within forest stands, creating a source of snags and down logs as important wildlife habitat and recycling nutrients which were locked up, in trees and logs—thus maintaining soil productivity. However, at severe levels, these diseases can greatly inhibit the development of a stand, limiting growth and habitat potential.

MECHANICAL DISTURBANCE

Windthrow of occasional trees also adds structural diversity by creating small gaps in the forest canopy, facilitating establishment of understory vegetation. As in the cooler, more Moist Forest types, all of these disturbance agents play an important role in providing a diversity of vegetative conditions and associated habitats across the landscape.

HUMAN DISTURBANCE

Human related disturbances (timber harvest, fire exclusion) have affected the Dry Forests in the analysis area more than the other forest types across the watershed. In the past, the most noticeable harvests focused on the removal of the larger overstory ponderosa pine. Years of selective removal of the largest ponderosa pine, combined with exclusion of fire, resulted in significant changes in the structural and compositional character of the Dry Forests.

The most noticeable feature is the absence of large ponderosa pine trees in many stands. This is particularly evident along the Middle Fork of the John Day River due to early railroad logging; there are few large trees and an abundance of young, small to medium sized trees for the magnitude of this type of harvest in the analysis area. In the early part of the past century, railroad logging removed most of the fire resistant component of fire-adapted forest stands (large ponderosa pine and western larch) in the analysis area (see Appendix E, Map 4—Historic Railroad Logging). The W.H. Eccles Company and the Oregon Lumber Company owned most of the lower elevation forests of the analysis area and began logging and processing lumber at a mill in Austin in 1905. Railroad logging played a prominent role in the history of the watershed. The Oregon Lumber Company constructed a narrow gauge railway from the historic town of Bates down the Middle Fork of the John Day River to the mining towns of Susanville and Galena in 1916. Numerous railroad spurs were built in order to high grade log the seven subwatersheds of the analysis area during this era. Another noticeable trend has been increasing proportions of shade tolerant grand fir and Douglas-fir growing in the understory. This has increased the proportion of stands with multi-strata structures.

> A major portion of the live forest is under stress because stands are too dense, especially the Douglas-fir and true fir understories beneath pines and larch, which increase the likelihood of future mortality in both the understory and overstory." (Johnson, et al, 1995).

Recent harvest patterns have focused on reverting stands back to a species composition similar to historic conditions by removing fir and regenerating to a higher proportion of seral species. Most of these treatments were constrained by arbitrary harvest unit size restrictions; resulting in a patchwork

appearance and fragmentation of stands rather than following historic landscape patterns. A few of the most recent harvest activities have been planned to more closely mimic historic patch sizes, either by using larger unit sizes or by connecting previous smaller patches.

Underburning has also recently been used to reduce the ground fuels and to begin to remove some of the small sized fire intolerant trees species, like fir, from the understory.

Species Composition and Successional Development

The low intensity/high frequency disturbance regime common in Dry Forest type favored fire resistant species (ponderosa pine, western larch, and to a lesser extent larger Douglas-fir) and development of more open stands with little vertical structure. This is because shade tolerant species (grand fir and Douglas-fir) were generally susceptible to frequent fires due to their thinner bark when these trees were young possessing, low hanging crown characteristics that were susceptible to fire. This was also true for Moist Forests occurring in a transitional area with Dry Forests. Smaller understory trees were vulnerable to periodic fires surviving only in openings with too little fuels to carry a fire. The extent of these ground fires likely varied from small areas (less than 10 acres in size) to entire slopes covering thousands of acres depending upon the season, topography, and climatic conditions. The intensity also varied in response to vegetative conditions. Areas missed by frequent fires (wetter northerly aspects) developed conditions where subsequent fires could potentially be of moderate to high intensity, resulting in patches of stand replacement with regeneration stands. This created an uneven mosaic to the landscape of the analysis area with infrequent openings and a small number of younger stands interspersed throughout the area. Higher intensity fire was limited by the preponderance of the larger open park-like stands that prevented large areas of uncharacteristically severe wildfire to occur (see Appendix E, Map 2—Large Fire History Map 6—Forest Stand Types; and Map 7—Forest Stand Structural Stages).

Overall, the frequency of these fires became an agent of stability in these forest ecosystems. Frequent low-intensity fire kept the ground vegetation dominated by fire adapted grasses (such as pine grass and elk sedge) and shrubs (ceanothus, snowberry, Oregon grape), while promoting and maintaining mature forest vegetation dominated by early seral species, such as ponderosa pine, western larch and, to a lesser extent, Douglas-fir. Because of the stabilizing effect of these fires, stands tended to be maintained with early seral species and larger fire resistant trees. Succession to shade tolerant species and associated multi-strata structures only occurred in areas that escaped several fire cycles.

Table 96—Dry Forest Historic and Current Structural Stages(see definitions below).

Dry Forest Structural Stage[51].	**Historic Range of Variability**[52]	**Current** Condition
Stand Initiation (SI)	5-15%	5%
Stem Exclusion Open Canopy (SEOC)	5-25%	42%
Stem Exclusion Closed Canopy (SECC)	5-10%	3%
Understory Reinitiation (UR)	5-10%	7%
Young Forest Multi-strata (YFMS)	5-15%	30%
Old Forest Single-stratum (OFSS)	30-55%	1%
Old Forest Multi-strata (OFMS)	5-15%	12%

This table is a description of potential vegetation group and the historical range denoted therein is based on observation and professional judgment of the historical extent of structural stages. They are estimates from interpreting existing stands—no historical data is available.

See Appendix E, Map 6—Forest Stand Types; and Map 7—Forest Stand Structural Stages.

[51]**Structural Stage Definitions:** see Appendix E Map 7—Forest Stand Structural Stages

Stand Initiation (SI): A single canopy stratum of seedlings and saplings, often established after a stand replacing disturbance.

Stem Exclusion Closed Canopy (SECC): A single canopy stratum of pole to small saw sized timber where shade excludes the development of an understory. See Photo 13 next page.

Stem Exclusion Open Canopy (SEOC): A single canopy stratum of pole to small saw sized timber where a lack of water excludes the development of an understory. Photo 14 next page.

Understory Reinitiation (UI): The overstory has been opened up by natural mortality or thinning, allowing establishment of an understory.

Young Forest Multi Strata (YFMS): Multiple canopy layers provide vertical and horizontal diversity with a mix of tree sizes. Large trees are absent or at low stocking levels. See Photo 7 page 16.

Old Forest Single Strata (OFSS): Large trees are frequent, with no lower canopy levels, often develops after repeated disturbances, such as underburning and a decrease in vigor and forage quality with decreasing shade and increased nutrient. See Photo 5, page 14 and Photo 13, page140.

Old Forest Multi Strata (OFMS): Large trees are frequent along with multiple canopy levels, often developing in absence of disturbances to the understory see Photo 16 page147.

Note: *Interior Columbia Basin Ecosystem Management Project* Supplemental Draft EIS (ICBEMP) document uses the term "story" rather than "strata" in the above definitions.

[52] The percentage of each structural stage thought to have existed across the landscape before Euro-American—American settlement. (See HRV, definition page t cycling provided by burning.

Photo 14 —Stem Exclusion Closed Canopy: A single canopy stratum of pole to small saw sized timber where shade excludes the development of an understory.

Photo 15— Stem Exclusion Open Canopy: A single canopy stratum of pole to small saw sized timber where a lack of water excludes the development of an understory.

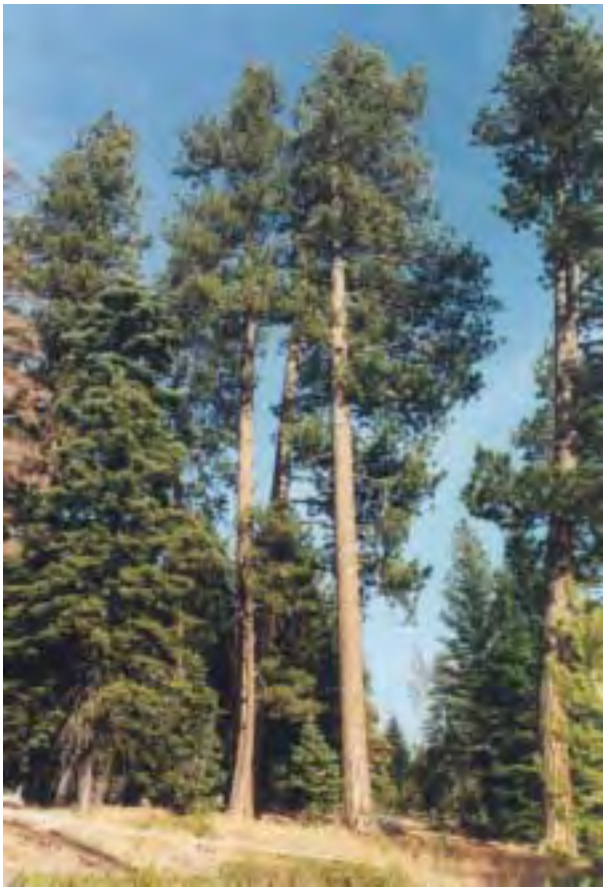

Photo 16—Old Forest Multi-strata: Large trees are frequent along with multiple canopy levels, often developing in absence of disturbances to the understory

3.2.4.2 MOIST FOREST TYPE

Moist forests occupy approximately 11,500 acres (23% of the Southeast Galena Restoration analysis area) on northerly aspects, mid elevations, and in the cooler, wetter draw bottoms throughout the watershed.

In the absence of a major disturbance (fire) Moist Forests has developed forest vegetation dominated by grand fir, Douglas-fir, and spruce. Where frost is frequent, lodgepole pine becomes the dominant species. Ponderosa pine, white pine, western larch, and lodgepole pine are early seral species that are dependent on disturbances to maintain suitable growing conditions.

Species composition varies depending upon the successional development stage, past disturbances, and microclimate[53], or microsite[54] differences. Earlier successional stages are dominated by early seral species such as lodgepole pine, ponderosa pine, western white pine, and western larch; while later stages show increased proportions of climax species such as grand fir, Douglas-fir, or Englemann spruce (in wetter areas). Western larch increases in abundance where past disturbance created bare soil conditions and an adequate seed source was present to re-colonize the disturbed areas. Wetter areas (such as along riparian areas and headwater areas) have increased amounts of Englemann spruce. The Moist Forests occupying the transitional areas with the Dry Forests generally reflect "drier" moist sites sustaining increased proportions of ponderosa pine, western larch, and Douglas-fir.

Understory Plants—Moist Forest

Moist Forest supports a more varied and abundant understory that increases wherever light becomes more available. Elk sedge (*Carex geyeri*) and pinegrass (*Calamagrostis rubescens*) are widespread, along with a number of forbs. Upland shrubs are noticeably sparse and heavily browsed by both wild and domestic ungulates, with little seed set or vegetative reproduction. Riparian shrubs and hardwoods are similarly absent or sparse, and heavily used by ungulates. Habitat for one upland sensitive plant species, clustered lady's-slipper (*Cypripedium fasciculatum*), is abundant, though no populations have been found. Habitat for several other sensitive species is common in riparian zones of Moist Forest, and 13 populations have been documented. Noxious weeds are an occasional problem where the forest canopy has been removed and ground

[53] Microclimate: the climate of small areas, such as under a plant or other cover.
[54] Microsite A small area.

disturbance has created an ideal seedbed as along road right-of-ways. The closed canopy of mature Moist Forest tends to limit the extent of weed infestations in that forest type.

Disturbance Processes—Moist Forest Type

Historically, fires were major agents of change and renewal in the Moist Forests of the watershed. The low frequency of stand replacement fires allowed for the development of large contiguous stands (large patch sizes) that provided high quality core habitats ranging from 200 to 2,000 acres. Fires generally kept the forest in a fairly vigorous condition, which reduced the role of insects and disease as a disturbance process. Currently, the Moist Forests have the most forest health problems.

FIRE

The historic/natural fire disturbance regime in the drier forest types of the Moist Forest Type is best characterized as a high frequency, low intensity regime overlaid with a low frequency, high intensity regime. The relatively frequent disturbances were generally low severity, ground fires that would occur every 10-50 years. Every 100 to 200 years there would be an infrequent disturbance that was of a high severity, stand replacing fire. The extent of these fires was variable due to the topography and could be as large as several hundred acres to over a thousand acres. Fire return intervals in these forest environments were on the magnitude of 50 to 275 years or more (Agee 1993).

Tree mortality was variable, as the tree species that grow in the Moist Forest Type have both thin and thick bark, and shallow and deep roots. Western larch and ponderosa pine have thick bark on medium to large trees. Grand fir, western white pine, Englemann spruce, and Douglas fir have thinner bark, especially when young and are most susceptible to mortality from ground fires. The persistent branches of grand fir and Douglas fir make them very susceptible to torching, often resulting in crown fires which kill all of the trees in a patch. Where Moist Forests occupy a transitional area with the Dry Forests more frequent, low to moderate intensity fires, result in vegetative and structural characteristics more similar to the Dry Forests (see Dry Forest section, page 140).

Where seed sources are present, fires can germinate snowbrush, creating a dense shrub field that could persist for several decades. Snowbrush adds to the diversity of vegetation and is a nitrogen fixing plant that can help replace some of the nitrogen lost through leaching and other processes during and after a fire.

INSECTS

Between the high intensity fires, other disturbance agents (such as insects and diseases) played a role in shaping stand structures and compositions across the landscape.

Endemic levels of bark beetles (primarily mountain pine beetles and fir engraver beetles) occurred in small patches acting as natural thinning agents facilitating the growth and development of residual trees and creating small openings (increasing structural diversity).

Epidemic levels of bark beetles also occurred. Large areas of dense stands of lodgepole that developed following fires created conditions conducive for outbreaks of mountain pine beetles (e.g. mountain pine beetle outbreak of the 1970's) resulting in subsequent stand reinitiation as understory trees respond to increased available light, water and nutrients. Resultant fuel levels associated with the bark beetle mortality also set the stage for regeneration and renewal by creating conditions conducive to subsequent high intensity fires.

Evidence of the 1970s mountain pine beetle outbreak is common in the Moist Forest portions of the analysis area. This past activity resulted in significant mortality in the mature lodgepole and ponderosa pine, creating high levels of down wood and increased representation of shade tolerant species. Following the decline of lodgepole and ponderosa pine, understory grand fir and Douglas-

fir were then released; this progression has resulted in an understory reinitiation stage. As this shade tolerant understory thrives—stands begin developing multi-strata stand structures.

Fir engraver and Douglas-fir bark beetles are other common insects in the Moist Forests. These two insects are endemic, with the exception of increased fir engraver activity in areas where elevated levels of root disease are present. In these areas, root disease decreases the vigor of infected trees, which are then attacked by insects. Douglas-fir bark beetle activity is present in association with the larger diameter, heavily mistletoe infected Douglas-fir trees. Again, the heavy mistletoe infection stresses these trees so that they are highly susceptible to opportunistic insects such as bark beetles.

Defoliating insects (such as western spruce budworm and Douglas-fir tussock moth) also occurred at epidemic levels in these forest types as large areas reached mid to late successional stages. The high proportion of suitable hosts (specifically true firs), multiple canopy layer conditions and increased tree stressors resulting from high stand densities and adverse climatic conditions (i.e. drought periods) have created conditions ideal for outbreaks of defoliators. Defoliation weakened many trees predisposing them to subsequent attack by bark beetles and/or root diseases.

Impacts of the recent (1985-1992) spruce budworm outbreak are widespread, especially in the multi-strata structures. In general across the landscape of the analysis area, the suppressed tree classes of grand fir, Douglas-fir and spruce exhibit poor crowns, reduced growth, and varying degrees of mortality because of past repeated defoliation. The band of Moist Forest along the southern boundary of the Vinegar Hill—Indian Rock Scenic Area was hit particularly hard by the budworm outbreak in 1991, with heavy defoliation and above average mortality levels. This area has been the location of three severe fires in the mid 1990's, no doubt made worse by the increased fuel levels caused by the budworm infestations. Another area of heavy defoliation and mortality lies just north and east of Ragged Rocks in the heads of the Butte Creek, Ruby Creek, and Ragged Creek drainages.

Trees surviving these outbreaks sometimes responded with increased growth due to the nutrient flush provided by the insect excretions and the thinning effects of tree mortality. The reduced canopy coverage and tree densities in heavily defoliated stands created conditions for understory reinitiation of trees, grasses, and shrubs. The mortality of the understory also increased fuel loads and the potential for regeneration by uncharacteristically severe wildfire.

The current and past insect related mortality has also provided significant increases in snag levels and down logs across the Moist Forests in the watershed, providing increased amounts of cavity nesting species habitat.

DISEASES

Root diseases such as *Annosus* and *Armillaria* generally worked at small to medium scales (less than 1 acre to 10-20 acres patches) within stands. Root disease mortality centers created gaps in stands helping to develop multi-strata structural characteristics enhancing both the horizontal and vertical structural diversity of forest stands. Severe levels of root disease resulted in significant tree mortality hindering development of late structural characteristics, while maintaining understory reinitiation and old forest multi-strata structural characteristics. These areas of high mortality were also at increased risk to stand replacing fires which ultimately returned stands to early seral species with greater tolerance to root diseases. Areas that escaped fires, and developed large areas of suitable hosts, likely showed increased levels of root diseases, resulting in changes to the stand structure and composition as levels of root disease intensified.

Other diseases such as gall rust and *atropellis* canker occurred much as they do today, affecting lodgepole growing in humid areas, resulting in stem malformation and subsequent breakage adding to the diversity of tree forms within stands. White pine blister rust was not present during historical times, as it has been introduced since Euro-American occupation of the Pacific Northwest.

Dwarf mistletoe was present throughout these forest types. Lodgepole pine, western larch ponderosa pine, and Douglas-fir dwarf mistletoe were likely present at low levels since infected trees were generally highly susceptible to fire. Stand replacing fires also sanitized stands of mistletoe-infected trees, keeping mistletoe levels low across the forest.

The primary root diseases operating with in the Moist Forests are *Armillaria* and *Annosus* root diseases. Armillaria root rot is found in several areas in the Tincup Creek and Little Boulder Creek drainages at fairly high levels. Armillaria infected stands show considerable amounts of mortality in virtually all sizes and species of trees. Grand fir and Douglas-fir are the most susceptible while, lodgepole pine, Engelmann spruce, ponderosa pine, and the occasional western white pine show varying degrees of tolerance. Western larch is the most resistant to the disease, but can still be infected in some instances.

Annosus root disease is often found in association with *Armillaria*, and is also prevalent in many stands previously entered with partial removal harvests. These stands show signs of Annosus related mortality associated with stumps and harvest related soil disturbance (skid trails). Most of the mortality is associated with grand fir indicating that it is the S-strain 4(true fir strain) of this root disease.

Indian paint fungus is common in grand fir throughout Moist Forests. Mature and suppressed grand firs have the highest incidence of the fungus. Indian paint fungus plays an important role in providing cavity-nesting habitat in live trees and subsequent snags. Large hollow, decayed live grand fir trees (30+ inch diameter trees) are often sought out as denning habitat by black bears and other mammals, and also provide excellent primary and secondary cavity nesting habitat for many birds and some mammals.

Western gall rust and *atropellis* canker are also fairly common in Moist Forest stands with a significant lodgepole component. These stem diseases cause cankers that can result in girdling the tree or at least creating a weak point that is susceptible to subsequent wind/snow breakage.

It is difficult to discern to what degree the blister rust and past logging has affected the distribution of white pine in the area. It is believed there was more white pine in areas that were logged in the earlier parts of this century. The introduction of white pine blister rust into western forests has caused a reduction in tree vigor and some mortality, although the white pine in the drier Blue Mountain environment seem to be fairly resistant to the disease. The area from Dixie Butte to Ragged Rocks contains far more white pine than any other area on the Malheur National Forest.

As with insects, these diseases play an important role in the forest by adding to structural diversity by creating openings in the forest canopy and snags, and sources of down logs important for wildlife habitat and soil productivity. At elevated levels, these diseases select for species that are more resistant, such as larch and pines. It can also inhibit stand development, limiting growth, tree size, and stand density.

MECHANICAL

Windthrow and breakage of occasional trees also added structural diversity by creating small gaps in the forest canopy allowing the release of the understory vegetation. Wind related disturbance was also important in recruiting habitat logs to the forest floor and creating live snags where tops were broken out, but the tree remained alive.

HUMAN

Fire exclusion, sheep and cattle grazing, and past harvest activities have also changed the condition of the Moist Forests. These human disturbances have affected the structural character, patch size, and species compositional across the watershed. In general, human disturbance has reduced large tree structures, reduced patch sizes, increased fragmentation, and reduced the proportions of fire tolerant species.

All of these disturbance processes played an important role in providing a diversity of vegetative conditions and associated habitats across the landscape.

Species Composition and Successional Development

Species compositions and structural characteristics of the Moist Forests were largely dependent upon the stage of succession of the stand, and associated landscape as dictated by the time since the last major disturbance (namely high intensity fire). In general, early successional stages were dominated by shade intolerant species lodgepole pine, western larch, western white pine and ponderosa pine (on lower elevation 'drier,' areas of the Moist Forest Type) while shade tolerant species such as grand fir, Douglas-fir and subalpine fir (in 'wetter' higher elevation areas of the Moist Forest Type) increased as stands developed toward later successional conditions.

The historic species composition of the Moist Forest had higher proportions of fire tolerant early seral species (ponderosa pine, lodgepole pine, and western larch) and lesser amounts of fire intolerant species (grand fir, Engelmann spruce, and Douglas-fir) prior to Euro-American influences. Where historic fires coincided with good western larch seed years, stands likely developed significant proportions of larch as larch establishment does very well on bare ground. Lodgepole pine generally dominated in cold air pockets, which favored it over the less cold hardy species. Western white pine were likely present in greater proportions since blister rust, an exotic disease, had not been introduced.

Table 97 Moist Forest HRV and Current Structural Stages (see definitions page 145).

Moist Forest Structural Stage(see definitions page 145)	**Historic Range of Variability**[55]	**Current** Condition
Stand Initiation (SI)	10-30%	6%
Stem Exclusion Open Canopy (SEOC)	5-10%	6%
Stem Exclusion Closed Canopy (SECC)	10-20%	4%
Understory Reinitiation (UR)	10-20%	6%
Young Forest Multi-strata (YFMS)	10-20%	39%
Old Forest Single-stratum (OFSS)	5-15%	5%
Old Forest Multi-strata (OFMS)	15-40%	34%
NOTE: This table is a description of potential vegetation and the historical range denoted therein is based on observation and professional judgment of the historical extent of structural stages. They are estimates from interpreting existing stands,no historical data is available.		

See Appendix E, Map 6—Forest Stand Types; and Map 7—Forest Stand Structural Stages.

3.2.4.3 LODGEPOLE PINE FOREST TYPE

Lodgepole pine is found throughout the cold, moist, and Dry Forest groups. Because lodgepole pine behaves the same throughout the various types, it is covered as a separate component. Lodgepole forests have evolved with low frequency, high intensity fire regimes.

Lodgepole pine occurs primarily as early seral stands, giving way to grand fir and/or subalpine fir as the lodgepole declines. Seral lodgepole forest acreages are included within the various forest types it is found in.

Lodgepole are also present as a climax species in the colder "frost pocket" areas where the cold tolerant, hardy lodgepole are favored and establishment of other species is inhibited; or in areas historically visited by high intensity fires every 80-120 years. These areas are environmentally induced "climax" lodgepole forests. These areas comprise about 1100 acres (3% of the Southeast Galena area).

Moist forest lodgepole sites have western larch and minor amounts of grand fir intermixed in the overstory. Exclusion of fire has allowed shade tolerant species, such as grand fir, to establish in the understory. With continued suppression of fire, these sites will eventually become dominated by grand fir.

Dry Forest lodgepole sites have minor inclusions of ponderosa pine and Douglas-fir. Where the lodgepole forests are intermixed with Dry Forest types, lodgepole are expanding outside of the colder areas (draws, depressions) into the adjacent uplands, resulting in lodgepole understories beneath ponderosa pine and Douglas-fir dominated overstories. Lodgepole are also expanding into meadow and grass areas.

Species Compositions and Successional Relationships

Species compositions and structural characteristics of the lodgepole forests were largely dependent upon the successional stage of the stand, and associated landscape. This was set in place by the last major disturbance (that is, the last high intensity fire or mountain pine beetle attack). In general, early successional stages were dominated by seral lodgepole pine. In a few cases where disturbance was absent for a longer period, shade tolerant species such as grand fir, Douglas-fir and sub-alpine fir (in moist and higher elevation areas) increased as stands developed toward later successional conditions.

Disturbance Processes—Lodgepole Pine Forest Type

Fires, insects, diseases, and human related disturbances have impacted the structural character and species compositions of many of the lodgepole stands in the watershed.

FIRE

The most important disturbance process in lodgepole pine forests has been fire. Historically, fires occurred relatively infrequently in the lodgepole forests. These fires were generally high intensity, stand replacing fires capable of regenerating large areas of lodgepole forest. In absence of fire, stands have become overstocked as trees grew larger and becoming prime candidates for attack by mountain pine beetle. Lodgepole pine stands either succeed to shade tolerant species (grand fir, subalpine fir, Englemann spruce), or die out and accumulate additional fuels and burn again.

The historic/natural fire disturbance regime in these forest types is best characterized as a low frequency, high intensity regime. These relatively infrequent disturbances were generally high severity, stand replacing fires. In some occasions, a low intensity ground fire would smolder from log to log, removing down fuel, but not killing the overstory. The extent of fire was highly variable due to the topography and the often patchy distribution of the lodgepole forests. Fire size could be as small as one clump of trees or as large as several hundred acres. Fire return intervals in these forest environments were on the magnitude of 50-275+ years (Agee 1993).

INSECTS

Endemic levels of bark beetles (primarily mountain pine beetles and fir engraver beetles) occurred in small patches acting as natural thinning agents facilitating growth and development of residual trees and creating small openings, increasing structural diversity.

Epidemic levels of insects also occurred. Large areas of dense stands of lodgepole that developed following fires created conditions conducive for outbreaks of mountain pine beetles (such as 1970's mountain pine beetle outbreak) resulting in subsequent stand reinitiation as understory trees responded to increased available light, water, and nutrients. Resultant fuel levels associated with bark beetle mortality also set the stage for regeneration/renewal by creating conditions conducive for subsequent high intensity fires.

Evidence of the 1970's mountain pine beetle outbreak is prevalent throughout the Lodgepole Forest type. This past mountain pine beetle activity resulted in significant levels of mortality, killing the

majority of mature lodgepole in many stands. The present day result is high levels of jack-strawed wood and generally abundant regeneration in the openings. This past mountain pine beetle related mortality and subsequent growth and establishment of the understory has resulted in the development of areas of understory reinitiation and multi-strata stand structures. Residual lodgepole pine in beetle-impacted stands generally exhibit reduced crowns (<20% live crown) and slow growth.

As a result of fire suppression, areas historically maintained in lodgepole by fire show increased shade tolerant true firs (grand fir and subalpine fir) growing in the understory. This can change stand characteristics to a true fir stand, replacing lodgepole pine.

Other insects common in the lodgepole forests include tip weevils and shoot borers which occur primarily in younger lodgepole stands, resulting in minor levels of top kill and associated deformity (forked, multiple tops) adding to the diversity of tree forms within stands.

DISEASES

Root diseases such as *Annosus* and *Armillaria* generally worked at small scales (less than 1 acre) within stands. Root disease mortality centers created gaps in stands, helping to develop multi-stratum structural characteristics enhancing both the horizontal and vertical structural diversity.

Localized areas of severe levels of root disease resulted in significant tree mortality hindering development of late structural characteristics while maintaining understory reinitiation and young forest multi-strata structural characteristics. These areas of high mortality were also at increased risk to stand replacing fires, which ultimately returned stands to early seral species with greater tolerance to root diseases. Areas that escaped fires and developed large areas of suitable hosts likely showed increased levels of root diseases, resulting in changes to the stand structure and composition as levels of root disease intensified.

The most common disease in the lodgepole forests is western gall rust. Essentially all stands have infections of gall rust. Severe infections cause stem malformation, while bole infections can girdle trees. Seedlings are especially vulnerable to the rust and the rust generally favors the fastest growing trees. *Atroppellis* canker is another fungus common in dense, young lodgepole stands. It too causes stem and bole malformations in infected trees. Both diseases increase the diversity of tree forms within stands, developing snags by physically girdling trees, or providing a weak point in the tree.

Dwarf mistletoe is also present in lodgepole forests. Levels of mistletoe infection vary from slight to heavy, with the most severe infections in the older, decadent lodgepole stands. Lodgepole mistletoe was likely present at low levels since infected trees were generally highly susceptible to fire. Stand replacing fires also sanitized stands of mistletoe-infected trees, keeping mistletoe levels low across the landscape. These infections can greatly reduce the growth potential of the understory, but are important for providing a variety of wildlife habitats. Characteristic "witches brooms" produced on infected branches provide potential nesting and roosting platforms, and the proliferation of buds of the host and aerial shoots of the mistletoe plants provide a source of food for a variety of wildlife species.

Other diseases such as gall rust and atropellis canker occurred as they do today, affecting lodgepole growing in humid areas, resulting in stem malformation and subsequent breakage adding to the diversity of tree forms within stands.

MECHANICAL DISTURBANCE

Windthrow and breakage of occasional trees also added structural diversity by creating small gaps in the forest canopy allowing release of understory vegetation. Wind related disturbances were also important in recruiting habitat logs to the forest floor.

All of these disturbance processes played an important role in providing a diversity of vegetative conditions and associated habitats across the landscape.

HUMAN DISTURBANCE

The primary human related a disturbance affecting the lodgepole pine forests has been the exclusion of fire and harvesting. Harvesting of lodgepole products includes house logs, small saw logs, posts and poles, and firewood. The openings created have often regenerated naturally back to lodgepole, maintaining the species on these sites.

In the absence of fire, many of the fire maintained lodgepole forests are developing significant grand fir and subalpine fir components following their natural successional potential. This is resulting in decreased amounts of lodgepole pine forests across the watershed as these stands convert to shade tolerant species. Ultimately, these stands will return to lodgepole following the next large stand replacement fire. Fire exclusion also played a role in the 1970's mountain pine beetle outbreak. Exclusion of fire across the landscape allowed large areas of dense lodgepole to develop, conditions conducive to bark beetle attack.

Table 98 Lodgepole Pine Forest HRV and Current Structural Stages (see definitions page 145).

Structural Stage((see definitions page 145))	Historic Range of Variability[1]	Current Condition
Stand Initiation (SI)	5-30%	0%
Stem Exclusion Open Canopy (SEOC)	5-10%	3%
Stem Exclusion Closed Canopy (SECC)	5-50%	18%
Understory Reinitiation (UR)	5-15%	24%
Young Forest Multi-strata (YFMS)	5-15%	39%
Old Forest Single-stratum (OFSS)	5-10%	16%
Old Forest Multi-strata (OFMS)	5-15%	12%

This Table is a description of potential vegetation group and the historical range denoted therein is based on observation and professional judgment of the historical extent of structural stages. They are estimates from interpreting existing stands—no historical data is available.

See Appendix E, Map 6—Forest Stand Types; and Map 7—Forest Stand Structural Stages.

3.2.4.4 COLD FOREST TYPE

Cold forests occupy approximately 2,000 acres (4% of the Southeast Galena Restoration analysis area) on high elevation sites, northerly aspects, and in the cooler, wetter draw bottoms throughout the watershed . In the absence of a major disturbance such as fire, Cold Forests will develop forest vegetation dominated by subalpine fir and Englemann spruce. Where frost is frequent, lodgepole pine will be the dominant species. White bark pine and lodgepole pine are early seral species that are dependent on disturbances to maintain suitable growing conditions.

Understory Plants

Understory vegetation in Cold Forests has probably changed the least of any forest type, since management was initiated. Because of dense canopy cover, understory species tend to be sparsely represented and tolerant of shade. Riparian shrubs are few, except where disturbance has created gaps. A notable exception is the high elevation sub-alpine steppe of Dixie Butte and the Vinegar Hill Scenic Area. The steppe vegetation consists of shrubs (mostly mountain sagebrush), grasses, and forbs tolerant of the short growing season and harsh climate. While most of the plants on these high elevation sites are native, the species mix has been severely altered by past sheep grazing practices. Soil compaction and loss have decreased capacity to support native grasses, and increased the cover of "weedy" increasers such as fleece flower (*Polygonum phytolaccifolium*) and coneflower (*Rudbeckia occidentalis*).

Species Compositions and Successional Relationships

Species compositions and structural characteristics of the Cold Forests were largely dependent upon the stage of succession of the stand and associated landscape as dictated by the time since the last major disturbance (i.e., high intensity fire). The conditions that affect disturbances in the Cold Forests have not changed substantially over time, resulting in little change in the fire severity from historic times to the present.

Lodgepole pine and whitebark pine are the primary seral species that would initially occupy a site. In stands with a longer fire-free interval, climax species such as subalpine fir and Englemann spruce would become established. Stands with a short fire return interval were maintained in lodgepole pine, because succession was continually reset, never getting past the early seral stages. They are discussed in the preceding lodgepole pine section. Whitebark pine were also likely present in greater proportions since blister rust, an introduced disease, had not been established.

Disturbance Processes—Cold Forest Type

Difficult access, low timber values, and political pressures of not entering Cold Forests in roadless areas discouraged timber harvesting, so there has been little impact from logging or road building. Near historic mining areas there was some tree removal for mining structures and mine props.

FIRE

Historically, wildfire was the major disturbance affecting Cold Forests. Between high intensity fires; other disturbance agents, such as wind throw, insects, and diseases, also played a role in shaping stand structures and compositions across the landscape.

The historic/natural fire disturbance regime in these forest types is best characterized as a low frequency, high intensity regime. These relatively infrequent disturbances were generally high severity, stand replacing fires.

Fire starts are frequent, due to the ridge top location of the Cold Forest stands. The extent of fires was highly variable due to topography and the often patchy distribution of Cold Forests, which are often interspersed with alpine meadows. Fire size could be as small as one clump of trees or as large as several hundred acres. Fire return intervals in these forest environments were on the magnitude of 50-275+ years (Agee 1993).

Tree mortality from fires is high in Cold Forests, many of the trees in Cold Forests retain branches to the ground and grow in dense, multistory patches. This predisposes them to torching and crowning fire behavior which kills all of the trees in the patch. Additionally, the thin bark of these species does not protect them from basal heating, resulting in high mortality—even by light ground fires. Stand establishment in Cold Forests after disturbance is often very slow, sometimes as long as a century.

Fire is still the most influential disturbance process occurring in Cold Forests. The impact of fire suppression is much less in this forest type than in other types, due mainly to long fire return intervals. The main effect of fire suppression over the last 70 plus years has been to reduce the diversity of age classes, allowing more stands to grow older than would naturally have occurred.

INSECTS

Endemic levels of bark beetles (primarily mountain pine beetles and fir engraver beetles) occurred in small patches acting as natural thinning agents, facilitating the growth and development of residual trees and creating small openings (increasing structural diversity).

Epidemic levels (populations that maintain themselves in a local area below outbreak population levels) of insects periodically occur in Cold Forest types. Large areas of dense stands of lodgepole that developed following fires created conditions conducive for outbreaks of mountain pine beetles (such as the 1970s mountain pine beetle outbreak) resulting in subsequent stand reinitiation as

understory trees responded to increased available light, water and nutrients. Spruce bark beetles are also found in Cold Forests. These insects are active within burned areas, blowdown areas, and areas with elevated levels of root disease. Resultant fuel levels associated with bark beetle mortality also set the stage for regeneration/renewal by creating conditions conducive for subsequent high intensity fires.

Defoliating insects such as western spruce budworm and Douglas-fir tussock moth also occurred at endemic levels in these forest types. They caused minor damage, weakening some trees and predisposing them to subsequent attack by mountain pine beetles and fir engraver. Impacts of the recent (1985-1992) western spruce budworm outbreak were moderate, with damage occurring mainly in the multi-strata structure stands. Budworm defoliation did not cause the widespread top kill or mortality that it did in the Moist Forest type.

The current and past insect related mortality has provided significant increases in snag levels and down logs. While it provides wildlife habitat, insect related mortality has also increased fuel levels, increasing size and intensity of future stand replacement fires.

DISEASES

Root diseases such as *Annosus* and *Armillaria* generally worked at small scales (less than 1 acre) within stands. Root disease mortality centers created gaps in stands helping to develop multi-stratum structural characteristics enhancing both horizontal and vertical structural diversity. Severe levels of root disease resulted in significant tree mortality, hindering development of late structural characteristics while maintaining understory reinitiation and young forest multi- strata structural characteristics. These areas of high mortality were also at increased risk to stand replacing fires which ultimately returned stands to early seral species with greater tolerance to root diseases. Areas that escaped fires and developed large areas of suitable hosts likely showed increased levels of root diseases resulting in changes to the stand structure and composition as levels of root disease intensified.

Other diseases such as gall rust and *atropellis* canker occurred as they do today, affecting lodgepole growing in humid areas, resulting in stem malformation and subsequent breakage, adding to the diversity of tree forms within stands. White pine blister rust was not present during reference times as it has been introduced since Euro-American occupation of the Pacific Northwest.

Dwarf mistletoe, a parasitic plant, was another disease present throughout these forest types. Lodgepole mistletoe was likely present at low levels since infected trees were generally highly susceptible to fire. Stand replacing fires also sanitized stands of mistletoe infected trees, keeping mistletoe levels low across the landscape.

Root diseases in the subalpine fir have not caused major problems. *Tomentosus* root disease, which is common in the mature spruce, makes it vulnerable to wind throw and subsequent spruce beetle attack.

White bark pine is susceptible to white pine blister rust and it is suspected that blister rust is responsible for the decline in the numbers of white bark pine in the area. Due to the low numbers of white bark pine in the watershed, any additional loss due to insects, diseases, and competition from other species is a concern.

MECHANICAL DISTURBANCE

Windthrow and breakage of occasional trees also added structural diversity by creating small gaps in the forest canopy allowing the "release" of understory vegetation. Wind related disturbance was also important in recruiting habitat logs to the forest floor and creation of live snags where tops were broken out, but the tree remained alive.

HUMAN DISTURBANCE

The main human disturbance has been fire suppression, which has allowed stands to follow successional paths farther than otherwise would have happened with more fires. Logging and other activities have been quite limited in the Cold Forests, mainly just localized use around mining operations for mine props and cabins.

All of these disturbance processes played an important role in providing a diversity of vegetative conditions and associated habitats across the landscape.

Table 99 Cold Forest HRV and Current Structural Stages (see definitions page 145).

Structural Stage (see definitions page 145)	Historic Range of Variability[1]	Current Condition
Stand Initiation (SI)	20-25%	0%
Stem Exclusion Open Canopy (SEOC)	5-10%	16%
Stem Exclusion Closed Canopy (SECC)	5-20%	9%
Understory Reinitiation (UR)	5-10%	0%
Young Forest Multi-strata (YFMS)	20-30%	57%
Old Forest Single-stratum (OFSS)	5-10%	0%
Old Forest Multi-strata (OFMS)	15-25%	18%

This Table is a description of potential vegetation group and the historical range denoted therein is based on observation and professional judgment of the historical extent of structural stages. They are estimates from interpreting existing stands—no historical data is available.

Stand structures in the Cold Forest Type are different than the other vegetation groups. With generally longer time for stand initiation, which can take as long as a century, a large percentage of the stands were in this stage. Stem exclusion is usually reached at fairly open densities, and due to the relatively short lived seral species, understory reinitiation may start before stand initiation has been completed. It would be rare for most of the climax tree species, with their relatively short life-span, to become large enough to be old forest multi-strata (Agee, 1993). See Appendix E, Map 6—Forest Stand Types; and Map 7—Forest Stand Structural Stages.

3.2.4.5 WOODLAND FOREST TYPE

Woodlands occupy approximately 1,400 acres (3% of the Southeast Galena analysis area) on dry, thin soil areas that are marginal for supporting forested stands of trees. The typical appearance is of a savanna with a few widely spaced ponderosa pine trees and juniper.

Species Compositions and Successional Relationships

Species compositions and structural characteristics of woodlands were largely dependent upon frequent fire and occasional insect attacks during droughts. Widely spaced ponderosa pine are the only tree species in any numbers, with an understory of juniper in varying amounts. With fire exclusion, both juniper and ponderosa pine have expanded their range into previously fire maintained meadows and have increased their numbers in the savannah areas.

Disturbance Processes—Woodland Forest Type

FIRE

Fire was the dominant disturbance process in woodlands, occurring as frequent, low intensity underburns in the past.

HUMAN DISTURBANCE

Human related disturbances (timber harvest, fire exclusion) have affected woodlands. Selective removal of the occasional ponderosa pine, combined with exclusion of fire, resulted in significant changes in the structural and compositional character of the woodlands.

3.2.4.6 OTHER VEGETATION TYPES

Sub-Alpine Meadows

Many of the sub-alpine meadows were maintained in a more open state by periodic fire that would kill invading trees. The reduction of the amount of burning by fire exclusion policies has led to a gradual increase in the amount of forested lands at the expense of sub-alpine meadows.

Hardwoods(including Aspen)

Both aspen and cottonwood are generally limited to stands of a few decadent trees. Condition of aspen stands has been previously discussed (see 1.2.1.4 Undesired Condition: Vegetation Outside Historical Range of Variability, page 14). Alteration of stream flooding patterns that used to provide the preferred substrate for cottonwood seed germination along the lower reaches of creeks and in the river floodplain has reduced cottonwood habitat. Grazing has virtually eliminated any recruitment of young trees, except occasionally in road cuts where terrain restricts access to animals that would browse these plants.

Examination of vegetation in the vicinity of Placer Gulch and Davis Creek and remnant vegetation along Big Boulder, the Middle Fork of the John Day River, and other streams in the watershed suggests that large cottonwood galleries were present historically. Aspen stands were probably larger, and more common, based on informal evaluations of present conditions. Within the analysis area most aspen and cottonwood are limited to stands of a few decadent trees. Remnant stands indicate that it is likely that existing aspen stands are only 10% of historical stand levels (Tatum 2001).

Riparian Meadows

Riparian meadows along the Middle Fork John Day have been converted to agricultural use, currently cattle grazing. Even meadows that were not plowed by earlier settlers have undergone species conversion through loss of the water table. As a result, moisture-loving species such as tufted hairgrass (*Deschampsia cespitosa*) and common camas (*Camassia quamash*) have been replaced with Kentucky bluegrass, meadow foxtail (*Alopecurus pratensis*), and other “pasture” grasses, and weedy increasers such as teasel (*Dipsacus fullonum*). Smaller riparian meadows at higher elevations have suffered from on-going overuse, sometimes by large numbers of elk as well as cattle, with a resultant conversion to rhizomatous sedges and rushes, or to Kentucky bluegrass if the water table has dropped. Plant diversity in these meadows has probably declined since historic times.

Rock Outcrops

Rock outcrops occasionally support relict populations of mountain mahogany (*Cercocarpus ledifolius*), many of which may have shrunk from their historic extent since fire suppression has allowed encroachment and shading by conifers. Several serpentine outcrops support unique plants that are serpentine obligates such as Shasta fern (*Polystichum lemmonii*).

Threatened Endangered and Sensitive Plant Species

Populations of 6 plant species designated as sensitive in USDA FS Region 6 have been located within the analysis area, for a total of 15 occurrences. The species found are 5 moonworts (*Botrychium crenulatum, B. lanceolatum, B. minganense, B. montanum* and *B. pinnatum*), and one sedge (*Carex interior*). Large, representative portions of each subwatershed have been surveyed for sensitive plants, with emphasis on their potential habitat. Not all the potential habitat has been surveyed.

*(See also **1.2.1.4 Undesired Condition: Vegetation Outside** Historical Range of Variability, page 14; **1.2.1.4 Undesired Condition: Vegetation Outside** Historical Range of Variability, page 14; **ISSUE 1.4.9—Inadequate Amount of Treatment**, page 33; **ISSUE 1.4.10—Insufficient Pileated Woodpecker Habitat**, page 33;and **ISSUE 1.4.11—Effects on Connectivity for** Wildlife, page 34.)*

3.2.5 High Wildfire Hazard

The analysis area once sustained resilient ecosystems, which could withstand a diverse array of natural disturbances. Wildfires were small, and rarely burned into the crowns of these large trees. M.L. Erickson, Assistant Forest Inspector, assessed fire danger in 1906.

> *Forest fires have done little damage to the reserve, and there is not a great possibility of extensive forest fires occurring on any part of the reserve. The most dangerous region is the high altitude in the Strawberry Mountains. In general, the country consists of an open forest with very little underbrush so that a fire, if started, would burn very little timber and would also be easy to extinguish. The main business of the reserve will be for some time, the care of grazing matters, and no extra men will be needed for patrol work alone. There are a few suitable sites in the reserve which will afford lookout stations, also that a ranger may be able to see over large areas and thus avoid riding over territory for the purpose of locating small fires. No lookout stations, therefore, are recommended, except as will be suitable for natural topographic features.* **From "Report on Blue Mountain (West) Reserve Oregon" 1906**

Despite an appearance of stability the Southeast Galena Analysis area, along with other similar portions of the Galena watershed has had the resilience of its ecosystems diminished to a state where it exists at a critical stage (see 3.2.4 Vegetation page 139). Unless methods to reverse current trends are applied—important habitat and resources will be lost. The magnitude and intensity of that loss can be measured by recent uncharacteristically severe wildfire that has occurred in the Galena Watershed.

Recent Uncharacteristically Severe Wildfire—1996 Summit Fire

In the past decade 40,264 acres of stand replacement fire (uncharacteristically severe wildfire) has burned across the landscape of the Galena Watershed, removing vegetative cover on approximately one third of this area. The 1996 Summit Fire, was an example of an uncharacteristically severe wildfire (see Appendix E, Map 2—Large Fire History). Burning through two National Forests and across private lands, this fire started on the Umatilla National Forest and burned 37,961 acres of Galena watershed—burning to the current Analysis Area (Galena WA, Supplement—2002)boundary causing severe effects to watershed resources. The vegetation conditions that exist in the Southeast Galena Restoration analysis area, are similar to those which carried the Summit Fire, therefore uncharacteristically severe wildfire such as the Summit Fire may be likely to occur in the future

(Johnson, et al, 1995). The Summit Fire Recovery Project,[56] was successfully implemented in response to the 1996 Summit Fire. This fire, caused a large array of natural resource damage (c.f. Summit Fire Recovery Project FEIS 1997; page 3-1-88). Among the many resources damaged were sensitive and threatened fish species as this large conflagration contributed detrimentally to elevated stream temperatures and short-to mid-term sediment delivery concerns in the John Day River. In addition to excess sediment, this large forest fire, has extensively reduced fish and wildlife habitat in the watershed. Among other damage to resources across the landscape of the watershed, the Summit Fire caused a reduction in crown density, which now allows a large area of the watershed's snow pack to have a longer and more intense exposure to sunlight, because of this—earlier snowmelt occurs on approximately one third of the watershed. Additionally, because the loss of overstory vegetation is causing an earlier snowmelt, water that was formerly being held into the late (summer) season is now being released earlier than it once was (cf., 3.2.1—Early Season Peak Flows, page 113). Before the Summit fire, water storage capacity was already diminished in the Galena watershed due to mining, logging, roads, and livestock grazing and was leaving the landscape earlier than in pre-settlement times. The consequence of a reduction in water storage capacity is that not enough water flow is retained through to drier seasons. The undesirable condition of water leaving the landscape earlier in the season has increased during the peak seasonal flows, which were smaller flows when a greater storage capacity existed (see 3.2.1—Early Season Peak Flows, page 113).

[56] Malheur National Forest *Summit Fire Recovery Final Supplemental Environmental Impact Statement* 1998

Photo 17—View toward Indian Rock before Summit fire 1996.

Photo 18— View (below)toward Indian Rock after the Summit Fire of 1996 (an example of an uncharacteristically severe wildfire, also see Appendix E, Map 2—Large Fire History).

Late summer and early fall movement of both fish and terrestrial wildlife depend upon the availability of water during critical dry months, during these months in the Galena watershed now less flow occurs than before the Summit fire. Additionally, the loss of vegetation from the Summit Fire has reduced the available habitat for a number of wildlife species. This large-scale removal of riparian and upland vegetation has reduced the viability of streams and forest stands to provide habitat for aquatic and terrestrial wildlife in the watershed (see 3.2.3 Aquatic Habitat, page 125). Additionally, another large fire with the magnitude and severity of the Summit Fire presents an unacceptable risk to all resources throughout the analysis area.

Wildfire Hazard and Risk

The threat of uncharacteristically severe wildfire is present with every fire season under current forest stand conditions. This is because of uncharacteristically overstocked conditions, high levels of forest litter, fuel accumulations, increased ladder fuels, and increased proportions of fire-intolerant trees such as Douglas-fir and grand fir. As stated previously, the natural processes of these fire adapted ecosystems once promoted open, park-like stands of trees, where fire regimes tended toward regular low intensity burns. Fire behavior will no longer be the historic low intensity burns that invigorated forest stands, shrub communities, and aspen stands, rather they present the threat of large areas incurring resource damage which will take decades to achieve recovery

Wildfire suppression is management policy of the Malheur National Forest *Land and Resource Management Plan*, and optimistically, suppression would be the outcome of wildfires starting in the analysis area in every case. Only two per cent of fires nationwide escape in a manner that would produce an uncharacteristically severe wildfire such as the Summit Fire. Yet, many factors involving risk and hazards exist in the Southeast Galena Analysis area which cause this area to be more vulnerable to uncharacteristically severe wildfires than other areas. **Fire Risk** *is a term relating to the probability of a fire starting,* while **Fire hazard** *relates to fuel accumulation or loadings* (see Appendix F for more information).

There is a high level of lightening strikes in the Blue Mountains (Agee 1993). Fire risk at 1.7 fires per thousand acres is very high. Fire hazard is determined by the combinations of slope, aspect and ground fuels, the analysis area is in a mostly high hazard condition due to steep slopes high proportion of south aspects and vegetation conditions. Most of the analysis area is characterized by a fire behavior rated at a Fuel Model 9[57] (Timber, loosely compacted litter); and Fuel Model 10 (Timber, heavy litter) historically, most of the Dry and Moist forest types were a fuel Model 2 (Timber, grass understory) in this fuel model there can be a high rate of spread though fine ground fuels,. however, crown fires were historically rare. Fuel Model 9 is typical of the existing dense Ponderosa Pine stands in the analysis area. Fires can run through the surface litter at a high rate because of the loose arrangement. Concentrations of dead and down woody material will contribute to possible torching, spotting, and crowning. Fuel Model 10 is typical of the existing late succession Moist and Dry Forest types that are mixed conifer in the analysis area. Fires in this fuel model can result in crowning and spotting.

In addition to heavy concentrations of ground fuels, the presence of ladder fuels is a big factor that can result in the fire reaching the crowns. Dense multi-storied stands have a high potential for crown fires. A model has been developed to determine risk of crown fires but there was not sufficient stand data or time to apply it to the project. Instead, a combination of stand structure and density was used as an indicator of crown fire potential. The crown fire hazard was determined to be high for 66% of the Dry Forest type, 60% for the Moist Forest type, 98% for the Lodgepole Forest type and 84% for the Cold Forest type. Of primary concern are the high crown fire hazards for the Dry and Moist Forest types because these types, for the most part, burned historically with low intensity ground fires. The Lodgepole and Cold Forest types are within HVR for crown fire hazards.

Crown fire risk can be reduced by treatment of high levels of dead ground fuels, by removal of ladder fuels by understory removal and by thinning of trees to increase the distance between trees to allow heat from fires to escape instead of building up under the crowns .

Large wildfires under current fuel conditions are dangerous and unpredictable for wild land firefighters, local residents and forest users presenting a potential for injury, loss of life, structures

[57] Fuel Models are classified by the amount, type arrangement of ground fuels as developed by the National Forest Fire Laboratory. See Appendix F for a complete list of Fuel Models.

and resource damage. Large fires can spread outside the Southeast Galena analysis area and threaten resources and structures on a landscape scale (cf. 4.3.9—Forest Stand Sustainability and Resilience, page 397). Likewise, the analysis area could be threatened by large fires in adjacent watershed areas because similar fuel conditions exist in surrounding areas.

Wind Event in Vincent and Vinegar subwatersheds

On July 2, 1998, a severe windstorm blew down thousands of trees in the headwaters of Vinegar and Vincent Creeks. This event (variously referred to as the Banner wind event of 1998, or the Banner Blowdown) created a 1400-acre area of wind thrown trees which left, root sprung and down portions of damaged trees, creating a large amount of ground fuels in riparian areas. About 300 acres within the center of the area sustained an almost complete blowdown. The area presents an additional fire-risk from an excess loading of ground fuels—and may pose a threat of insect infestation.

The majority of the damaged acres fell within riparian areas of these subwatersheds. Concern for the riparian area upstream for sensitive and threatened fish species has prevented a salvage effort of this area. The blow down created excess fuels and prompted a Forest Service review of insect infestation of the area (*Insect and Disease Review of Banner Blowdown* (USDA FS 1998 BMZ-98-5). Within he riparian areas , the blowdown consisted of 45 percent Englemann spruce, 20 percent lodge ole pine, 15 percent western larch, 10 percent white fir, nine percent Douglas-fir, and one percent ponderosa pine.

This area is classified as Fuel Model 13 and is a concern, not for the size, but for the amount of fuels. Heavy fuels in all size classes are present in this area. The resistance to fire control is high. Loosely compacted fuels that can allow high fire intensities and the difficulty of walking through the jack straw timber, make the area a safety hazard to fire fighters, thereby increasing the risk that a fire in the area can escape initial attack and could result in an uncharacteristically severe wildfire.

Private Land Interface

The *National Wildland and Prescribed Fire Management Policy* of August, 1998 lists priorities for protection from wildfires. These protection priorities are: (1) human life and (2) property and natural/cultural resources. If it becomes necessary to prioritize between property and natural/cultural resources, this is done based on relative values to be protected, commensurate with fire management costs. Location of private property and structures on private lands are concerns when wildfires occur, and when prescribed fires are utilized as a management tool. There is a need to inventory fuel loading and ladder fuels next to private property or valuable resources to help identify specific projects and to prioritize them within the context of addressing the larger scale treatments that are developed. There are 10,243 acres of private land in the watershed. There are 1,235 acres in the analysis area. At least 15 homes or cabins are present with the boundary of the analysis area, most of which are occupied year-round.

Air Quality

Currently, prescribed burning and wildfires are temporary emission sources from the Forest that affect air quality. The Oregon Smoke Management Program directs the Forest Service to conduct prescribed burning under smoke dispersion conditions which minimize smoke impacts and protect air quality. Prescribed burning is done during times of air mass instability which allows the smoke to disperse into the upper atmosphere instead of being trapped near the ground where it can cause visibility and other problems. In order to burn during unstable conditions, most prescribed burning is

done in the spring as there are very few unstable days with the correct amount of fuel moisture in the fall.

Light southwest winds during the spring, summer and fall provide relatively clean, clear air in the Blue Mountains. The exclusion of fire from Blue Mountain ecosystem has helped create a condition that formerly had periods of when smoke was noticeably a part of the atmosphere. Now local residents have been accustomed to the clear air through most of the summer months. If prescribed fire is used to reduce the build up in fuels and restore ecosystem health, even a light amount of smoke, in recent years, has prompted calls from some residents complaining about smoke. When inversions at night trap smoke in valleys, there have been complaints about health problems occurring, and visibility on highways may become a concern. When large wildfires occur, the smoke impacts have been much greater than what has occurs with prescribed burning.

The nearest Class I Area for air quality that can be affected by burning in the watershed is the Strawberry Mountain Wilderness area. Air quality standards are to be met from July 1 through September 15 in Class I Areas. Predominately southwest winds tend to carry Forest smoke away from heavily populated areas like Boise, Idaho which is 200 miles to the east. Air quality effects have generally dispersed by the time they reach other Class I resides over the Eagle Cap Wilderness in Oregon or the Selway-Bitteroot Wilderness in Idaho.

Burning that might affect the town of John Day is to be done only after careful evaluation of meteorological conditions and potential impacts. Emissions limits have been established for the Blue Mountains which takes into account wildfire emissions. When the emissions limit is reached, no more burning is allowed for the year. In years with severe summer fire events fall burning may be curtailed because of this factor.

(See also page 17 ***ISSUE 1.4.9—Inadequate Amount of Treatment****, page 33;* ***ISSUE 1.4.10—Insufficient Pileated Woodpecker Habitat****, page 33;* ***ISSUE 1.4.11—Effects on Connectivity for*** Wildlife*, page 34;and* ***ISSUE 1.4.12—Effects of Managing Roadless*** Areas *page 34).*

3.2.6 WILDLIFE HABITAT

Threatened, Endangered or Sensitive (TES[58]) species, Management Indicator Species (MIS[59]), and Species of Interest (SOI[60]) utilize the analysis area. Habitats for these species developed with the fire adapted forests of the past. As forest conditions moved outside of their Historic Range of Variability (HRV), habitat conditions for these species were also altered. A combination of management activities, including timber harvest, road construction, grazing, and fire suppression, and natural disturbances, such as wildfire and windstorms have reduced some habitats below historic levels. Chapter 1, Section 1.2.1.6 Undesired Condition: Degraded Wildlife Habitat, page 18 highlighted losses in old growth habitat, dead wood habitat (large snags and down logs), grass and shrub forage and dispersal habitat for large, wide ranging carnivores. A more complete discussion of these topics follows.

This wildlife discussion first summarizes existing habitat conditions and needs for each TES species, MIS and SOI which use or may use the analysis area. TES species are addressed in Section 3.2.6.1, MIS in Section 3.2.6.2 and SOI in Section 3.2.6.3. Secondly, Section 3.2.6.4 summarizes the relationships between these wildlife species and each Forest type and structural stage (e.g. Dry Forest OFMS). Essentially, forest types and structural stages describe habitat types.

3.2.6.1—Threatened, Endangered, and Sensitive (TES) Species

A variety of Threatened, Endangered and Sensitive species occur and/or have potential habitat in the Southeast Galena analysis area. The *Land and Resource Management Plan* establishes management direction for TES species via Forest-wide standards (pages IV-30-IV-33). The gray wolf is listed as an endangered species. The Canada lynx and northern bald eagle are listed as threatened species. The peregrine flacon, Canada wolverine, Pacific fisher, bobolink, sandhill crane, long-billed curlew, tri-colored blackbird, Columbia spotted frog, western sage grouse, and gray flycatcher are considered sensitive species. These species are included on the Malheur National Forest list of Endangered, Threatened and Sensitive species (MNF 2000). Existing conditions for TES species are described in more detail in the Wildlife Biological Evaluation located in the Appendix of this document.

Gray Wolf *Canis lupis*

The gray wolf is listed as an endangered species. Wolves need large, remote areas relatively free from human disturbance (Snyder 1991). Forests, open meadows, rocky ridges, and lakes or rivers all comprise a pack's territory (Snyder 1991). Wolf' habitat preferences appear to be more prey dependent than cover dependent. Wolves prey mainly on large ungulates, such as deer and elk. In the West, wolves have been known to follow the seasonal elevation movements of deer and elk herds. Other prey species include various rodents, upland game birds and waterfowl, snowshoe hare, beaver, and black bear (Snyder 1991). Occasionally wolves prey on domestic livestock.

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58 Endangered Species: An animal or plant species listed under the Endangered Species Act that is in danger of extinction throughout all or a significant portion of its range.
Threatened Species: An animal or plant species listed under the Endangered Species Act that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.
Sensitive Species: Species identified by a Forest Service regional forester for which species viability is a concern either a) because of significant current or predicted downward trends in population numbers or density, or b) because of significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.
59 Management Indicator Species (MIS): A species used to monitor the effects of planned management activities on viable populations of wildlife and fish, including those that are socially or economically important.
60 Species of Interest (SOI): A species of high public interest or demand.

Wolves excavate dens in well-drained soils in meadows near water, but occasionally they will den in hollow logs, under tree roots, rock outcrops, or even in beaver lodges (Snyder 1991).

Packs occupy, and defend from other packs and individual wolves, a territory of 20 to 214 square miles (*Federal Register*: July 13, 2000). Poisons, trapping, and shooting, spurred by federal, state, and local government bounties, resulted in its extirpation from more than 95 percent of its range in the 48 contiguous States.

Wolves are habitat generalists and potentially could occupy the entire Malheur National Forest. However, because of human persecution, seclusion is a very important factor in providing wolf habitat. Within the analysis area, the Vinegar Hill-Indian Rock Scenic Area and Dixie Butte Wildlife Emphasis Area provide areas relatively low in human impacts and disturbances.

Wolves are considered extirpated from Oregon. In 1999, one radio-collared, female wolf from the experimental Idaho population traveled through portions of the three Blue Mountain Forests. The female was trapped in the vicinity of the Upper Middle Fork Watershed and returned to Idaho. In 2000, a male wolf was killed on Interstate 84 near Baker City, Oregon. These incidents indicate that the Blue Mountains probably provide suitable habitat for wolves. Over time, wolves dispersing from the growing experimental, non-essential Idaho population could return to the Blue Mountains and establish breeding territories.

Canada Lynx *Lynx Canadensis*

The Canada lynx is listed as a threatened species. Habitat is primarily associated with high elevation, subalpine coniferous forests with a mix of age and structural classes (Ruediger et al., 2000). Lynx require late-successional forest for denning and protection and early successional forest for hunting.

The population density and distribution of lynx is closely tied to the population density and availability of prey species, primarily snowshoe hare (Ruggiero et al., 1994). Snowshoe hare seek dense, early successional conifer thickets to feed and escape predators and extreme cold during the winter months. In the spring, summer and fall, snowshoe hare are often associated with hardwood thickets and other area where herbaceous and woody forage is available. Lynx will also prey upon other species including squirrels, grouse, mice and other small mammals. Typical home range territories are 45-155 square miles (Ruggiero 1994). Home range size varies considerably and is usually dependent upon prey availability.

Lynx sightings are rare in Oregon. In the early 1990's, winter track and camera station surveys were conducted on the Malheur National Forest to inventory forest carnivores, but no lynx were detected. The District completed scratch pad surveys in 1999, 2000 and 2001. The 1999-2000 surveys did not determine lynx presence; 2001 data is still being analyzed. Recent unconfirmed lynx sightings have been reported along the Middle Fork of the John Day River, Blue Mountain Ranger District, and in the Reynolds Creek Subwatershed, Prairie City Ranger District.

Causes for population decline have been identified in the Lynx Conservation and Assessment Strategy (LCAS) (Ruediger et al., 2000), and include the following: habitat fragmentation or loss; direct mortality caused by starvation, motor vehicle accidents, or trapping; and increased human use of habitat areas such as in winter recreation areas. Timber harvest, road construction, fire suppression, winter recreation development, livestock grazing and wildfire have all contributed to degradation of habitat.

The analysis area is in the Southeast Galena Lynx Analysis Unit (LAU). Twenty-nine percent of this LAU (16,636 of the 58,352 acres) is classified as lynx habitat or potential lynx habitat. Habitat is concentrated in two areas. In the north, habitat is located in and around the Vinegar Hill-Indian Rock Scenic Area. In the south, habitat is located in and around the Dixie Butte Wildlife Emphasis Area.

In the Southeast Galena analysis area, twenty-eight percent of the analysis area (13,688 of the 49,473 acres) is classified as lynx habitat or potential habitat.

Generally, habitat is defined as stands above 5,000 feet that are in the cold, moist or Lodgepole Forest types. In the Dry Forest types, only the grand fir/grouse huckleberry plant association provides lynx habitat and only on north and east slopes above 5,000 feet and on south and west slopes above 5,650 feet. The elevation band is somewhat critical. A lynx's long legs and broad paws allow them to negotiate deep snow and effectively hunt snowshoe hare. Snow levels 2-4 deep or greater tend to limit access by other large carnivores that might compete with the lynx.

Stand structural stages, combined with tree canopy coverage, were used to further refine habitat data into denning, foraging, or unsuitable habitat, as defined by the LCAS. Table 100 displays lynx habitat classification within the Southeast Galena LAU and the Southeast Galena Analysis area.

Species Compositions and Successional Relationships—Cold Forest

Species compositions and structural characteristics of the cold forests were largely dependent upon the stage of succession of the stand and associated landscape as dictated by the time since the last major disturbance (namely high intensity fire). The conditions that affect disturbances in the cold forests have not changed substantially over time, resulting in little change in the fire severity from historic times to the present.

Lodgepole pine and whitebark pine are the primary seral species that would initially occupy a site. In stands with a longer fire-free interval, climax species such as subalpine fir and Engelmann spruce would become established. Stands with a short fire return interval were maintained in lodgepole pine, because succession was continually reset, never getting past the early seral stages. They are discussed in the preceding lodgepole pine section. Whitebark pine were also likely present in greater proportions since blister rust, an introduced disease, had not been established.

Table 100 Lynx habitat classification in Southeast Galena LAU and Southeast Galena Analysis Area--denning, foraging, unsuitable, and created unsuitable habitat by acres and percent of total lynx habitat.

Habitat Element	Existing Condition			
	Southeast Galena LAU		Southeast Galena Analysis Area	
	Acres	% Habitat	Acres	% Habitat
Denning	8,165	49%	6,608	48%
Forage	6,166	37%	5,739	42%
Unsuitable[1]	2,305	14%	1,341	10%
Created Unsuitable[2]	1,281[2]	8%[2]	639[2]	5%[2]
Total[3]	16,636[3]	100%[3]	13,688[3]	100%[3]

[1]*Unsuitable* = habitat made unsuitable by management activities, such as timber harvest, within the last *15* years *or* habitat made unsuitable by natural disturbances such as wildfire or wind throw regardless of when the disturbance occurred.

[2]*Created Unsuitable* = a subset of "unsuitable" and refers to lynx habitat made unsuitable by management activities within the last *10* years. The acres of "created unsuitable" habitat displayed above are included acres of "unsuitable" habitat as well.

[3]*Total acres* = denning + forage + unsuitable = 16,638 acres/13,688 acres. *Created unsuitable* acres are already included in *unsuitable* category and consequently, not double-counted.

Denning habitat typically occurs in stands classified as OFMS, YFMS or UR. The number of down logs for denning sites tends to be higher in these stands than in younger stands. Primary denning sites are often in large hollow logs, beneath windfall or upturned roots, or in brush piles in dense thickets (Brittell et al. 1989).

Foraging habitat occurs in many, but not all, stands classified as OFMS, YFMS, UR, and SI. OFMS and YFMS[61] stands, which represent more mature stand conditions, are likely to be optimal squirrel habitat. SI stands, i.e., early successional stands, dominated by dense young trees, provide habitat for snowshoe hares if trees are about 8 feet or taller. The highest quality habitat is in advanced regeneration units of lodgepole pine. SECC stands containing fairly dense pole-sized trees, provide some forage during the winter; however the forage is very limited.

Unsuitable habitat is created by management activities, such as timber harvest, or natural disturbances such as wildfire or windthrow. The 1994 Reed Fire and 1996 Summit Fire destroyed denning and foraging habitat in many areas. Many acres have been planted with conifers. Natural regeneration of lodgepole is high in some areas. Recent burns may stimulate woody browse production for use by snowshoe hares. Although many fire-killed trees were harvested, snag levels remain high. Snags will eventually fall, and may provide down wood for future lynx denning.

The 1998 Vincent/Vinegar windstorm blew down approximately 1,400 acres of mature trees. Rarely was blowdown 100% on any one acre. Quality denning conditions probably exist where blowdown was more moderate and overstory canopies remain intact. Extreme blowdown occurred on only 250 acres, and even on these acres smaller trees and advanced regeneration remain intact and are providing forage. On the 250 acres, the windstorm converted lynx denning habitat to forage habitat due to the reduction in canopy cover. The number of large trees on the ground would provide great opportunities for denning except that many of the concentrations are out in the open. Quality denning conditions probably only exist where log piles are located immediately adjacent to undamaged denning habitat at the periphery of the blowdown area. Log piles provide natal sites while adjacent canopy cover provides additional security.

In the Southeast Galena analysis area, lynx habitat is generally well distributed. Both the Lynx Analysis Unit (LAU) and the analysis area meet Lynx Conservation and Assessment Strategy LCAS standards.

Travel corridors provide security during movement from denning areas to foraging areas and during dispersal. Cover that is generally greater than 8 feet tall with stem densities in excess of 180 trees per acre allows for movement of lynx within their home ranges (Koehler 1990). Riparian corridors, forested ridges, and saddles appear to be favored travel ways. Connectivity for lynx is being provided via *Land and Resource Management Plan* Amendment 2 (LRMP2) corridors and a recommended 3-mile wide Key Linkage Area(KLAs). See Appendix E, Map 20—Wildlife Connectivity—For Action Alternatives.

Northern Bald Eagle *Haliaeetus leucocephalus*

The bald eagle is listed as a threatened species. Bald eagles prey largely on fish and, to a lesser extent, waterfowl and are usually associated with rivers or lakes. Habitat includes clean water with abundant fish and/or waterfowl populations, and many large, "wolfy" perch trees and roost sites nearby. In the Pacific Northwest, bald eagle nests are usually in multistoried, predominantly coniferous stands with old growth components near water bodies that support adequate food supply (U. S. Dept. Interior 1986). They usually nest in the same territories each year and often use the same nest repeatedly which can result in very large nest structures, 2-3 feet deep and up to 5 feet in diameter. Most nests in Oregon have been within 1/2 mile of water.

Eagles congregate at winter roost sites during the late fall, winter, and early spring. On the Malheur National Forest they scavenge in agricultural valleys and wetlands, feeding primarily on carrion normally found in areas of cattle concentration and birthing, or where ranchers dispose of dead animals. They roost at night in mature forest stands that provide a microclimate that helps protect them from cold weather and wind.

[61] See structure definitions page145.

Bald eagles have been sighted along the Middle Fork of the John Day River and probably forage there during the winter as long as carrion is present and available. In 2001, wildlife biologists identified the first suspected bald eagle nest to be located on the Blue Mountain Ranger District. The nest was identified along the Middle Fork of the John Day River, approximately 9 miles west, i.e., down river, of the Southeast Galena analysis area. It is believed the nest failed to fledge young. In the winter, bald eagles roost and feed in Bear Valley, along the South Fork John Day River, downstream on the Middle Fork John Day River, and the main John Day River. Temporary winter roosts are possible within the analysis area but none have been documented.

There are no bald eagles or critical habitat necessary for their recovery within the analysis area. According to the Pacific Bald Eagle Recovery Plan (USFWS 1986), key areas nearest the analysis area occur as winter roost sites along the John Day River.

American Peregrine Falcon *Falco peregrinus*

The peregrine falcon is a Region 6 sensitive species. Peregrine falcons prefer a variety of open habitats near nesting cliffs or mountains (Snyder 1991). They usually inhabit areas near water, such as lakes, rivers, or oceans. Nest sites are often used for several years. They tend to choose overhanging cliffs with loose soil, sand, dead vegetation, or gravel, in which they can scrape a depression for their eggs. Peregrine falcons primarily eat birds. Secondary prey species include tree and ground squirrels, rabbits, various other small mammals (Snyder 1991).

The peregrine falcon's most destructive predator is man. Peregrine falcon populations in the United Sates were dramatically reduced by exposure to chlorinated hydrocarbon pesticides. These pesticides reduce eggshell thickness, thereby causing the eggs to break during incubation. These pesticides are now banned in the United States and Canada. The peregrine falcon has made a dramatic comeback in the past decade.

Peregrine falcons have been observed in the Galena Watershed with most sightings occurring at Coyote Bluffs and Ragged Rocks. Coyote Bluffs is located within the analysis area on cliffs adjacent to the Middle Fork of the John Day River; cliff characteristics and close proximity to County Road 20 probably make this site low potential for nesting. Ragged Rocks is located approximately 3 miles west of the Southeast Galena analysis area; this site has been identified as having good potential for falcon nesting. Nesting peregrines have not been documented at either site. Nesting habitat also occurs about one mile north of the analysis area on the Umatilla National Forest; peregrines have been reported there, but nesting has not been documented.

California Wolverine *Gulo gulo*

The California wolverine is a Region 6 sensitive species. There is little information in the Blue Mountains relative to population density and distribution of wolverines. Research indicates that wolverines tend to prefer higher alpine areas with a mixture of habitats, including dense mixed conifer forest as well as shale/rock slide areas for both denning and foraging habitat (Ruggiero et al., 1994). In pre-settlement times, wolverines were widespread but it is likely this species presence always occurred at low densities in the western United States.

Wolverines are predominantly scavengers, especially in winter when their diets consist primarily of deer and elk (Ruggiero et al., 1994). In summer, they use a wider variety of foods including small mammals, birds, carrion and berries.

Home ranges of adult wolverine in North America are approximately 62 to 249 square miles for females, and approximately 124 to 995 square miles for males. Home range size may vary due to differences in abundance and distribution of food. Habitat is reduced or degraded, primarily due to forest fragmentation and high road densities.

Wolverine habitat within the southern Blue Mountains occurs primarily in wilderness and large roadless areas. Areas with low human impacts, low human disturbance, and high deer and elk concentrations are preferred. Within the analysis area, the Vinegar Hill-Indian Rock Scenic Area and Dixie Butte Wildlife Emphasis Area exhibit characteristics of wolverine habitat . Elsewhere on the District, the Strawberry Mountain Wilderness, Dry Cabin Wildlife Emphasis Area and the Shaketable, McClellan Mountain, and Aldrich Mountain Roadless Areas share the same characteristics.

Periodically throughout the 1990s, wolverine surveys were conducted across the District, including areas in and near the analysis area. No wolverine tracks or individuals were found. A wolverine was confirmed from bones and fur found in the Strawberry Mountain Wilderness in 1992. Unconfirmed sightings of wolverine were reported in the analysis area near Dixie Mountain and to the northwest near Big Boulder Creek. Additional sightings of animals and tracks have occurred on the District, but none have been confirmed.

It is likely that a wolverine could use the analysis area, particularly the large, unroaded areas associated with the Vinegar Hill-Indian Rock Scenic Area and Dixie Butte Wildlife Emphasis Area.

The Cold and Moist Forests represent the highest quality habitat, particularly where they remain relatively undeveloped and undisturbed. Quality habitat includes both the OFMS and YFMS structural stages. Approximately 13,500 acres of these forest types exist. Of that, 9,895 acres, or 73%, are in OFMS or YFMS condition. Structural stage percentages are within the estimated HRV for OFMS and in excess of the estimated HRV for YFMS.

Elsewhere, lesser quality habitat provides sufficient cover and security to meet landscape connectivity between potential home range areas.

Pacific fisher *Martes pennanti*

The Pacific fisher is a Region 6 sensitive species. Fisher are associated with mature and overmature stands in mixed conifer forests, especially those with complex physical structure near the ground (Buskirk and Powell 1994). Some hardwoods may be desirable for maximum prey numbers and diversity (Ruggiero 1994). A 70 to 80 percent canopy closure is believed optimum, but a California study showed a preference for 40 to 70 percent canopy cover areas. Fishers are medium sized carnivores that prey on a wide variety of foods including birds, rabbits, porcupines and carrion. Large diameter trees with cavities are important as denning sites. Dense forest stands in the latter successional stages provide the best quality habitat. Ruggiero et al. (1994) noted that fisher use riparian areas disproportionately more than their occurrence and exhibit a strong preference for habitats that have overhead tree cover. Movement and dispersal over the landscape is maintained by providing corridors with consistent overhead cover (Ruggerio et al. 1994).

Distribution is likely governed by the availability of food but the presence of overhead cover may also be an important factor. Home range sizes of fishers vary up to approximately 19 square miles for adult males. The range of one male will overlap those of more than one female.

The Moist Forest, Cold Forest and lodgepole pine forest represent the highest quality habitat for fisher based upon site capability. Quality habitat includes both the OFMS and YFMS structural stages. Approximately 14,600 acres of these forest types exist. Of that, 10,510 acres, or 72%, are in OFMS or YFMS condition. Structural stage percentages are within the estimated HRV for OFMS and in excess of the estimated HRV for YFMS.

The *warmer* Dry Forest environments likely provide fisher habitat as well, i.e., those plant associations with a notable grand fir component. Many of these stands have higher tree densities than they did historically. These conditions have resulted in the accumulation of dead wood habitat, both in the form of snags and down wood. These dead wood habitats, however, are generally smaller, and may provide a poorer quality of habitat. While fisher may use these areas for foraging,

and possibly denning, over all use is likely less when compared to Moist Forest, Cold Forest and lodgepole pine environments. In addition, these drier habitats tend to be more fragmented and degraded by timber harvest. Approximately 17,500 acres of dry grand fir plant associations exist. Of that, 9,915 acres, or 57%, are in OFMS or YFMS structure habitat. This percentage is excess of the estimated HRV of 10% to 30% for OFMS and YFMS in Dry Forests.

Although habitat exists in the analysis area, fisher are not known or suspected to occur there. Fisher have been extirpated from much of their range due to trapping and loss of habitat due to logging. They are considered extirpated from Oregon (Oregon Natural Heritage Program 2001).

Bobolink *Dolichonyx oryzivorus*

The Bobolink is a Region 6 sensitive species. Bobolinks are found in native and tame grasslands, haylands, lightly to moderately grazed pastures, no-till cropland, small-grain fields, wet meadows, and planted cover. Bobolinks prefer habitat with moderate to tall vegetation, moderate to dense vegetation, moderately deep litter, and without the presence of woody vegetation (Dechant et al., 2001). If habitat is not maintained, use by bobolinks declines significantly, possibly due to the accumulation of litter and encroachment of woody vegetation. Bobolinks respond positively to properly timed burning or mowing treatments, and moderate grazing.

Bobolinks are very local and scattered in the eastern one-third of Oregon and are known to breed on the Malheur National Wildlife Refuge, south end of Blitzen Valley, Harney County, Union County, and Wallowa County (Marshall 1996). Locally, sporadic nesting occurs in the Prairie City, Mt. Vernon, Silvies Valley, and Bear Valley areas (Sweeney, 2001; Winters 2001). In the Southeast Galena Analysis area, there has only been one reported sighting on the Middle Fork of the John Day River.

Bobolinks appear to prefer large grassland areas to small, requiring approximately 25-110 acres depending on habitat quality. Consequently, in Southeast Galena, habitat is likely limited to meadows and grasslands along the Middle Fork of the John Day River. About 615 acres of capable habitat exist, with the majority of the acres on private land. Many of these acres are grazed and may not be providing tall enough grass for bobolinks. Meadows exit in the uplands, but they tend to be small or habitat is naturally dry and low in productivity.

Sandhill Crane *Grus Canadensis* **and**
Long-billed curlew *Numenius americanus*

Both the sandhill crane and long-billed curlew are Region 6 sensitive species. Sandhill crane habitat includes large, undisturbed wetlands with vigorous wetland vegetation, such as sedges and cattails. Foraging habitat includes grains, seedlings and animal matter found in agricultural fields and large wetlands. Long-billed curlews construct nests on the ground in short vegetation, usually grasses and annual forbs, on rolling topography (Bicak et al. 1980). They also need areas of tall vegetation to provide hiding cover for chicks.

On the Malheur National Forest, these species have been seen at various locations, including Bear Valley and Logan Valley to the south and Phipps Meadow, Bridge Creek Meadow and Lobelia Meadow to the east. In the analysis area, cranes and curlews have been sighted along the Middle Fork of the John Day River, predominantly on private land. This area likely provides feeding habitat in the spring. None of the reported sightings along the Middle Fork confirmed nesting animals.

Tricolored blackbird *Agelaius tricolor*

The tricolored blackbird is a Region 6 sensitive species. Historically, tricolored blackbirds have been reported in dense, wet or dry tule marshes or patches of tules, cattails, or other emergent vegetation. More recently, the trend has been for more colonies to occur in blackberry thickets, and certain spiny grain crops such as wheat and barley (SJMSCP 2000). Nests are built of cattails, sedges, grasses, or other aquatic vegetation collected from the surface or in shallow water, and attached to cattails or

twigs in shrubs and blackberry thickets, usually near water. Feeding and roosting occurs in dense flocks, ranging from a few to 20,000 in a colony, throughout the year (USGS 1998). In winter, they move through marshes, open cultivated lands, and pastures. Food is gleaned from the ground and low vegetation, consisting of insects, spiders, and occasionally small tadpoles and snails (USGS 1998). Foraging areas have to be within a few miles of the nesting site (SJMSCP 2000).

In the Southeast Galena analysis area, habitat is considered limited. Habitat may be associated with the Middle Fork of the John Day River, but has not been confirmed. There are no known sightings on the Malheur National Forest (Sweeney, Hunt 2001, pers. comm.).

Columbia Spotted Frog *Rana luteiventris*

The spotted frog is a Region 6 sensitive species. Spotted frogs are highly aquatic and are rarely found far from permanent water. Breeding habitat is usually in shallow water in ponds or other quiet waters along streams. Breeding may also occur in flooded areas adjacent to streams and ponds. Adults may disperse overland in the spring and summer after breeding. Habitat has been degraded by past management activities, such as livestock grazing, road construction along streams, and timber harvest adjacent to streams, lakes ponds, springs, and marshes

The spotted frog is considered present in all subbasins on the Malheur National Forest. It is assumed this species is widely distributed in the analysis area. No habitat surveys have been conducted specifically for spotted frogs; however, habitat probably exists along most perennial and some intermittent streams. Fish surveys records incidental sightings of non-fish species. During 1996 fish surveys, spotted frogs were reported in the Davis/Placer subwatershed, along the Davis and Placer Creeks. .

Western sage grouse *Centrocercus urophasianus phaios*

The sage grouse is a Region 6 sensitive species. Sage grouse are residents of sagebrush habitat, usually inhabiting sagebrush-grassland or juniper (*Juniperus* spp.)-sagebrush-grassland communities. Meadows surrounded by sagebrush may be used as feeding grounds (Johnsgard 1973). Sage grouse use sagebrush of different age classes and stand structures as lekking, nesting, brooding, and wintering grounds. Neither expansive dense sagebrush nor expansive open areas constitute optimal sage grouse habitat. Sage grouse once occurred virtually everywhere there was sagebrush. Habitat loss, primarily due to overgrazing, sagebrush elimination, and land development, caused their decline (Hamerstrom and Hamerstrom 1961).

On the Malheur National Forest, sage grouse habitat is primarily associated with the larger expanses of sagebrush habitat located on the southern end of the Forest. In the Southeast Galena analysis area, sagebrush habitats and juniper/sagebrush habitats are very limited, probably providing marginal habitat at best. About 1,650 acres of dry shrublands and 1,400 acres of juniper woodlands could potentially support sage grouse.

Gray flycatcher *Empidonax wrightii*

The gray flycatcher is a Region 6 sensitive species. This species prefers relatively treeless areas with tall sagebrush, bitterbrush, or mountain mahogany communities, but is also associated with pinyon-juniper woodland with understory sagebrush, and open ponderosa pine forests (Csuti et al. 1997). This species in most abundant in extensive tracts of big sagebrush, often selecting areas along washes where the sagebrush is especially tall. In the western Great Basin, this species nests in tall big sagebrush shrublands (Ryser 1985).

About 1,400 acres of juniper woodlands, 1,450 acres of dry meadows and grasslands, 1,650 acres of dry shrublands, and 860 acres of moist meadows that could provide gray flycatcher habitat occur in the analysis area. All of these acres are not necessarily in a condition that will support this species. Quality sagebrush communities, for example, are relativity rare. Numerous mountain mahogany

stands and some bitterbrush occur as small inclusions in other forested habitat types. Because they are small, they were not mapped separately; therefore, acres for these types are not available.

3.2.6.2—Management Indicator Species(MIS)

To maintain viable populations of existing native and desired non-native vertebrate populations, the Malheur National Forest (under regulation 36 CFR 219.9) established a list of Management Indicator Species (MIS) that can be used to monitor the effects of planned management activities on viable populations of wildlife.

Selected MIS may reflect a mix of threatened, endangered, or sensitive species; species commonly hunted fished or trapped; non-game species of special interest; or species selected because their population changes are believed to indicate the effects of management activities on specified biological communities.

Once an MIS is designated, the Forest Service must evaluate the effects of recommended management activities in terms of both amount and quality of habitat and of animal population trend (36 CFR 219.19(a)(2)). The Forest Service need not conduct surveys to determine population levels of vertebrate species but can assume that maintenance of habitat is necessary to maintain a viable population sufficient to meet the regulatory requirements of NFMA (Inland Empire, 88F.3d).

In most cases formal surveys were not conducted in Southeast Galena to determine presence, but informal observations were used to determine presence whenever possible. If the presence of a certain species was not determined, based on one or more sightings, habitat suitability was used as a proxy to determine "probable presence." This assumes if the habitat is present, then the species is present and treats them as such.

3.2.6.2.1—MIS for Old Growth

Pileated woodpeckers, pine marten, three-toed woodpeckers and white-headed woodpeckers were selected as indicators of mature and old growth habitat. The Land and Resource Management Plan establishes management direction for old growth MIS via Forest-wide standards (page IV-32) and Management Area direction (pages IV-105 to IV-107). By providing habitat for these species, it is assumed that habitat for other old growth obligate species will be provided as well.

Pileated Woodpecker *Drycopus pileatus*

The pileated woodpecker is designated in the *Land and Resource Management Plan* as a Management Indicator Species (MIS) for old growth habitat, i.e., OFMS stand structure (see structural definitions page145)The species are also used as an indicator of dead and defective tree habitat. Pileated woodpeckers prefer to nest, roost, and (to a lesser extent) forage in mature or old growth forest with high canopy cover (Bull et al 1992, Bull 1980, Mellen et al 1992, Bull and Holthausen 1993). In northeastern Oregon, this species is associated with mature, multi-storied grand fir forests, but can also be found in ponderosa pine mixed conifer as well. Optimum habitat contains at least 4 large (> 20 inches dbh) snags/acre, plus at least 400 lineal feet of down logs to provide nesting, roosting and foraging sites (Bull and Holthausen 1993). Large dead trees, usually ponderosa pine or western larch, in excess of 20 inches dbh are necessary to accommodate a nesting cavity of significant size. A preference is shown for stands with canopy closures greater than 60 percent. Pileated woodpeckers forage mainly by excavating insects from snags and down logs in the summer, and scaling bark for insects in the winter. Forage habitat is most commonly found in grand fir forest types and consists of snags, usually greater than 20 inches dbh, logs larger than 25 inches in diameter, and live trees greater than 21 inches dbh used mostly for scaling.

Home range for a breeding pair has been identified by different sources as ranging from 300 acres (Thomas 1979) to 550 acres (Bull 1987) to 900 acres (Bull and Holthausen 1992). In a 900-acre home range, about 25% should be in OFMS, with the remainder in mid or old structural stages and half of the areas should have a canopy closure of at least 60% (Bull and Holthausen, 1993). The *Land and Resource Management Plan* recommends that a 600-acre habitat area (300-acre nesting area and 300-acre foraging area) be established to support each reproducing pair.

The Moist and Cold Forest environments represent the highest quality habitat for pileated woodpeckers based upon site capability. Approximately 13,500 acres of potential habitat exists. Of that 4,200 acres, or 31%, are in the old structure habitat conditions, preferred for nesting. Structural stage percentages are within the estimated HRV for OFMS. Canopy closure often exceeds 60%. Many stands likely meet the *Land and Resource Management Plan* standard for large snag density at 2.4 snags/acre greater than 21 inches diameter at breast height (dbh), but meeting this standard may or may not meet the optimum snag density standard of 4 snags/acre greater than 21 inches. Densities for smaller snags, 12" to 21" dbh, are relatively higher. The YFMS structural stage (see definition page 145)) at 5,625 acres, or 42% of the moist and Cold Forests, is considered poorer quality habitat that is often deficient in large tree structure, dead wood habitats and /or canopy cover. These habitats likely meet some of the feeding needs of the pileated woodpecker, as well as some nesting trees. However, because of the less than ideal condition of these habitats, it is likely that larger home ranges are required to meet the species habitat needs. Structural stage percentages are in excess of the estimated Historical Range of Variability (HRV see definition, page 6) for YFMS.

The *warmer* Dry Forest environments likely provide pileated woodpecker habitat as well, i.e., those plant associations with a notable grand fir component. However, snag and down wood densities tend to be lower or deficient, often not meeting *Land and Resource Management Plan* standards of 2.4 snags/acre > 21" dbh. Despite these deficiencies, these habitats still likely provide for some of the species needs, particularly foraging habitat. Pileated woodpeckers likely persist in these habitats, although at reduced densities and poorer distributions. Approximately 17,500 acres of dry grand fir plant associations exist. Of that, 2,435 acres, or 14%, are in OFMS structure habitat. This percentage is within the estimated HRV of 5% to 15% for OFMS in Dry Forests. About 7,480 acres, or 43%, are in YFMS structure habitat. This percentage is in excess of the estimated HRV of 5% to 15% for YFMS in Dry Forests. A century of fire suppression has probably improved some of these forest types for pileated woodpeckers, permitting understory fir to establish and increasing canopy closure and stand complexity.

Land and Resource Management Plan, Management Area 13 (MA-13) provides for the management of old growth habitat through a system of Dedicated Old Growth (DOG) units. DOGs were delineated Forest-wide to provide an even distribution of habitat areas, one DOG every 12,000 acres, or approximately 5 miles apart (see Appendix E, Map 19 Dedicated and Replacement Old Growth for Action Alternatives). The *Land and Resource Management Plan* assumes that that this system of DOGs will provide for species viability. Five DOGs have been delineated for pileated woodpeckers within the analysis area (see Dedicated Old Growth and Connectivity, page 178). To meet the 12,000-acre distribution requirement, DOG locations do not always correspond with the highest quality habitat. DOG's 330 and 332 are on moist sites, representing the highest quality habitat. DOG's 129, 333 and 433 are predominantly in the drier grand fir sites, representing lesser habitat. Currently, DOGs and associated feeding areas may not meet the 600-acre size requirement specified in the *Land and Resource Management Plan* (see Dedicated Old Growth and Connectivity, page 178).

Four relatively large, contiguous blocks of OFMS exist, ranging in size from 600 acres to 1,700 acres. As distributed, and only considering the highest quality habitat (OFMS in cold and Moist Forest types), the analysis area supports home ranges for six reproducing pairs of pileated

woodpeckers, based on a 600-acre home range as directed in the *Land and Resource Management Plan*. Consequently, despite the habitat quality and size of the five DOGs, the analysis area could support at least six reproducing pairs. When this quality habitat is combined with somewhat lower quality habitat, the analysis area likely supports additional reproducing pairs. The analysis area would provide for species viability.

Pine Marten *Martes americana*

The pine marten is designated in the *Land and Resource Management Plan* as a MIS for old-growth habitat, i.e., OFMS. Marten are associated with mature and overmature stands in moist coniferous forests, especially those with complex physical structure near the ground (Buskirk and Powell 1994). These animals generally prefer complex stands associated with lodgepole pine as home range habitat (Fager 1991) with heavier use near riparian areas (Spencer and Zielinski 1983). Martens show a strong avoidance of open areas, probably as a response to predator avoidance (Hawley and Newbry 1957). Prey species are influenced by seasonal availability and are composed mainly of voles, tree squirrels and ground squirrels. Complex lower stand structure (i.e. lower branches, boles, stumps, logs, and shrubs) provides resting sites, subnivean (below snow) access for winter foraging, and cover from predators. A variety of structures are used for denning, primarily trees, logs, and rocks. Dry Forest types and those that lack structure near the ground are used very little (Buskirk and Powell 1994). Movement and dispersal over the landscape is maintained by providing corridors with consistent overhead cover (Ruggerio et al. 1994).

The home range of pine marten are much larger than would be expected for a carnivore of this size (Ruggiero et al., 1994). Territory size for pine martens was found to vary from 103 acres in the fall when prey is abundant to 618 acres in the spring when prey is scarce. Some biologist's (Freel, 1991) have recommended a home range size of 1,400 acres for a reproducing pair of marten. Home range size may be larger in fragmented forests than they would be where large, contiguous blocks of old growth exist (Soutierre 1979, Thompson and Colgan 1987). The *Land and Resource Management Plan* recommends that a 160-acre home range be established to support each breeding female.

Habitat classification within the analysis area is similar to that described for pileated woodpeckers; however, marten do not exhibit as strong a need for larger diameter trees as pileated woodpeckers. The Moist Forest, Cold Forest and lodgepole pine forest represent the highest quality habitat for pine marten based upon site capability. Because large diameter trees are not as critical for pine marten viability, quality habitat includes both the OFMS and YFMS structural stages. Approximately 14,600 acres of these forest types exist. Of that, 10,510 acres, or 72%, are in OFMS or YFMS condition. Structural stage percentages are within the estimated HRV for OFMS and in excess of the estimated HRV for YFMS.

The *warmer* Dry Forest environments likely provide pine marten habitat as well, i.e., those plant associations with a notable grand fir component. District biologists have reported sightings of martens in these habitats. Many of these stands have higher tree densities than they did historically. These conditions have resulted in the accumulation of dead wood habitat, both in the form of snags and down wood. These dead wood habitats, however, are generally smaller, and may provide a poorer quality of habitat. While pine marten may use these areas for foraging, and possibly denning, over all use is likely less when compared to Moist Forest, Cold Forest and lodgepole pine environments. In addition, these drier habitats tend to be more fragmented and degraded by timber harvest than other forest types. Approximately 17,500 acres of dry grand fir plant associations exist. Of that, 9,915 acres, or 57%, are in OFMS or YFMS structure habitat. This percentage is excess of the estimated HRV of 10% to 30% for OFMS and YFMS in Dry Forests. Pine martens likely persist in these habitats, although at reduced densities and poorer distributions. Individuals using these areas likely require larger home ranges to make up for the poorer quality habitat.

The most important prey of marten- various vole species - is highly associated with dense herbaceous and riparian habitats. Although riparian shrubs are generally in an upward trend, it is suspected that species composition, distribution and vigor are lower than potential throughout much of the watershed. In some areas, shrubs are old and decadent and not reproducing well. Fire suppression, conifer encroachment, stream channel and floodplain modification along with big game and livestock browsing continue to limit recovery of hardwoods from their historic levels. These conditions have reduced the suitability of foraging habitat for marten.

Eleven Dedicated Old Growth (DOG) units have been delineated for pine martens within the analysis area (see Dedicated Old Growth and Connectivity, page 178). DOGs were delineated to provide an even distribution of habitat areas, one DOG every 4,000 to 5,000 acres, or approximately 3 miles apart (see Appendix E, Map 19 Dedicated and Replacement Old Growth for Action Alternatives). The *Land and Resource Management Plan* assumes that that this system of DOGs will provide for species viability. As with pileated woodpeckers, DOG locations may not always correspond with the highest quality habitat. DOG's 242, 243, 245, 249,250, and 252 are in Moist Forests, representing the highest quality habitat. DOG's 248, 333 and 533 are predominantly in the drier grand fir sites, representing lesser habitat. Currently, DOGs may not meet *Land and Resource Management Plan* size requirements for a breeding female (see Dedicated Old Growth and Connectivity, page 178).

Habitat is plentiful. Even if one considers only the highest quality habitat (10,510 acres of OFMS and YFMS in the Moist, Cold and Lodgepole types), large contiguous blocks of habitat are available. The pileated woodpecker section highlights four large contiguous blocks of OFMS; the inclusion of adjacent YFMS as habitat greatly expands the size of these blocks. The analysis area could support as many as 65 territories for pine marten based on a 160-acre home range as directed in the *Land and Resource Management Plan*. Consequently, regardless of the size and habitat quality of the eleven DOGs, the analysis area could support well over eleven territories. When this quality habitat is combined with somewhat lower quality habitat, the analysis area likely supports additional territories. The analysis area would provide for species viability.

Three-toed Woodpecker *Picoides tridactylus*

The three-toed woodpecker is designated in the *Land and Resource Management Plan* as a MIS for old growth lodgepole pine. The species is also used as an indicator of dead and defective tree habitat. The species prefers stands where lodgepole pine is either dominant or co-dominant, and uses mostly trees 9" dbh and greater for both nesting and foraging (Bull 1980, Goggins 1986). Suitable habitat is tied to existing levels of diseased and decaying trees with heart rot for nesting and roosting, as well as decaying substrate to provide a prey base for wood-boring insects (Goggins et al. 1987). The species forages by scaling and pecking in trees with scaly bark, which include lodgepole pine, Engelmann spruce and western larch. In particular, three-toed woodpeckers are attracted to areas with high concentrations of beetles, such as habitats created by stand replacing burns or blowdown. Habitat is believed to overlap with that of black-backed woodpeckers, although the three-toed woodpecker has a slightly more northern and higher elevation distribution, and tends to feed more exclusively in lodgepole pine-dominated stands (Marshall 1992).

Home range varies from 130 to 750 acres. Goggins (1987) recommends that Management Areas for each pair of three-toed woodpeckers should be 528 acres of mixed conifer or lodgepole pine forest in mature and overmature condition and at an elevation of 4,500 feet or higher. *Land and Resource Management Plan* standard 59 gives direction to identify potential or existing old growth lodgepole pine habitat for 3-toed woodpeckers to assure species viability. Minimum management requirements suggest establishing habitat areas of 75 acres for every 2,000 to 2,500 acres (UDA 1986).

The Lodgepole Pine Forest, Moist Forest and Cold Forest types represent the highest quality habitat for three-toed woodpeckers. Approximately 14,600 acres of potential

habitat exists. Of that 4,450 acres, or 30%, are in the old structure habitat conditions, preferred for nesting and foraging. The OFMS structural stage is within the estimated HRV.

In the Granite Boulder Subwatershed, there are three larger blocks of climax lodgepole, ranging from 120 acres in size to 190 acres in size. These blocks are located at high elevations in the Vinegar Hill – Indian Rock Scenic Area. Several stands classify as old-growth lodgepole. Stands have a sufficient level of snags and down woody debris for foraging and lodgepole pine trees for nesting. Adjacent stands, lacking in lodgepole pine, may still provide secondary habitat. Habitat appears suitable for three-toed woodpeckers, and possibly, for black-backed woodpeckers as well. DOGs for three-toed woodpeckers have not been established in these areas, but habitat is protected because of its inclusion in the scenic area. The 1994 Reed Fire, the 1996 Summit Fire and the 1998 Vincent/Vinegar windstorm probably provided the elevated beetle habitat this species prefers. The period when burns and beetle-infested stands are useful for foraging is limited to 3 to 5 years, because beetles no longer use snags after they have dried out (Bull 1980).

White-headed woodpecker *Picoides albolarvatus*

White-headed woodpeckers are highly associated with Old Forest Single Strata (OFSS) stands, i.e., open canopy stands of large mature and overmature ponderosa pine, and less frequently mixed ponderosa pine and Douglas-fir stands (Burleigh 1972, Ligon 1973, Webber and Cannings 1976). This species is also used as an indicator of dead and defective tree habitat. Forage items vary by season, with ponderosa pine seeds comprising the diet in fall and winter, and insects on tree surfaces used throughout the year when available (Morrison and With 1987). Nests are commonly excavated in ponderosa pine snags with diameters greater than 23 inches (Frederick and Moore 1991). Home range size varies from 250 to 500 acres with an average of 350 acres.

Habitat abundance and distribution for white-headed woodpeckers has been reduced/eliminated in the Dry Forest types. Past harvest activities have concentrated on removing the large overstory ponderosa pine, western larch and Douglas-fir trees and snags, setting many stands back to younger structural stages. Significant reduction in numbers of large, mature ponderosa pine reduces trees for nesting and cones for winter food supplies. In other areas, fire suppression has permitted increased stocking of understory trees, often shifting stand structure from OFSS to OFMS. Stand densities have increased since the 1940's to the detriment of white-headed woodpeckers, which prefer more open understory structure. Research in central Oregon found that white-headed woodpecker home range sizes were up to four times larger in multi-storied, fragmented areas with multiple silvicultural treatments as compared to larger, contiguous tracts of ponderosa pine that still exhibited old-growth characteristics.

Potential habitat for white-headed woodpeckers is most often associated with the Dry Forest types. Approximately 29,000 acres of potential habitat exists. Today, 290 acres, or 1%, of these forest types are classified as OFSS. Historically, 30 to 55% of the Dry Forest types were in stands of OFSS. OFMS stands are probably providing habitat for OFSS associated species to a degree, as long as canopy cover is not too great, and appropriate tree species composition exists, i.e., predominantly ponderosa pine, Douglas-fir and western larch. However, habitat suitability may not be high, and will continue to decline as stands continue to increase in tree density and proportion dominated by true firs. It is unlikely that these habitats would provide for viable densities and distribution of the species across the analysis area. There are currently 3,480 acres, or 12% of these forest types, in OFMS that are probably providing habitat for OFSS associated species.

The Moist Forest types likely supported OFSS stands, but at a much lower level than the Dry Forest types. Approximately 11,500 acres of Moist Forest types exist. Today, 570 acres, or 5% of these forest types, are classified as OFSS. Historically, 5 to 15% of these types are believed to have been OFSS.

In the Granite Boulder Subwatershed, a 500-acre contiguous block of OFSS exists. In 1994, the Reed Fire burned through this area, killing the understory trees, while preserving most of the large overstory trees. Other blocks of OFSS exist, ranging in size from 10 to 80 acres in size.

Because of the lack of mature, open-grown ponderosa pine habitat, it is questionable as to whether the existing habitat is providing for population viability of white-headed woodpeckers.

Dedicated Old Growth and Connectivity

Land and Resource Management Plan, Management Area 13 (MA-13) provides for the management of old growth habitat through a system of dedicated old growth (DOG) units and replacement old growth (ROG) units (see Appendix E, Map 19 Dedicated and Replacement Old Growth for Action Alternatives). Habitat is to be composed of mature/overmature sawtimber (150 years or older). The goal of MA-13 is to provide suitable habitat for old growth dependent wildlife species, ecosystem diversity, and preservation of aesthetic qualities. Three MIS, as discussed previously, are used as indicators of the amount and quality of old-growth habitat: pileated woodpecker, pine marten and three-toed woodpecker. Pileated woodpecker and pine marten are used as indicators for OFMS habitat. Three–toed woodpeckers are used as an indicator for OFMS lodgepole pine. The white-headed woodpecker, although not specifically raised as a MIS for old-growth in the *Land and Resource Management Plan*, is recognized as a good indicator of OFSS habitat. Replacement old growth (ROG) areas are established to counter possible catastrophic damage or deterioration of the DOGs.

The *Land and Resource Management Plan* directs that pileated woodpecker areas are to be 600 acres, composed of a 300-acre DOG and a 300-acre feeding area(PWFA). ROGs are intended to be ½ the size of DOGs, i.e., 150 acres for pileated woodpecker DOGS. ROGs may overlap with the feeding areas. Pine marten units are to be 240 acres, composed of a 160-acre DOG and an 80-acre ROG. Again, ROGs are intended to be ½ the size of their corresponding DOG. DOGs managed for both species should be managed at the 600-acre home range recommended for pileated woodpeckers. Management requirements are derived from the US Forest Service 1986 Minimum Management Requirements.

In Southeast Galena, thirteen DOG units have been delineated for pileated woodpecker, pine marten, or a combination of both species, totaling 3,099 acres. Table 101 shows species designation and acres for each DOG unit. No DOG units have been established for three-toed woodpeckers. There is no specific provision in the *Land and Resource Management Plan* to identify management areas for white-headed woodpecker. Existing DOGs do not always meet minimum size requirements, and they are not always tied to logical stand or topographical boundaries.

ROGs have not been established for 11 out of 13 DOGs. Pileated feeding areas have not been established for 4 out of 5 pileated woodpecker DOGs. Table 101 displays existing ROG and feeding area acres.

Table 101 Dedicated Old Growth (DOGs) and Replacement Old Growth (ROGs) Units

DOG #	Old Growth Management Area (MA-13) Species	Minimum MA-13 Acre Requirements	Existing DOG Acres	Existing ROG Acres	Total Existing Acres
DOG 129	Pileated Woodpecker	600	397	0	397
DOG 242	Pine Marten	240	249	47	296
DOG 243	Pine Marten	240	204	0	204
DOG 245	Pine Marten	240	214	0	214
DOG 248	Pine Marten	240	149	0	149
DOG 249	Pine Marten	240	168	0	168
DOG 250	Pine Marten	240	169	0	169
DOG 252	Pine Marten	240	153	0	153
DOG 330	Woodpecker and Marten	600	340	0	340
DOG 332	Woodpecker and Marten	600	302	0	302
DOG 333	Woodpecker and Marten	600	366	134	500
DOG 433	Pileated Woodpecker	600	171	0	171
DOG 533	Pine Marten	240	217	0	217
TOTALS		4,920	3,099	181	3,280

[1] **Old-growth Management Area (MA-13) Minimum Management Requirements:**
Pileated Woodpecker Areas = 300-acre DOG + 300-acre feeding area = *600 acres*. ROGs = 150-acres and overlap with feeding areas.
Pine Marten = 160-acre DOG + 80-acre ROG = *240 acres*

Approximately 2,035 acres or 66% of the 3,099 acres located within the DOGs/ROGs currently classify as OFMS. Most of the remaining acres classify as YFMS (young forest multiple strata). These latter acres typically provide adequate canopy complexity and canopy closure, but the number of large diameter trees present fall short of quantities required for OFMS classification.

DOG/ROG locations may not always correspond with the highest quality habitat. DOGs 242, 243, 245, 249, 250, 252, 330 and 332 are in Moist Forests, representing the highest quality habitat. DOGs 129, 248, 333, 433, and 533 are predominantly in the drier grand fir sites, representing lesser habitat. ROG 242 is in Moist Forest; ROG 333 is in Dry Forest.

Forested areas located outside designated DOGs, ROGs and feeding areas can provide additional habitat for pileated woodpeckers and pine martens. The analysis area currently contains approximately 7,900 acres of OFMS and 900 acres of OFSS. See previous habitat descriptions for pileated woodpeckers and pine martens

In the Southeast Galena Watershed, OFSS habitat on the Dry Forest types is well below the historic range of variability due to timber harvest and fire suppression activities. Stands that were historically OFSS are now overly stocked with smaller diameter trees. Many of these stands now classify as OFMS. Risk of uncharacteristically severe wildfire is elevated. Insect and disease risk is elevated. Old growth conditions may not be sustainable.

Regional Forester's *Land and Resource Management Plan* Amendment 2 requires that connectivity corridors be established between late and old structure stands. Within corridors, canopy closure is to be within the top 1/3 of site potential and medium or larger diameter trees are to be common. Standards require that corridors be at least 400 feet wide. Hereafter, these corridors will be referred to as *Land and Resource Management Plan* Amendment 2 corridors or LRMP2 corridors. LRMP2

corridors provide dispersal and migratory habitats for a variety of wildlife, including bird species, large wild ungulates, small mammals and wide-ranging carnivores such as the lynx, wolverine and pine marten.

All late and old structure stands and existing DOGs/ROGs have been identified and connectivity corridors delineated (see Appendix E, Map 20—Wildlife Connectivity—For Action Alternatives). Quality of this habitat varies depending on forest type, stand structure, plant association, and canopy closure. Late and old habitats, including DOGs/ROGs, are generally well connected, and the designated corridors meet Land and Resource Management Plan Amendment 2 standards. Some of the corridor habitat, however, is in a less ideal condition as it lacks some of the ground level structure important for providing quality habitat. Stem exclusion open and closed canopy (SEOC, SECC see photos page 146) stand structures are examples. In addition, breaks in connective corridors occur in some areas as the result of past regeneration harvest, insect and disease outbreaks, and natural openings.

3.2.6.2.2—MIS—Primary Cavity Excavators (PCE)

Eleven species were selected as Management Indicator Species (MIS) of dead and defective tree habitat because they create their own nesting cavities in dead or detective trees. The *Land and Resource Management Plan* establishes management direction for PCEs via Forest-wide standards (pages IV-29 to IV-30), as amended. By providing habitat for these woodpeckers, habitat is provided for many other cavity dependent species. Species associated with dead wood habitats include the pileated woodpecker, three-toed woodpecker, white-headed woodpecker, black-backed woodpecker, Lewis' woodpecker, Williamson's sapsucker, red-naped sapsucker, red-breasted sapsucker, hairy woodpecker, downy woodpecker, and northern flicker. Three species serve as MIS for both old growth and primary cavity excavators (see 3.2.6.2.1—MIS for Old Growth, page 173). Habitats for the pileated wood pecker the three-toed woodpecker and the white-headed woodpecker were described in the previous section. The remainder of PCEs are described below.

Black-backed Woodpecker *Picoides arctus*

Black-backed woodpeckers are associated with lodgepole pine, ponderosa pine, or mixed forests containing lodgepole and ponderosa pine and other conifers such as larch, true fir, and Engelmann spruce (Marshall, 1992). A study on the Deschutes National Forest showed their preference for mature and overmature lodgepole pine stands over younger stands or logged areas. All the nests were in heart rot infected lodgepole pine, with an average diameter of 11" dbh. A study on the Starkey Experimental Forest showed that over half of the nests were in ponderosa pine, with the other half being in lodgepole and larch. Cankers, mistletoe clumps, and other deformities in mature and overmature lodgepole are important for providing roosts. Concentrations of birds occur in stands where wind, fire, or insect-killed timber supports bark beetles above normal levels (Marshall, 1992). This species is anatomically and morphologically adapted more than other woodpeckers for drilling and pecking because it can deliver stronger blows by striking from a greater distance than other woodpeckers. Consequently, it prefers to nest in smaller trees (<20" dbh, averaging about 12"dbh), recently dead and therefore, harder snags (Bull 1980, Marshall 1992a, Saab and Dudley 1997). Black-backed woodpeckers usually forage by drilling and scaling, or flaking, the bark of trees to reach insects (Bull 1980, Raphael and White 1984). Scaling is most easily accomplished on smaller diameter trees that have thinner bark, which also explains why black-backs are attracted to smaller diameter trees. Habitat is believed to overlap with that of three-toed woodpeckers, although the black-backed woodpecker tends towards slightly lower elevations and a mix of conifer species rather than the pure lodegpole dominated stands preferred by three-toed woodpeckers (Marshall 1992).

Home ranges on the Deschutes study varied form 180 to 810 acres with an average of 430 acres. Goggins (1987) recommends Management Areas for each pair of black-backed woodpeckers should be 956 acres of lodgepole pine or lodgepole pine dominated mixed conifer forest in mature and overmature condition, with some areas at elevations less than 4,500 feet elevation. There is no specific provision in the *Land and Resource Management Plan* to identify blocks of habitat for the black-backed woodpecker.

The lodgepole pine forest, Moist Forest and Cold Forest represent the highest quality habitat for three-toed woodpeckers. Approximately 14,600 acres of potential habitat exists. In the Moist and Cold Forest types, black-backed woodpeckers are more strongly associated with the OFMS structural stage. In the Lodgepole Forest types, black-backed woodpeckers will use OFMS, YFMS and UR structural stages. Consequently, quality habitat is currently provided on 5,145 acres, or 35% of potential habitat. The OFMS structural stage is within the estimated HRV; the YFMS and UR structural stages are in excess of HRV.

Grand fir/grouse huckleberry sites in the Dry Forests may also provide habitat. These forest stands often are a mix of conifer species, including ponderosa pine and lodgepole pine. Species composition is fairly variable, and is strongly influenced by elevation, aspect and topography. Lodgepole pine is often restricted to cold sites located in the riparian bottoms. In Southeast Galena, grand fir/grouse huckleberry sites occupy about 6,900 acres with 1,080 acres in a OFMS condition. These sites have not been specifically surveyed for their potential as black-backed woodpecker habitat, and it is uncertain whether sufficient levels of lodgepole pine exist.

The previous three-toed woodpecker description describes the larger blocks of lodgepole pine that occur in the analysis area. To date, there are no survey techniques to determine presence because the birds do not respond to tape-recorded calls like other birds such as goshawks and pileated woodpeckers.

Lewis' Woodpecker *Melanerpes lewis*

The Lewis' woodpecker is used as an indicator of dead and defective tree habitat. Unlike most other woodpecker species in Oregon, Lewis' woodpecker is an aerial insectivore and requires openings for foraging maneuvers. Preferred nesting habitat consists of two distinct types in eastern Oregon: riparian areas with large cottonwoods, and burned over ponderosa pine forests. This species seldom excavates its own nest cavity, instead using cavities created by other woodpeckers (Bock 1970). In burned areas, ponderosa pine snags greater than 16 inches dbh are chosen for nesting. Similar diameter cottonwood snags in riparian areas are selected (Galen 1989). Excluding burned coniferous forest and riparian habitat, the greatest concentration of Lewis' woodpecker source habitats was in ponderosa pine forests in the OFSS structural stage (Wisdom et al., 2000).

Cottonwood habitat is sparse throughout the analysis area, restricted to riparian areas. Scattered individual and groups of individuals are located along the Middle Fork of John Day River and along several of its tributary streams. Numbers of cottonwood are low and declining. Areas burned in the 1996 Summit Fire and 1994 Reed Fire have a high density of large diameter snags. Although much of the fire areas were salvage harvested, snag mitigation required the retention of snags in excess of the 2.4 snags/acre required by the *Land and Resource Management Plan*. Approximately 1,300 acres burned by wildfire is within the Southeast Galena analysis area. Habitat is limited, except in the fire areas.

As previously described for white-headed woodpeckers, 29,000 acres of Dry Forest provides potential habitat for Lewis' woodpecker. Today, only 290 acres, or 1%, of these forest types are classified as OFSS. Reductions in OFSS have reduced forest patch openings that allowed foraging maneuvers. Multi-storied forests have reduced understory shrubs and presumably reduced the abundance of associated arthropods on which Lewis' woodpeckers feed.

Williamson's Sapsucker *Sphyrapicus thyroides*

In northeastern Oregon, Williamson's sapsuckers prefer mature and old growth mixed conifer forests at 3,500 - 6,500 feet elevations (Bull et al., 1986). The species also uses riparian habitats to an extent (Conway and Martin 1993, Raphael and White 1984). Nesting occurs in large diameter trees (generally >20" dbh), both live and dead, and comprised mainly of western larch, but also ponderosa pine, Douglas-fir, and grand fir (Bull 1980, Raphael and White 1984). Although all forest types contained this species, 53% of nesting occurred in grand fir types. This species feeds by gleaning insects, drilling for insects and sapsucking (Bull 1980, Raphael and White 1984). References to home range size were not found in the literature.

The Moist and Dry Forest environments represent the highest quality habitat for Williamson's sapsuckers. Approximately 40,500 acres of potential habitat exists. Of that 7,390 acres, or 18%, are in the old structure habitat conditions, preferred for nesting. Structural stage percentages are within the estimated HRV for OFMS. In the Moist Forests, dead wood habitats are sufficient. In the Dry Forests, dead wood habitats are deficient.

Riparian hardwood habitats have declined over time. Aspen habitats are a minor component of the landscape, comprising 25 identified sites on 28 acres. These stands are generally decadent, heavily encroached by conifers, declining in health and vigor, and over-browsed by big game and livestock. Cottonwood habitats are in similar condition to aspen habitats. Riparian habitat conditions for sapsuckers are likely poor.

Red-naped Sapsucker *Sphyrapicus nuchalis*

Red-naped sapsuckers were formerly a subspecies of yellow-bellied sapsuckers. Late/old aspens clones are the preferred habitat. They are found in forests containing pure stands of aspen or mixed stands of aspens and conifers (Jackman 1974). They may also use riparian willow communities for foraging (Csuti 1997). Nest trees are most commonly aspen with heart rot, but ponderosa pine is also selected (DeGraaf 1991). This species feeds by sapsucking, flycatching, gleaning and pecking. Suitable habitat has declined over time. Conifer and riparian habitats are similar to those described for Williamson's sapsucker.

Hairy Woodpecker *Picoides villosus*

Suitable habitat for the hairy woodpecker includes open stands with low basal areas along ridges, low slopes, and southerly aspects in the ponderosa pine forest types. It is more common in older forests, but readily uses burned areas and forest edges for foraging (Csuti 1997). In northeastern Oregon, nesting occurs primarily in ponderosa pine 10-20 inches dbh. Grand fir trees are not selected, but other species may be used (Bull et al. 1986). Hairy woodpeckers feed mostly in ponderosa pine stands, and will use grand fir stand types as well. Both live and dead trees greater than 10 inches dbh serve as forage habitat.

Hairy woodpeckers are considered habitat generalists, i.e., they are less restricted by habitat conditions than other woodpecker species. Although the hairy woodpecker has preferences for certain tree species for nesting and foraging, it has been observed in almost all forest types in the analysis area as long as an adequate amount of dead wood habitat is available. Habitat is well distributed throughout the analysis area. However, low snag densities in the Dry Forests may inhibit occupation in these areas.

Downy Woodpecker *Picoides pubescens*

Preferred habitat for the downy woodpecker includes cottonwood and aspen stands as well as riparian areas, but they will use coniferous-deciduous and sometimes coniferous forests. Nesting occurs in trees and snags greater than 6 inches dbh at heights over 15 feet (Thomas 1979). They forage by a variety of means such as pecking and flaking bark for insects, gleaning leaves, and flycatching (Csuti 1997).

Potential habitat for this species is currently found in existing riparian areas and to a more limited extent in aspen stands in the planning area. As discussed for the Lewis' woodpecker and the sapsuckers, aspens and cottonwoods are at very low levels throughout the analysis area. In addition, this species may be relegated to breeding at lower elevations (Csuti 1997), and may not breed in the elevations existing in Southeast Galena.

Northern Flicker *Colaptes auratus*

The northern flicker is used as an indicator of dead and defective tree habitat. The species is most often associated with open forests (Jackman 1975). In northeastern Oregon, historic habitat may have been most often associated with open park-like stands of ponderosa pine for nest sites adjacent to grasslands where the birds foraged (Bull 1986). The birds commonly nest in broken-topped pine snags greater than 20 inches dbh. Tree canopy closures are generally less than 35%. Herbaceous ground cover is generally high because of the lack of canopy closure. Northern flickers spend most of their time foraging for ants on the ground and less time excavating, pecking, gleaning, and seed harvesting in live and dead trees, downed logs and stumps.

Northern flickers, like hairy woodpeckers, are considered habitat generalists, i.e., they are less restricted by habitat conditions than other woodpecker species. Although the flicker has preferences for certain tree species for nesting and foraging, it has been observed in almost all forest types. Habitat is well distributed throughout the analysis area.

3.2.6.2.3—MIS—Rocky Mountain Elk

Rocky Mountain Elk *Cervus elaphus*

Rocky Mountain Elk were selected as a Management Indicator Species (MIS) due to their economic and social value, and their response to changes in forest cover, forage quality and road. While Rocky Mountain elk are an *Land and Resource Management Plan* MIS species, deer habitat needs are similar and they will be discussed together in this section. Differences between the two species will be highlighted.

Mule Deer *Odocoileus hemionus* **and**
White-tailed deer *Odocoileus virginianus*

Elk and deer occupy all subwatersheds within the planning area. Deer in the area are primarily mule deer although there are some white-tailed deer along the Middle Fork of the John Day River.

Elk and deer will use a variety of habitats and are adaptable. Currently, elk and deer numbers are high and the species are relatively well distributed. Exceptions include the 30,000-acre Summit Fire and the 2,300-acre Reed Fire areas where loss of natural cover and forage reduced elk and deer habitat, and likely forced animals to move to other areas. In lower elevations of the Tincup/Little Butte and Granite Boulder Subwatersheds, high open road densities also likely deter big game use.

The Malheur National Forest *Land and Resource Management Plan* (LRMP*)* establishes management direction for deer and elk via Forest-wide standards (pages IV-27 to IV-32) and Management Area direction (pages. IV-69 to IV-73 and IV-131 to IV-133). The *Land and Resource Management Plan* goal is to provide for the maintenance and enhancement of big game habitat so as to sustain elk and deer populations at levels identified by the Oregon Department of Fish and Wildlife. The analysis area is divided into summer range (40,018 acres), winter range (6,292 acres) and wildlife emphasis area (3,162 acres). *Land and Resource Management Plan* standards vary by management area. See Appendix E, Map 3—Management Areas and Roadless Areas.

Summer range is predominately in mixed conifer stands at higher elevations and during periods of high temperatures both deer and elk most likely utilize northern aspects and stands with high canopy closure. Portions of all seven subwatersheds in the analysis area are classified as summer range:

Davis/Placer, Vinegar, Vincent, Little Boulder/Deerhorn, Tincup/Little Butte, Butte, and Granite Boulder.

Winter range is primarily at lower elevations where forested areas are interwoven with non-forested grasslands and bitterbrush and mountain mahogany brush fields. Portions of four subwatersheds, Little Boulder/Deerhorn, Tincup/Little Butte, Butte and Granite Boulder are actively managed for winter range. Management Area 4a-Winter Range —establishes specific management direction (LRMP, pp. IV-69 to IV-73).

The Dixie Butte Wildlife Emphasis Area is located at higher elevations around Dixie Butte and includes portions of Davis/Placer, Little Boulder/Deerhorn, Tincup/Little Butte and Butte Subwatersheds. Much of this area is roadless. Management Area 21—wildlife emphasis area without scheduled timber harvest—establishes management direction (LRMP, pp. IV-131 to IV-133). Management focuses on a variety of wildlife species, including deer and elk.

The Malheur National Forest *Land and Resource Management Plan* defines elk and deer habitat by four broad categories based on vegetative conditions: forage, hiding cover, marginal cover, and satisfactory cover. These categories generally reflect the gradation from early to late successional structural stages. A mosaic of forage and cover areas, and adequate water, is preferred. Definitions of forage, hiding cover, marginal cover, and satisfactory cover follow:

- Forage consists of all woody and non-woody plants that are available to livestock or wildlife as a food source. Browsing refers to foraging on woody plants, typically hardwood shrubs or trees. In general, deer prefer browse forage such as shrubs and forbs while elk prefer forage dominated by grasses.
- Hiding cover, also referred to as security cover, is vegetative cover that hides at least 90 percent of an adult elk at 200 feet. Hiding cover provides a visual barrier between big game animals and potential predators or sources of disturbance, and is chiefly important during hunting season when big game alter their travel patterns to avoid humans. This provides cover for the animals and a higher quality hunting experience for the big game hunters.
- Marginal cover is defined as an area at least 30 acres in size (10 acres in winter range) and 200 yards wide with 40-59 percent forest canopy closure[62]. Marginal cover and satisfactory cover are also sometimes referred to as thermal cover. Deer and elk use this thermal cover to moderate harsh weather conditions. Under thermal cover, animals need to expend less energy for thermal regulation, i.e., to keep cooler on hot days and to keep warmer on cold days. Often, but not always, thermal cover also provides hiding cover.
- Satisfactory cover is defined as an area of the same size as marginal cover but with 60 percent or more forest canopy closure in mixed conifer stands (50% or more in ponderosa pine stands) and at least two canopy layers. Satisfactory cover is considered superior to marginal cover.

Cover comprises 39 percent of the Galena Watershed with 16 percent in satisfactory cover and 23 percent in marginal cover. In the Southeast Galena Analysis area, total cover comprises 53 percent of the area; satisfactory cover and marginal cover comprise 15 percent and 38 percent of the area, respectively. Current cover information was derived from satellite imagery data. Any cover lost to timber harvest or wildfire since the data was collected was reclassified as forage. Appendix Map 22—Big Game Cover—Existing Condition, shows the cover distribution. Cover analysis for the Southeast Galena Analysis area included stands 10 acres and greater. *Land and Resource*

[62] The ground area covered by the crowns of trees or woody vegetation as delimited by the vertical projection of crown perimeters and commonly expressed as a percent of total ground area. *Synonym*-crown cover. *Dictionary of Forestry,* Society of American Foresters 1998

Management Plan standard Number 31 directs that stands of this size can be used in winter range and elsewhere if they are providing effective use by big game. Field reconnaissance suggests that elk and deer are using these stands based on the number of tracks and pellet piles observed. Cover is fairly well distributed throughout the watershed, with the exception of the Summit and Reed Fire areas where cover was reduced to almost nothing in areas that burned intensely. Hiding cover is plentiful, although difficult to quantify. Many stands classified as satisfactory or marginal cover provide hiding or security cover. Even in non-thermal cover stands, small thickets of saplings or seedlings 1 to 2 acres in size can offer security.

Elk and deer numbers appear to be out of balance with forage, particularly in the amount of browse species. Growing conditions for forage plants are less favorable on many sites compared to historical conditions. This is largely a result of fire suppression, which allows conifers to increase and shade out understory grass and shrubs. Also, fire no longer acts as a rejuvenating agent, which invigorates many shrub and grass species and is vital for some species, such as ceanothus. Grazing and browsing pressure by deer, elk and cattle is high. In the Summit and Reed Fire areas, grass seeding immediately after the fire provided good forage for elk, and other vegetation is beginning to emerge, however, forage availability still remains low in many areas, especially in winter. Specific surveys are not available to determine forage quality.

Due to past timber harvest and fragmentation, cover and forage patches are interspersed and distributed across the landscape. Specific movement patterns of animals can only be conjectured, but current vegetative conditions provide north-south and east-west corridors to facilitate daily and seasonal species movements (see Appendix E, Map 20—Wildlife Connectivity—For Action Alternatives). Connectivity is provided in areas where stand density is moderate to high; however, breaks in connective corridors occur in some areas as the result of past timber harvest, fire, insect and disease outbreaks, and natural openings.

Optimum calving and fawning habitat includes a combination of thermal cover, hiding cover, and quality forage located in close proximity to water (USDA, 1979). Habitat is provided primarily within riparian areas where high quality succulent vegetation and water are readily available. Hardwood shrubs, thickets of conifer saplings and seedlings, and down logs provide hiding/security cover. Typically calving and fawning habitat is located in spring/fall range where slopes are usually less than 15%. These gentle sloped areas however are often located on benches surrounded by steep topography (USDA, 1979).

In the analysis area, untreated, riparian areas at mid-elevations probably provide some of the best calving and fawning habitat, at least where open roads have not been constructed directly in the riparian areas. Typically conifer stocking is higher and stand structure more complex than in adjacent upland areas where trees have often been thinned. Although hardwood shrubs are generally in an upward trend, it is suspected that species composition, distribution and vigor are presently lower than potential levels throughout much of the watershed. In some areas, shrubs are old and decadent and not reproducing well. Aspen stands are very limited, in poor condition and continuing to decline. Fire suppression, conifer encroachment, stream channel and floodplain modification along with big game and livestock browsing continue to limit recovery of hardwoods from their historic abundant levels throughout the analysis area. Hardwood vegetation levels could be increased along many stream reaches including: Butte Creek, Caribou Creek, Davis Creek, Deadcow Gulch, Deerhorn Creek, Flat Creek, Granite Boulder Creek, Little Butte Creek, Little Boulder Creek, Murdock Creek, Placer Gulch, Tincup Creek, Vincent Creek, Vinegar Creek and Windlass Creek. The presence of roads in riparian areas may reduce the effectiveness of calving and fawning habitat, not only because roads convert habitat to non-habitat, but also because road traffic during the spring and early summer may disturb animals and their young.

Deer, and especially elk, are quite vulnerable to human disturbance. Scientific research shows that higher open road densities reduce deer and elk habitat effectiveness (Thomas et al 1990). Roads open to motorized traffic allow people easy access to big game habitat. Motor vehicles and associated human activities can stress big game animals, causing them to avoid use of available habitat and unnecessarily expend energy. Researchers have reported decreased use of areas within ½ mile of roads. This can lead to poor distribution of animals within available habitat. Easy access on forest roads also lead to reduced deer and elk escapement during hunting seasons and facilitates illegal taking of game animals. In the Southeast Galena Restoration Analysis area, high open road density may be limiting use of habitat in some areas, particularly at lower elevations in the Tincup/Little Butte and Granite Boulder Subwatersheds. Road closures can be used to reduce access and consequently, reduce the potential for disturbance.

Habitat for elk and deer was probably better prior to settlement by Euro-Americans than today because there were more open stands with native grasses and healthy fires adapted shrubs for forage, plus a good distribution of cover for thermal regulation. More importantly, roads and associated human access were much more limited prior to settlement, and consequently elk and deer were not impacted by human disturbance to the extent that occurs under present conditions. Although, American Indians had some effect on the populations of these animals prior to Euro-American settlement, it is unknown what extent, or degree this effect occurred. Actual numbers of elk on the National Forest may have been lower than the present numbers. This is because elk probably used more of the lower elevation foothills and valleys on what are now, non-National Forest lands. Human development in these bottomlands has pushed more elk up onto National Forest lands. Mule deer were likely more abundant in the mountains. White-tail deer would have used the river bottom and lower slope areas. Wolves were the primary predator before settlement by Euro-Americans. Wolves hunting in packs probably limited population numbers of all wild ungulate species (deer and elk).

Thomas et al. (1988) developed the Habitat Effectiveness Index (HEI) model for estimating elk habitat effectiveness on the landscape. Overall habitat effectiveness (HEcsrf) incorporates four variables or indices: cover quality (HEc), size and spacing of cover (HEs), density of roads traveled by vehicles (HEr), and quality and quantity of forage (HEf). The Malheur *Land and Resource Management Plan* establishes minimum standards for these indices. In addition, the *Land and Resource Management Plan* identifies minimum standards for retention of satisfactory cover (%S), marginal cover (%M), and total cover (%S+M). The LRMP also establishes standards for open road density.

Table 102, Table 103, and Table 104 display existing HEI values, cover percentages and open road densities by subwatershed. Standards are different for summer range and winter range, as well as for the Dixie Butte Wildlife Emphasis Area. *Land and Resource Management Plan* standards are displayed at the beginning of each table. The forage indice (HEf) is only used when evaluating winter range and wildlife emphasis areas.

Table 102 Summer Range—Existing HEI values, cover percentages and open road densities by subwatershed.

Subwatershed	HEc	HEs	HEr	HEsrc (HEI)	%S	%M	Total Cover %	Open Road Density (miles per square mile)
LRMP STANDARD Summer Range	.30	.30	.40	.40	12%	5%	20%	3.2 (1.5)♥
Davis/Placer	.67	.47	.48	.52	17	34	51	2.05
Vinegar	.53	.64	.54	.54	2	40	42	1.84
Vincent	.53	.63	.50	.54	3	38	41	1.64
L.Boulder/Deerhorn	.59	.42	.57	.52	12	52	64	1.21
Tincup/Little Butte	.70	.43	.55	.54	29	42	71	1.42
Butte	.76	.59	.55	.59	23	21	44	1.38
Granite Boulder	.73	.53	.55	.57	23	27	50	1.34

HEI = Habitat Effectiveness Index HEI = $(HEc \times HEs \times HEr)^{1/3}$
HEc = habitat effectiveness derived from the quality of cover
Hes = habitat effectiveness derived from the size and spacing of cover
HEr = habitat effectiveness derived from the density of roads open to vehicular traffic
%S = Satisfactory Cover
%M = Marginal Cover
% Total Cover = %S + %M

♥The *LRMP* standard for open road density in summer range is 3.2 miles per square mile; however, the LRMP Record of Decision directs that managers will strive for an open road density of 1.5 miles per square mile.

In summer range, HEI values exceed *Land and Resource Management Plan* standards in all subwatersheds. Total cover exceeds *Land and Resource Management Plan* standards, as does marginal cover (%M), but satisfactory cover (%S) is below standards in the Vinegar and Vincent Subwatersheds. The Vincent and Vinegar Subwatersheds are at 2% and 3% satisfactory cover respectively, rather than the requisite 12%. All subwatersheds meet the minimum standard for open road density (3.2 miles of open road per square mile), but do not always meet the target level recommended in the *Land and Resource Management Plan* Record of Decision (1.5 miles of open road per square mile). Four of the seven subwatersheds meet this desired target level.

In the Vinegar and Vincent Subwatersheds, the low satisfactory cover values may not be unreasonable. Cover requirements may not always be compatible with Historical Range of Variability (HRV). This conflict is readily apparent in the Dry Forest types dominated by ponderosa pine. Historical conditions and fire return intervals favored large blocks of single story, mature stands with canopy closure too low to support large blocks of satisfactory or marginal cover. Under historical conditions, cover percentages would be inherently low, probably below *Land and Resource Management Plan* standards. Today, cover requirements are being met on many ponderosa pine sites; however, stands are overstocked and at high risk to bark beetle attack and uncharacteristically severe wildfire. Cover levels may not be sustainable under these conditions. Unfortunately, tree thinning, the treatment that most effectively reduces beetle and fire risk, also reduces the effectiveness of a stand as cover.

Table 103 Winter Range —Existing HEI values, cover percentages, and open road densities by subwatershed.

Subwatershed	HEc	HEs	HEr	HEf	HEsrcf (HEI)	%S	%M	Total Cover %	Open Road Density (miles per square mile)
LRMP STANDARD Winter Range	.40	.30	.50	.40	.50	10%	10%	25%	2.2 (1.0) ♥
Davis/Placer	---	---	---	---	---	---	---	---	---
Vinegar	---	---	---	---	---	---	---	---	---
Vincent	---	---	---	---	---	---	---	---	---
L.Boulder/Deerhorn	.56	.75	.68	.50	.62	5	34	39	0.72
Tincup/Little Butte	.58	.63	.30	.50	.48	5	26	31	3.92
Butte	.71	.76	.63	.50	.64	19	26	45	0.90
Granite Boulder	.60	.55	.10	.50	.36	12	44	56	7.00

HEI = Habitat Effectiveness Index HEIcsrf = (HEc x HEs x HEr x HEf)1/4

HEc = habitat effectiveness derived from the quality of cover

Hes = habitat effectiveness derived from the size and spacing of cover

HEr = habitat effectiveness derived from the density of roads open to vehicular traffic

HEf = habitat effectiveness derived from the quantity and quality of forage

%S = Satisfactory Cover

%M = Marginal Cover

% Total Cover = %S + %M

♥The $_{LRMP}$ standard for open road density in winter range is 2.2 miles per square mile; however, the LRMP Record of Decision directs that managers will strive for an open road density of 1.0 mile per square mile.

In winter range, HEI values exceed *Land and Resource Management Plan* standards in all subwatersheds except the Tincup/Little Butte and Granite Boulder Subwatersheds where high road densities resulted in poor HEr values. *Land and Resource Management Plan* standards require 2.2 miles of open road per square mile. The Tincup/Little Butte Subwatershed currently has an open road density of 3.9 miles/square mile and the Granite Boulder Subwatershed has an open road density of 7 miles per square mile. Two of the four subwatersheds meet the road density target level in the *Land and Resource Management Plan* Record of Decision (1.0 mile of open road per square mile).

Total cover exceeds *Land and Resource Management Plan* standards, as does marginal cover (%M), but satisfactory cover (%S) is below standards in the Little Boulder/Deerhorn and Tincup/Little Butte Subwatersheds. Both subwatersheds are at 5% satisfactory cover rather than the requisite 10%. Cover requirements in winter range, as discussed for summer range, are also likely incompatible with HRV. This inherent conflict may be even more relevant in winter range, which is often located in low elevation, Dry Forest types. For example, winter range in the Little Boulder/Deerhorn and Tincup/Little Butte Subwatersheds is predominantly on south facing slopes at lower elevation, and is dominated by these Forest types. The low satisfactory cover values may better reflect historic conditions.

Although forage values meet standards, quality and quantity of forage are difficult to estimate and as stated in Chapter 1, believed to be below potential. Native grasses, forbs, and shrubs, that are adapted to short fire return intervals and the higher sunlight of open, Dry Forest environments, are not as numerous or vigorous as they were in the past. Fire suppression has allowed overstory conifers to increase in numbers, which has to a large extent shaded out this important component of the analysis area's vegetation. Currently, low intensity burns (which occurred historically in the analysis area), no longer stimulate common species such as pine grass, blue wild rye, and bitterbrush, while browsing pressure from both wild and domestic ungulates prevent these plants from regenerating. Elk, for instance, currently have population numbers, which exceed State goals,

and are not in balance with the existing forage of the analysis area. Forage is considered more important in winter range than in summer range.

Table 104 Wildlife Emphasis Area—Existing HEI values, cover percentages and open road densities by subwatershed.

Subwatershed	HEc	HEs	HEr	HEf	HEsrcf (HEI)	%S	%M	Total Cover %	Open Road Density (miles per square mile)
LRMP STANDARD Wildlife Emphasis	.50	.60	.60	.50	.70	20%	20%	40%	1.5
Davis/Placer	.53	.55	1.0	.50	.62	2	24	26	0.00
Vinegar	---	---	---	---	---	---	---	---	---
Vincent	---	---	---	---	---	---	---	---	---
L.Boulder/Deerhorn	.79	.46	1.0	.50	.65	43	30	73	0.00
Tincup/Little Butte	.96	.26	1.0	.50	.59	85	8	93	0.00
Butte	.74	.44	.64	.50	.57	38	43	81	0.84
Granite Boulder	---	---	---	---	---	---	---	---	---

HEI = Habitat Effectiveness Index HEIcsrf = (HEc x HEs x HEr x HEf)1/4

HEc = habitat effectiveness derived from the quality of cover

Hes = habitat effectiveness derived from the size and spacing of cover

HEr = habitat effectiveness derived from the density of roads open to vehicular traffic

HEf = habitat effectiveness derived from the quantity and quality of forage

%S = Satisfactory Cover

%M = Marginal Cover

% Total Cover = %S + %M

In the Dixie Butte Wildlife Emphasis Area, overall HEI values are below standards in all subwatersheds. Large, unfragmented blocks of cover habitat have resulted in high HEc values and low HEs values. As with summer and winter range, the HEI model may not be compatible with managing these landscapes for HRV or for species that require large blocks of unfragmented habitat; rather, the model assumes that an ideal landscape is one fragmented by a checkerboard pattern of cover and forage stands. The Dixie Butte area is in high elevation, Cold and Moist Forests. A natural fire regime of low frequency/high intensity fires allows for the development of large, contiguous blocks of old growth habitat, exactly the condition of the area today. Eventually, stand replacement wildfire may convert large areas to forage habitat. Historically, high HEs values may only have been obtainable following such a large fire disturbance. Although current conditions may not be ideal for deer and elk, they do meet habitat requirements for other wildlife species, such as primary cavity nesters and forest carnivores that require large, contiguous blocks of old-growth habitat. In reality, deer and elk use of the Dixie Butte Wildlife Emphasis Area, is high during the summer due to cooler temperatures and higher stand densities that afford decreased human access and increased big game security.

In the wildlife emphasis area, the Davis/Placer Subwatershed is below total cover requirements with only 26% cover rather than the requisite 40% cover. This can be attributed to the large number of acres around Dixie Butte that are naturally non-forested. This open, steppe habitat consists of grasslands, shrublands and talus fields and is incapable of ever meeting cover requirements. Only 2% of the forested habitat is in satisfactory cover, well below the requisite 20%. This can also be attributed to site conditions. Much of the forested habitat is in subalpine plant associations on east slopes and 60% canopy closure is probably not obtainable on these cold, harsh sites.

The open road density standard for this management area is 1.5 miles per square mile. This standard is met in all subwatersheds. Although overall objectives in wildlife emphasis areas are to

manage for an unroaded condition, some road construction is permitted. Only one open road (Forest Road 2610-759) currently bisects the Dixie Butte Wildlife Emphasis Area. This road is part of a loop access route to Dixie Summit, and is a popular travel route during hunting season. An open road density of 0.84 miles per square mile meets the road density standard.

Table 105 combines the Summer Range, Winter Range and Wildlife Emphasis Values from Table 102, Table 103, and Table 104, providing an all-inclusive way to display and compare existing values.

Table 105 Summer Range, Winter Range and Wildlife Emphasis Area. Existing HEI values, cover percentages and open road densities by subwatershed.

Subwatershed Management Area	HEc	HEs	HEr	HEf	HEsrcf (HEI)	%S	% M	Total Cover %	Open Road Density (miles per square mile)
LRMP STANDARDS									
Summer Range	.30	.30	.40	N/A	.40	12%	5%	20%	3.2 (1.5)♠
Winter Range (4a)	.40	.30	.50	.40	.50	10%	10%	25%	2.2 (1.0)
Wildlife Emphasis (21)	.50	.60	.60	.50	.70	20%	20%	40%	1.5
Davis/Placer									
Summer Range	.67	.47	.48	N/A	.52	17	34	51	2.05
Winter Range (4a)	---	---	---	---	---	---	---	---	---
Wildlife Emphasis (21)	.53	.55	1.0	.50	.62	2	24	26	0.0
Vinegar									
Summer Range	.53	.64	.50	N/A	.54	2	40	42	1.84
Winter Range (4a)	---	---	---	---	---	---	---	---	---
Wildlife Emphasis (21)	---	---	---	---	---	---	---	---	---
Vincent									
Summer Range	.53	.63	.52	N/A	.54	3	38	41	1.64
Winter Range (4a)	---	---	---	---	---	---	---	---	---
Wildlife Emphasis (21)	---	---	---	---	---	---	---	---	---
Little Boulder/Deerhorn									
Summer Range	.59	.42	.57	N/A	.52	12	52	64	1.21
Winter Range (4a)	.56	.75	.68	.50	.62	5	34	39	0.72
Wildlife Emphasis (21)	.79	.46	1.0	.50	.65	43	30	73	0.0
Tincup/Little Butte									
Summer Range	.70	.43	.55	N/A	.54	29	42	71	1.42
Winter Range (4a)	.58	.63	.30	.50	.48	5	26	31	3.92
Wildlife Emphasis (21)	.96	.26	1.0	.50	.59	85	8	93	0.0
Butte									
Summer Range	.76	.59	.55	N/A	.59	23	21	44	1.38
Winter Range (4a)	.71	.76	.63	.50	.64	19	26	45	0.90
Wildlife Emphasis (21)	.74	.44	.64	.50	.57	38	43	81	0.84

Subwatershed Management Area	HEc	HEs	HEr	HEf	HEsrcf (HEI)	%S	% M	Total Cover %	Open Road Density (miles per square mile)
LRMP STANDARDS									
Granite Boulder									
Summer Range	.73	.53	.55	N/A	.57	23	27	50	1.34
Winter Range (4a)	.60	.55	.10	.50	.36	12	44	56	7.00
Wildlife Emphasis (21)	---	---	---	---	---	---	---	---	---

NOTES:

HEI = Habitat Effectiveness Index for summer range HEIcsr = (HEc x HEs x HEr)1/3

HEI = Habitat Effectiveness Index for winter range and wildlife emphasis area HEIcsrf = (HEc x HEs x HEr x HEf)1/4

HEc = habitat effectiveness derived from the quality of cover

Hes = habitat effectiveness derived from the size and spacing of cover

HEr = habitat effectiveness derived from the density of roads open to vehicular traffic

HEf = habitat effectiveness derived from the quantity and quality of forage

%S = Satisfactory Cover %M = Marginal Cover

% Total Cover = %S + %M

♠The LRMP standard for open road density in summer range is 3.2 miles per square mile; however, the LRMP Record of Decision directs that managers will strive for an open road density of 1.5 miles per square mile. In winter range, the standard is 2.2 miles per square miles, but managers will strive for 1.0 mile per square mile.

3.2.6.3—Species of Interest (SOI)

Several wildlife species/groups that are of high public interest but not classified as Threatened, Endangered or Sensitive (TES) species or Management Indicator Species (MIS). Habitat conditions and needs for northern goshawks, blue grouse, and landbirds/neotropical migrant birds are summarized below.

Northern Goshawk *Accipter gentilis*

Northern goshawks are known to use interior forests habitats of mature and old growth. These raptors prefer mature and over mature stands in mixed conifer with overstory ponderosa pine, but need a more open understory or openings for hunting compared to other interior forest raptors. Nests are often within ¼ mile of flowing water (De Stephano, 1992). Goshawk territories vary from 1 to 2 square miles, i.e., 640 acres to 2,560 acres.

Goshawks are not considered a MIS, but there is some concern with habitat loss. *Land and Resource Management Plan* Amendment 2 identifies goshawks as an important indicator for interior late and old structure habitat. The *Land and Resource Management Plan* requires that a 30-acre nest area and 400-acre Post-fledging Area (PFA) be established around all active and historic nest trees.

Primary nesting habitat consists of OFMS cool moist and warm dry mixed conifer stands, often with a dominant presence of large ponderosa pine. Approximately 29,000 acres of potential habitat exists. Of that, 6,400 acres, or 22%, are in OFMS that are preferred by this species. These habitats also function as foraging areas. Secondary nesting habitats, generally young forest multiple story (YFMS) often lacking the large tree component, occurs on 11,850 acres. Additional foraging habitat, consisting primarily of stem exclusion open canopy (SEOC) and understory re-initiation (UR), occurs on 7,260 acres. Total foraging habitat is found on 25,510 acres.

Four nest sites, have been identified in Southeast Galena as supporting reproducing pairs of northern goshawks. A 30-acre nest site and 400-acre PFA have been established around each of the four nest sites. Nest sites may or may not be active in all years. Table 106 identifies the four sites and activity monitoring results.

Table 106 Goshawk Nests/Post-fledging (PFA) area

Post-fledging Area (PFA) Name	Subwatershed	Activity Record
Deerhorn	Little Boulder Creek/Deerhorn 30207	Active in 1993. Inactive in 1994, 1997 and 2000. Nest site not visited in 1998 and 1999. .
Little Boulder	Little Boulder Creek/Deerhorn 30207	Active in 1996 and 1998. Inactive 1997, 1999, and 2000. Adults in area in 1999 and 2000.
Placer Gulch	Davis Creek/Placer Gulch - 30201	Active in 1997 and 1998. Nest tree blown down in 1999. Site inactive in1999 and 2000.
Sulpher	Butte Creek – 30213	Active in 1995, 1996 and 1997. Inactive in 1998, 1999, and 2000.

The Southwestern Guide for managing goshawks (USDA 1992) recommends that PFAs be managed for the following structural stages[63] and percentages: OFMS and YFMS at 60%, SEOC and UR at 20%, SI at 10% and grass/forbs at 10%. All four PFAs generally meet these recommendations, although three out of four PFAs are skewed towards the older structural stages. The Placer Gulch PFA is dominated by YFMS stands rather than OFMS stands.

Blue Grouse Dendragapus obscurus

Blue grouse are listed in the *Land and Resource Management Plan* as a featured species requiring management consideration. Blue grouse inhabit coniferous forests intermixed with grassy or bare, shallow-soiled openings. For winter roosts, they use large mistletoe-infected Douglas-fir trees, typically located near or at the upper 1/3 of the slope (Schroeder 1984). Approximately 1,700 acres are in plant associations and stand structure that could provide winter roost habitat. This is likely a conservative estimate of habitat. Only OFMS, OFSS, and YFMS stands in the Douglas-fir series were considered in the estimate. In actuality, it is likely that many mixed conifer stands in the grand-fir series would also have Douglas-fir as a substantial species component. Classified acres have not been specifically surveyed for potential winter roost trees. *Land and Resource Management Plan* standard 50 directs managers to maintain winter roost habitat.

Land Birds including Neo-Tropical Migrant Birds

A wide variety of land birds, including neo-tropical migrant birds, use habitats available within the analysis area. Habitats include a mixture of conifer forest, hardwood habitats, riparian areas and meadow habitats. Nesting, foraging and cover security needs are generally provided. The abundance of conifer habitats, present in a variety of stand structures and vegetative compositions, provides suitable habitat for most of the conifer habitat dependent species. Exceptions exist for those species that depend upon mature, open park-like ponderosa pine habitats that are severely lacking within the analysis area. White-headed woodpecker, Lewis' woodpecker (both also MIS), flammulated owl and chipping sparrow have likely been affected by decline in this habitat. Those species heavily dependent upon riparian or hardwood habitats such as aspen, cottonwood or willow stands are not adequately provided for due to poor habitat condition and distribution. Species such as the red-naped sapsucker (also MIS), hermit thrush, red-eyed vireo and olive-sided flycatcher are likely affected. Grassland/meadow habitats are also on the decline as conifers continue to encroach into previously non-forested areas.

[63] See Structural stage definitions on page145.

3.2.6.4—Habitat Summary Tables

Table 107 through Table 111 summarize the relationships between the various TES species, MIS and SOI and each Forest type and structural stage (e.g. Dry Forest OFMS). Essentially, forest types and structural stages describe habitat types.

3.2.6.4.1—Dry Forests and Associated Wildlife Species

The Dry Forests are generally less structurally and compositionally diverse than the other forest types. They include two general categories: the *hotter* Dry Forests types and the *warmer* Dry Forest types. Hot Dry Forest types generally include the pure ponderosa pine forest types and ponderosa pine/Douglas-fir mixes. The warm Dry Forest types include the mixed conifer stands with a high component of grand fir. The "climax" structural potential for the warm Dry Forests is both OFSS and OFMS[64]. The OFSS condition, more often associated with the pure ponderosa pine stands, provides important habitat for white-headed woodpeckers, Lewis' woodpeckers, flammulated owls and various other birds and mammals. The OFMS condition, more often associated with the mixed conifer stands, provides important late successional habitat for such species as pileated woodpeckers, pine martens, fishers and goshawks. Table 107 displays the relationships of Dry Forest structural stages to various wildlife species and provides a summary of the current habitat

[64] See structural stage definition, page 145

Table 107 Relationship of Dry Forests to Wildlife Habitats and Existing Condition

Stand Structure	SI	SEOC	SECC	UR	YFMS	OFMS	OFSS
Wildlife Species	**TES**						
Gray Wolf				C	C	C	
Canada Lynx	F♠		F♦♦	F♠	D♦♦ F♦♦	D♠	
California Wolverine				C	C	C	
Pacific Fisher					N♦♦ F♦♦	D♠ F♠	
Gray Flycatcher		N F					N F
Sage Grouse		N F					N F
MIS							
Pileated Woodpecker					N♦♦ F♦♦	N♠ F♠	
Pine Marten					D F	D F	
Three-toed Woodpecker						N F	
White-headed Woodpecker						N♦♦ F♦♦	N♠ F♠
Black-backed Woodpecker						N F	
Lewis' Woodpecker							N F
Williamson's Sapsucker					N F	N F	
Red-naped Woodpecker					N F	N F	
Hairy Woodpecker					N F	N F	
Downy Woodpecker					N F	N F	
Northern Flicker					N F	N F	
Others							
Northern Goshawk		F♦♦			N♦♦ F♠	N♠ F♠	F♠
Acres of Habitat, % Total Habitat and HRV							
Acres of Habitat	1,450	12,180	870	2,030	8,700	3,480	290
% Total Habitat (29,000 ac.)	5%	42%	3%	7%	30%	12%	1%
HRV	(5-15%)	(5-25%)	(5-10%)	(5-10%)	(5-15%)	(5-15%)	(30-55%)

C = Connectivity/Corridor Habitat
D = Denning
F = Foraging
N = Nesting
♠ = Primary Habitat
♦♦ = Secondary Habitat

The Dry Forest type is the most abundant forest type within the analysis area, covering 29,000 acres. OFSS structure is conspicuously absent. Historically, 30-55% of hot dry habits were in OFSS. Today, only 290 acres or 1% of the habitat is OFSS. This raises concern for species such as the white-headed woodpecker and flammulated owl. Primary nesting and foraging habitat, composed of the mature, open park-like ponderosa pine habitats, is not available. Sparse pine

habitats that are transitioning to non-forest may provide habitat for gray flycatcher and sage grouse, at least where sagebrush is a common understory species.

YFMS is in excess of that believed to have occurred historically. Consequently, the Dry Forests may be providing higher levels of habitat for species such as the pileated woodpecker and pine marten then they did historically. Habitat may be degraded, however, due to deficiencies in large snags and downed log habitat. Pileated woodpeckers and pine martens typically demand higher levels of dead wood habitat, and consequently, habitat for these species may be of less value than similar structural stages in the Moist and Cold forest types.

In the Dry Forests, dead wood habitat for primary cavity excavators is deficient. The *Land and Resource Management Plan* specifies that in order to provide habitat for 100 percent potential population levels of primary cavity excavator species, i.e., it is necessary to have a minimum of 2.39 snags per acre >21" dbh, averaged over each 40-acre parcel of forested land. In the Dry Forests, there are probably areas 40 acres in size or larger with very few or no snags, providing habitat for less than 20 percent potential population levels. Past harvest practices and firewood cutting likely removed the majority of the existing snags. Stands are in younger structural stages and consequently deficient in large diameter trees. Because stands are overstocked, individual tree growth is low. Without management is it is unlikely these stands can grow the large diameter trees required to provide a sustained flow of large diameter snags. In Dry Forest areas, population viability for primary cavity excavator species is likely to remain low.

While some corridor habitat is present for the lynx, wolverine and gray wolf, its value as habitat is reduced, due in large part to the poorer cover conditions that naturally occur in the drier, lower productivity plant associations.

3.2.6.4.2—Moist Forests and Associated Wildlife Species

The Moist Forest types have a high degree of structural and compositional diversity, providing habitat for a wide diversity of wildlife species. Their occurrence in the moister, more productive areas makes them capable of providing high quality cover habitat. The "climax" structural potential for these forests is OFMS. This condition provides important late successional habitat for pileated woodpeckers, pine martens, lynx and fishers. The presence of lodgepole pine during early successional stages and in gaps within later successional stages provides lynx foraging habitat and quality hiding cover habitat. Table 108 displays the relationship of the moist structural stages to various wildlife species and provides a summary of the current habitat conditions.

Table 108 Relationship of Moist Forests to Wildlife Habitats and Existing Condition

Stand Structure	SI	SEOC	SECC	UR	YFMS	OFMS	OFSS
Wildlife Species	**TES**						
Gray Wolf				C	C	C	
Canada Lynx	F♠		F♦♦	F♠	D♦♦ F♦♦	D♠	
Wolverine				C	D F	D F	
Pacific Fisher					N♦♦ F♦♦	D F	
MIS							
Pileated Woodpecker					N♦♦ F♦♦	N♠ F♠	
Pine Marten					D F	D F	
Three-toed Woodpecker						N F	
White Headed Woodpecker							NF
Black-backed Woodpecker						N F	
Williamson's Sapsucker					N F	N F	
Red-naped Woodpecker					N F	N F	
Hairy Woodpecker					N F	N F	
Downy Woodpecker					N F	N F	
Northern Flicker					N F	N F	
Others							
Northern Goshawk		F♦♦			N♦♦ F♠	N♠ F♠	F♠
Acres of Habitat % Total Habitat (11,500 ac.) HRV Range	690 6% (10-30%)	690 6% (5-10%)	460 4% (10-20%)	690 6% (10-20%)	4,485 39% (10-20%)	3,910 34% (15-40%)	575 5% (5-15%)

C = Connectivity/Corridor Habitat ♠ = Primary Habitat
D = Denning ♦♦ = Secondary Habitat
F = Foraging
N = Nesting

The Moist Forest types comprise 11,500 acres, and consequently provide a significant habitat community within the analysis area. About 73% of this forest type is in a structural condition that provides nesting and foraging habitat for primary cavity excavators; 34% is in a high quality habitat condition. Snag and down log densities are higher in the Moist Forests than they are in Dry Forests, likely meeting *Land and Resource Management Plan* standards for 100% potential population levels.

The 1994 Reed Fire and 1998 Vincent/Vinegar Windstorm dramatically increased snags and downed logs in localized areas; although most primary cavity excavator species respond favorably to such disturbance events, three-toed and black-backed woodpeckers likely benefited the most.

Denning and foraging habitat is provided for lynx and pine marten. Goshawk nesting and foraging is provided, both in primary and secondary habitat conditions. Connectivity habitat for wolverine, lynx and gray wolf is abundant within this forest type.

3.2.6.4.3—Lodgepole Forests and Associated Wildlife Species

The Lodgepole Pine types are compositionally very simple – being dominated by lodgepole pine—yet structurally diverse providing a range of specialized habitats. The "climax" structural potential for lodgepole pine stands is OFMS. Under natural disturbance regimes, lodgepole forests have a much shorter successional cycle than the Dry, Moist and Cold Forest types, typically succeeding from SI through OFMS in 100 to 140 years versus 200+ years for the other Forest types. Table 109 displays the relationship between the lodgepole pine forest structures and associated wildlife habitats and summarizes existing conditions.

Table 109 — Relationship of Lodgepole Pine Forests to Wildlife Habitats and Existing Condition

Stand Structure / Species	SI	SEOC	SECC	UR	YFMS	OFMS	OFSS
TES							
Gray Wolf				C	C	C	
Canada Lynx	F♠		F♠	F♦♦	D♦♦ F♦♦	D♠	
Wolverine				C	D F	D F	
Pacific Fisher					N♦♦ F♦♦	D♠ F♠	
MIS							
Pine Marten					N♦♦ F♦♦	D♠ F♠	
Three-toed Woodpecker						N F	
Black-backed Woodpecker				F	N F	N F	
Acres of Habitat: % Total Habitat (1,100 ac.) HRV Range:	0 0% (5-30%)	30 3% (5-10%)	195 18% (5-50%)	260 24% (5-15%)	435 39% (5-15%)	180 16% (5-15%)	0 0% (5-10%)

C = Connectivity/Corridor Habitat ♠ = Primary Habitat
D = Denning ♦♦ = Secondary Habitat
F = Foraging
N = Nesting

The lodgepole pine habitats are one of the least abundant habitats, comprising only 1,100 acres of the analysis area. These habitats, however, are of particular importance to four species. Lynx use these habitats extensively for their foraging needs, particularly the SI and UR structural stages, but also the SEOC and SECC stages. Eventually, Stem Exclusion stands(SEOC and SECC) deteriorate due to mountain pine beetle attack. Trees killed by beetles eventually fall, and create a layer of jackstrawed logs. Overstory canopies are opened up, permitting regeneration of a second, and

eventually third, canopy layer of young lodgepole pine. OFMS and YFMS stands have the best potential to provide denning habitat; jackstrawed trees killed by mountain pine beetle provide denning structures and understory lodgepole have grown in, increasing canopy closure. Pine marten and fisher will also use these late structural stages; complex lower stand structures provide resting sites, subnivean (below snow) access for winter foraging, and cover from predators. Three-toed and black-backed woodpeckers prefer OFMS and YFMS as nesting and foraging habitat. Currently 55% of these lodgepole pine stands are in the OFMS and YFMS structural stages, well over the 10%-30% range believed to have occurred historically.

3.2.6.4.4—Cold Forests and Associated Wildlife Species

Cold Forest types are similar to Moist Forest types in that they typically have a high degree of structural and compositional diversity. High productive sites provide high quality cover habitat similar to those found in the Moist Forest types. At the highest elevations, however, site productivity is usually reduced. Stands cannot support the large diameter trees and canopy covers that lower elevations support. Stands become more fragmented, occurring in a mixture of forested areas and open alpine meadows. The “climax” structural potential for Cold Forests is OFMS. This condition, at least on the higher productive sites, provides important late successional habitat for pileated woodpecker, pine marten, fisher, lynx and wolverine. The presence of lodgepole pine during early successional stages and in gaps with later successional stages provides lynx foraging habitat and quality hiding cover habitat. Table 110 displays the relationship of the moist structural stages to various wildlife species and provides a summary of the current habitat conditions.

Table 110 Relationship of Cold Forests to Wildlife Habitats and Existing Condition

Species	SI	SEOC	SECC	UR	YFMS	OFMS	OFSS
TES							
Gray Wolf				C	C	C	
Canada Lynx	F♠		F♦♦	F♠	D♦♦ F♦♦	D♠	
Wolverine				C	D F	D F	
Pacific Fisher					N♦♦ F♦♦	D♠ F♠	
MIS							
Pileated Woodpecker					N♦♦ F♦♦	N♠ F♠	
Pine Marten					D F	D F	
Three-toed Woodpecker						N F	
Black-backed Woodpecker						N F	
Lewis' Woodpecker						N F	
Williamson's Sapsucker					N F	N F	
Red-naped Woodpecker					N F	N F	
Hairy Woodpecker					N F	N F	
Downy Woodpecker					N F	N F	
Northern Flicker					N F	N F	
Acres of Habitat: % Total Habitat (2,000 ac.) HRV Range:	0 0% (20-25%)	320 16% (5-10%)	180 9% (5-20%)	0 0% (5-10%)	1,140 57% (20-30%)	360 18% (15-25%)	0 0% (5-10%)

C = Connectivity/Corridor Habitat ♠ = Primary Habitat
D = Denning ♦♦ = Secondary Habitat
F = Foraging
N = Nesting

The Cold Forest habitats are one of the least abundant habitats, comprising only 2,000 acres of the analysis area. In Southeast Galena, these habitats are primarily located in the Dixie Butte Wildlife Emphasis Area and Vinegar Hill-Indian Rock Scenic Area, areas that are less developed and consequently, receive fewer disturbances. Wolverines are particularly sensitive to disturbance and may be using these areas. OFMS and YFMS provide denning and foraging opportunities for wolverine, lynx, fisher and marten. Snag and down log densities are higher in Cold Forests than they are in Dry Forests at lower elevations. OFMS and YFMS habitat provide nesting and foraging habitat for primary cavity excavators. Eighteen percent of the habitat is in a high quality condition. Corridor habitat for wolverine, lynx, fisher, marten and gray wolf is abundant within these forest types. YFMS appears elevated at 57%, while SI is deficient at 0%. This can probably be attributed

to the absence of any recent major disturbance such as wildfire. When structural stages are viewed across the entire Galena Watershed, however, structural stage distribution matches HRV (Malheur National Forest 1999). The Summit Fire converted a large portion of the watershed to SI. Consequently, a deficiency in SI habitat in Southeast Galena is probably not critical to any species.

3.2.6.4.5—Unique and Sensitive Habitats: Non-Forested Areas, Hardwoods, and Juniper Woodlands

A variety of unique and sensitive habitats (springs, seeps, wallows, wet and dry meadows, sagebrush fields, aspen stands, mountain mahogany patches, rock outcrops, talus slopes and juniper woodlands) exist across the analysis area. These diverse and widely distributed vegetation types provide a variety of specialized habitats. Locations of the larger habitat areas are generally well documented. Locations of the smaller habitat areas, such as springs and seeps, are not always well documented. Habitat conditions are often unknown.

Table 111 displays the relationship between these various vegetation types and associated wildlife habitats.

Table 111 Relationship of Non-Forested Areas, Hardwoods, and Juniper Woodlands to Wildlife Habitats and Existing Condition

Species	Non-Forested Habitats (Moist)	Non-Forested Habitats (Dry)	Young Hardwood Habitats	Mature Hardwood Habitats	Juniper Woodlands
TES					
Canada Lynx			F♠	F♦♦	
Sandhill Crane	N F				
Long-billed curlew	N F				
Gray Flycatcher		N F			N F
Bobolink	N F	N F			
Sage Grouse		N F			N F
MIS					
Lewis' Woodpecker			F	N F	
Williamson's Sapsucker			F	N F	
Red-naped Woodpecker			F	N F	
Downy Woodpecker			F	N F	
Acres of Habitat: % Total Habitat (ac.)	860 15%	3,475 60%	0 0%	28 <1%	1,400 24%

C = Connectivity/Corridor Habitat ♠ = Primary Habitat
D = Denning ♦♦ = Secondary Habitat
F = Foraging
N = Nesting

Timber harvest, grazing, fire suppression, road construction, recreation development, mining and natural events such as fire and drought, have impacted many of these habitats to one degree or another. Approximately 860 acres of wet meadow is available for sandhill cranes and long-billed curlews. Only the open areas along the Middle Fork John Day River (610 acres) likely have habitat that will support these species, and most of this habitat is on private land. Other wet meadows are generally smaller in size, probably limiting the use by cranes and curlews. Sage grouse may occupy sagebrush habitats and juniper/sagebrush habitats, but these habitats are rather limited compared to large expanses on the southern, drier end of the Malheur National Forest. Habitat for gray flycatchers often overlaps with habitat for sage grouse. Hardwoods trees are very limited, including 28 acres of mature aspen and scattered cottonwood along the Middle Fork John Day River and its tributaries. Regeneration of these species is poor. Hardwood habitats are of particular importance

to the Lewis' woodpecker and the sapsucker species. The deficiency in this habitat is likely adversely impacting populations of these species within the analysis area.

3.2.6.4.6—Culturally Significant Plants

While Southeast Galena Analysis area may not be an area of concentrated plant use by nearby tribes, several culturally significant plant species occur in small populations. Big huckleberry (*Vaccinium membranaceum*) is the most common. Fire suppression, dense canopy cover in overstocked conifer stands, and intensive browse levels currently combine to limit the extent of productive huckleberry patches.

Chokecherries (*Prunus virginiana*) are not widespread, but at least one productive population along the river offers fruit sources, and has yielded seed for future replanting efforts throughout the watershed. Most plants occur along smaller streams and primarily where rock outcrops or steep terrain limit browsing access by deer, elk and cattle, but many of these plants are not large enough to produce fruit.

Plants such as onions (*Allium species*), biscuitroot (*Lomatium species*), yampah (*Perideridia species*), and bitterroot (*Lewisia redeviva*), are found on open scab flats. Bitterroot tends to prefer dry, rocky sites with little soil, and is the least common, probably because its preferred habitat is uncommon. While most are not highly palatable to deer, elk and cattle, all these root crops can suffer from overuse of scablands when large numbers of animals trample saturated soils and displace the roots. This effect tends to occur early in the growing season when vernal moisture is still present on many scabs.

*(See also **1.2.1.6 Undesired Condition: Degraded Wildlife** Habitat, page 18 **ISSUE 1.4.7—Blow down in Vincent/Vinegar** RHCAs, page 32; **ISSUE 1.4.8—Effects of Toxic Chemicals**, page 32;**ISSUE 1.4.9—Inadequate Amount of Treatment**, page 33;**ISSUE 1.4.10—Insufficient Pileated Woodpecker Habitat**, page 33; **ISSUE 1.4.11—Effects on Connectivity for** Wildlife, page 34; and **ISSUE 1.4.12—Effects of Managing Roadless** Areas, page 34.)*

3.2.7—NOXIOUS WEEDS

Approximately 65 acres of noxious weeds (including 15 different species) have been inventoried within the watershed, and will be treated manually, biologically, or chemically under the forest Weed EA. Recently discovered sites within the analysis area cover a total of 1.9 acres at 10 sites. Two species of knapweed are the most aggressive and the most likely to spread rapidly on newly disturbed ground as their seeds are carried easily on the wind. Canada thistle is the most common and widespread, and tends to be associated with riparian habitats. All other species are present in very small patches, and are most often associated with road right-of-ways and other disturbed sites such as log landings and skid trails. Three infested sites are in rock quarries from which road surfacing materials may be spread throughout the project. These sites are of particular concern as potential sources of seed dissemination.

Table 112 Noxious Weed Species Present.

Species	Common Name
Carduus nutans	musk thistle
Centaurea diffusa	diffuse knapweed
Centaurea maculosa	spotted knapweed
Centaurea solstitialis	yellow starthistle
Cirsium arvense	Canada thistle
Euphorbia esula	leafy spurge
Hypericum perforatum	St. Johnswort/ goatweed
Linaria dalmatica	Dalmatian toadflax
Linaria vulgare	yellow toadflax
Senecio jacobaea	tansy ragwort

All ground-disturbing activities such as trail construction, road construction, logging, grazing, and fire line construction for prescribed burning and wildfires can create soil and habitat disruptions that encourage invasion by noxious species. These actions are amenable to mitigation in the form of seeding with native or non-persistent, non-native plant species to provide rapid competition that will exclude noxious weed establishment. However, such preventive measures are not absolute, and some new infestations will appear, especially if the disturbance is widespread. Open ground is most susceptible to invasion by exotics for 2 to 3 years, or until plant cover is well re-established. The possibility of eradicating an infestation decreases rapidly with each year that seed is allowed to set, and the cost of doing so increases proportionately.

Of particular concern in this project are the “roadless” acres. Because they currently receive little impact besides grazing, opportunities for weeds to spread are limited. Surveys from 2000 indicate there are only a few known populations of noxious weeds within the roadless area, and these are primarily around the perimeter. However, without roads for easy entry, recommended ground and vegetation disturbing activities may create new infestations that are difficult to find, as well as to access for eradication treatments.

It should be recognized that infestation by noxious weeds does not necessarily follow the creation of newly disturbed seedbeds. Many early seral species will revegetate freshly disturbed soils, some of them weedy, but few of them designated as “noxious.” But the very invasive nature of noxious species means they are likely to spread quickly once established. At this point in time, the MFJD watershed has relatively few and small populations of noxious weeds, and the object of treating them is to maintain, or preferably improve on, that status in order to minimize seed sources from which the weeds can spread.

*(See also **1.2.1.7 Undesired Condition: Noxious Weeds** are Present, page 20; **ISSUE 1.4.8—Effects of Toxic Chemicals**, page 32; **4.3.8—**, page 365)*

3.3.0 ROADLESS CHARACTER

Portions of two Malheur *Land and Resource Management Plan* inventoried roadless areas[65] are located within the analysis area: The Dixie Butte roadless area comprises about 7,865 acres on the south side of the analysis area and the Greenhorn Mountain roadless area comprises about 6,519 acres on the north side of the analysis area. The *Land and Resource Management Plan* allocated acres in the Dixie Butte and Greenhorn Mountain roadless areas to several management areas MA 1 and 2-General Forest/Rangeland, MA 21-Wildlife Emphasis Area with Non-Scheduled Timber Harvest, MA 14-Visual Corridors, and MA 13-Old Growth (see 1.5.2 Planning Documents, page 36, also see, Appendix E, Map 3—Management Areas and Roadless Areas). The two roadless areas are described in this Chapter are based on nine roadless characteristics defined in CFR 36 CFR 294.11. The nine characteristics are:

1. High quality or undisturbed soil, water, and air
2. Sources of public drinking water
3. Diversity of plant and animal communities
4. Habitat for threatened, endangered, recommended , candidate, and sensitive species (TES) and for those species dependent on large, undisturbed areas of land
5. Primitive, semi-primitive non-motorized and semi-primitive motorized classes of dispersed recreation
6. Reference landscapes
7. Natural appearing landscapes with high scenic quality
8. Traditional cultural properties and sacred sites
9. Other locally identified unique characteristics

3.3.1—Dixie Butte Roadless Area

The Dixie Butte roadless area is located in the southern portion of the analysis area; the roadless area extends beyond this analysis area's boundaries. It consists of Dixie Butte (elevation 7,592 feet) and surrounding drainage tributaries to the Middle Fork of the John Day River and the main stem John Day River. Dixie Butte is a prominent landmark above surrounding forested areas. Side slopes are steep at higher elevations and bench-like at lower elevations. About 94 % of the area is forested. About 65% of the roadless area falls within the analysis area.

Characteristic 1—*High Quality Resources*

Resources have been somewhat degraded. Impacts from historic railroad logging, truck logging, mining, and sheep grazing are still visible.

Logging primarily occurred in the lower elevation Dry and Moist Forests where about 30% of the roadless area has been altered. Most of the overstory pine and western larch were removed. Fire suppression has allowed grand fir and Douglas-fir to increase, shifting the species composition on these once predominant pine sites. Tree stocking is high. Vegetation is considered outside the

[65] See this document Appendix M, Map___). See also "Roadless Area Descriptions and Disposition," in the Malheur National Forest *Land and Resource Management Plan*, Appendices FEIS, Appendix C, Dixie Butte roadless area C-32; and Greenhorn Mountain roadless area C-72)

Historic Range of Variation (HRV). The fire regime is no longer one of high frequency/low intensity fires. Some of the logging railroad grades and roads are grown over and slowly healing.

Generally, the upper elevation Cold and Moist Forest types have not been managed or logged with the only alterations coming from livetsock grazing and fire suppression. These activities allowed tree stocking to increase and fuels or slash to accumulate. Despite these alterations, vegetation conditions close to the HRV. These areas still support the high intensity/low frequency fire regimes expected in these Forest types.

Water resources have been impacted by old railroad access, sheep grazing, mining, and irrigation ditch lines which altered water flows.

Characteristic 2—*Public Drinking Source*

The Dixie Butte roadless area does not serve as a public drinking source.

Characteristic 3—*Plant/Animal Diversity*

The tree vegetation is diverse due to elevation and soil type change. The area includes all Forest Types (Cold, Moist, Lodgepole, and Dry Forest types). Cold Forest types are located on the upper slopes of Dixie Butte and include subalpine fir, Engelmann spruce, and white bark pine. Moist Forest types are located in the mid-elevations and are primarily composed of grand fir, western white pine, Douglas-fir, western larch, lodgepole pine, and Engelmann spruce. Lodgepole types are generally small and scattered. Dry Forest types occupy the lower elevations and are dominated by ponderosa pine, Douglas-fir, grand fir, and western larch.

Western white pine has a much narrower distribution than other conifer species, and is naturally absent from much of the Malheur National Forest. White pine growing in the Dixie Butte area is considered to be at the edge of its range. White pine has decreased in abundance. Bark beetles and white pine blister rust are killing mature trees. Dense stands resulting from fire exclusion limit regeneration; white pine regenerates well after a fire, which opens up the forest canopy allowing germination and regeneration.

Understory vegetation includes grasses, forbs, and shrubs, but species diversity is relatively low. A sagebrush area near the top of Dixie Butte is unique to the Dixie area, however, as you travel down the Middle Fork of the John Day River, sagebrush becomes more prevalent.

The diversity of Forest types and natural openings creates a diversity of habitat types. The area supports a variety of Threatened, Endangered and Sensitive Species (TES), Management Indicator Species (MIS) and Species of Interest (SOI) (see 3.2.6 Wildlife Habitat, beginning on page 165, for a list wildlife species and the management categories that apply respectively to theses animals). The area also supports a variety of other terrestrial species including cougar, black bear, bobcat, and other small game mammals.

Much of the roadless area is in the Dixie Butte Wildlife Emphasis Area, as designated by the *Land and Resource Management Plan*. The roadless area contains three Dedicated Old Growth Areas (DOGs) and one northern goshawk Post-Fledging Area (PFA). The area provides summer and winter range for mule deer and Rocky mountain elk.

Wildlife diversity is likely lower than occurred historically. The Dry and Moist Forests are outside of HRV as described under Characteristic 1. Old Forest Single Strata (OFSS) is deficient and well below historic levels due to management activities. This has likely reduced populations of species that prefer open park-like stands of large ponderosa pine. Species such as the white-headed woodpecker, Lewis' woodpecker, flammulated owl, and chipping sparrow have likely seen population decreases.

A number of drainages supporting fish populations have their headwaters in the Dixie Butte roadless area. The Butte, Little Butte, Deerhorn, and Davis Creeks flow north into the Middle Fork of the John

Day River and provide spawning and rearing habitat for steelhead and redband trout. Some of the streams provide rearing habitat for Chinook salmon.

Characteristic 4—*Large, Undisturbed blocks of TEPCS (Wildlife Habitat)*

The area includes habitat for Threatened, Endangered and Sensitive (TES) species, particularly those species dependant on large, undisturbed areas of forest. Habitat has the potential to support such species as gray wolf, Canada lynx, California wolverine, and Pacific fisher. Currently, California wolverine is likely the only one of these TES species to inhabit the area. The area lies within the Southeast Galena Lynx Analysis Unit (LAU), and includes denning and foraging habitat that could support Canada lynx.

The upper elevation Moist and Cold Forests contain large contiguous blocks of old forest multi-strata (OFMS) with few roads. This area represents the historic, or near historic vegetation and fire regime for these Forest types. These Forest types also contain the best habitat for the TES species listed previously. Although the lower elevation Dry and Moist Forests have been altered from past activities, stand structure and canopy closure is now somewhat homogeneous due to overstocking and tree species conversion.

The area contains habitat for TES fish species as described under Characteristic 3. Area streams support steelhead, redband trout and Chinook salmon.

No TES plants have been identified.

Characteristic 5—*Dispersed Recreation*

There are about 7,865 acres of Dixie Butte Roadless Area within the Southeast Galena analysis area. Of that acreage, 71% is semi-primitive motorized, 27% is roaded natural, and 2% is roaded modified. The Davis Creek Trail, which permits motorized travel, bisects the roadless area. Current recreational uses include hiking, cross-country skiing, snowmobile riding, hunting, prospecting, camping, and sightseeing. Area streams provide opportunities for resident trout fishing.

Characteristic 6—*Reference Landscapes*

The higher elevations Cold Forest and Moist Forest types represent what may have been historic conditions in these Forest types, and therefore may provide a reference landscape. The Dry Forest types and the lower elevation Moist Forest types have been sufficiently altered that they no longer provide a reference landscape. The most noticeable impacts are from timber harvest, unimproved roads, livestock grazing, and mineral development.

Characteristic 7—*Natural Appearing, Scenic Landscape:*

From a distance, the Dixie Butte area appears to have an unaltered, high scenic quality condition. The upper elevation Cold and Moist Forest types support a fairly natural appearing landscape. In the low elevation Dry and Moist Forest types, management activities are apparent as described in Characteristic 1, particularly when viewed close up or while walking through the area.

Characteristic 8—*Traditional Cultural Properties and Sacred Sites*:

There are no known or recorded properties or sites at this time.

Characteristic 9—*Other*

An area near the summit of Dixie Butte is being considered as a Resource Natural Area.

In MA 1 and 2-General Forest/Rangeland: Managing for timber production and other multiple use is permitted on a sustained yield basis (MA 1) and managing for livestock forage production and other multiple use is permitted on a sustained yield basis (MA 2). Dry forest types and low elevation Moist Forest types are outside HRV exhibiting high hazards that tend toward the likelihood of uncharacteristically severe wildfire occurring in these areas (see .

3.3.2—Greenhorn Mountain Roadless Area

The Greenhorn Mountain roadless area is located in the northern portion of the analysis area. This roadless area is located on both the Malheur and Umatilla National Forests and in both Grant and Baker Counties. The roadless area extends along the divide between the Middle and North Forks of the John Day River, where glacially carved granite meets Columbia Basalt formations. About 87 % of the area is forested.

Most of the area is on or near ridge tops and is comprised of an undulating terrain of forested areas and alpine meadows. Below these ridge tops, however are sharp breaks in the terrain, particularly to the north, with dramatic, sharp rock cliffs dropping away to steep drainages below. Generally, the area is south facing and tends to be a drier environment.

The Greenhorn Mountain Roadless Area is technically a roadless area; however it is bisected by Forest Road 2010 and old mining access roads. This road accesses the Vinegar/Indian Rock Scenic Area and Vinegar Hill. About 40% of the roadless area falls within the analysis area.

Characteristic 1—*High Quality Resources*

Historic railroad logging, truck logging, mining, sheep grazing, and recreation use have altered resources.

Logging has been relatively light. A minor amount of railroad logging and truck logging occurred along the edges of the roadless area, primarily in the Dry Forest types. Dry Forest types and their expected fire regime are outside HRV as described for the Dixie Butte roadless area, Characteristic 1. The remainder of the forested area is relatively untouched by timber harvest. Generally, the upper elevation Cold and Moist Forest types have not been managed or logged with the only alterations coming from sheep grazing and fire suppression. These activities allowed tree stocking to increase and fuels or slash to accumulate. Despite these alterations, vegetation conditions remain relatively similar to historic conditions. These areas still support the high intensity/low frequency fire regimes expected in these Forest types.

The greatest impact to the Greenhorn roadless area occurred from past mining development and associated access roads; there is some evidence of seepage coming from some of the old mining locations. Grazing, in particular past sheep grazing, has affected the higher elevation areas, partially denuding these areas of ground vegetation and compacting the soils. Sheep grazing ended in the 1940's. Although ATV use is considered prohibited, there is some evidence of current use. Many of these activities are limited to small, localized areas with the roadless area.

Characteristic 2—Public Drinking Source

The Greenhorn Mountain roadless area does not serve as a public drinking source.

Characteristic 3—Plant/Animal Diversity

The tree vegetation is diverse due to elevation and soil type change. The area includes all Forest types (Dry, Moist, Lodgepole, and Cold Forest types); however, the Dry Forest type is fairly limited because so much of the area is at the higher elevations. Generally, tree species are as described for the Dixie Butte roadless area, Characteristic 1, although the Greenhorn area supports far more Engelmann spruce and very little western white pine. Spruce bogs are scattered. Forest stands along both sides of the ridge dividing Little Boulder Creek and Windlass Creek are in poor condition due to spruce budworm defoliation, fir engraver, and root rot resulting in heavy fuel accumulations making for a very high fire risk.

Understory vegetation includes grasses, forbs, and shrubs; species include alpine sagebrush, alpine fescue, pine grass, elk sedge and huckleberry.

Soil types include serpentine and granite soils. Some soil types found in Greenhorn limit plant life.

The diversity of Forest types and natural openings creates a diversity of habitat types. The area supports a diversity of Threatened, Endangered and Sensitive Species (TES), Management Indicator Species (MIS) and Species of Interest (SOI) See 3.2.6 Wildlife Habitat for a list of wildlife species beginning on page 165. The area also supports a variety of other terrestrial species including cougar, black bear, bobcat, and other small game mammals. The unique alpine habitat provides an opportunity to view uncommon bird life such as pine grosbeaks and northern three-toed woodpeckers.

The roadless area contains five dedicated old growth areas (DOGs) and one northern goshawk post-fledging area (PFA). The area provides summer range, and a small amount of winter range, for mule deer and Rocky mountain elk.

A number of drainages with headwaters in the Greenhorn roadless area contain fish populations. The Vinegar, Little Boulder, and Granite Boulder Creeks flow south into the Middle Fork of the John Day River and provide spawning and rearing habitat for steelhead and redband trout. Some of the streams provide rearing habitat for Chinook salmon. Granite Boulder Creek provides spawning and rearing habitat for bull trout.

Characteristic 4—*Large, Undisturbed blocks of TES (Wildlife Habitat)*

The area includes habitat for Threatened, Endangered and Sensitive (TES) species, particularly those species dependant on large, undisturbed areas of forest. Habitat has the potential to support such species as gray wolf, Canada lynx, California wolverine, and Pacific fisher. Currently, California wolverine is likely the only one of these TES species to inhabit the area. The area lies within the Southeast Galena Lynx Analysis Unit (LAU), and includes denning and foraging habitat that could support Canada lynx. A Key Linkage Area (KLA) for large, wide-ranging carnivores is recommended through the roadless area.

The upper elevation Moist and Cold Forests contain large contiguous blocks of old forest multi-strata (OFMS) with few roads. This area represents the historic, or near historic vegetation and fire regime for these Forest types. These Forest types also contain the best habitat for the TES species listed previously.

Drainages with headwaters in Greenhorn contain populations and habitat for TES fish including steelhead, redband trout, Chinook salmon, and bull trout as described under Characteristic 3.

There are some sensitive plants primarily associated with riparian areas in the headwaters areas. Greenhorn has plenty of potential habitats for sensitive plants, but all sites are likely not identified.

Characteristic 5—*Dispersed Recreation*

About 6,519 acres of the Greenhorn Roadless Area are located within the analysis area. Of that acreage, 66% is semi-primitive motorized/semi-primitive non-motorized, 32% is roaded natural, and 2% is roaded modified. Trails include the Princess, Black Eye, and Tempest Mine trails. Current uses include hiking, cross-country skiing, snowmobile riding, hunting, prospecting, camping and sightseeing. Area streams provide opportunities for resident trout fishing.

Characteristic 6—*Reference Landscapes*

The higher elevation Cold Forest and Moist Forest types, alpine meadow systems, and serpentine areas are potential reference landscapes. Generally, past management activities identified in Characteristic 1 are limited to small, localized areas within the roadless area.

Characteristic 7—Natural Appearing, Scenic Landscape:

The area shows some evidence of human use and activities, but this remains substantially unnoticeable. Overall, the area remains a large, relatively unspoiled tract of land. The most intrusive impacts would be the unimproved roads and mining activity.

***Characteristic* 8—*Traditional Cultural Properties and Sacred Sites*:**
There are no known or recorded properties or sites at this time.

Characteristic 9—*Other*
The Vinegar Hill/Indian Rock Scenic provides high scenic values and recreation opportunities. No other unique features exist.

3.4.0—Human Use

3.4.1 History of the Analysis Area

Human activity and natural resource use in the Galena watershed has probably been occurring for at least the last 10,000 years. Prior to Euro-American settlement, people utilizing the watershed were engaged strictly in a hunting and gathering economy. Ethnographically, the primary occupants of the watershed were the Northern Paiute who wintered near Prairie City and Canyon City; although tribes from the Columbia Plateau such as the Umatilla, Tenino, Cayuse, Walla Walla, and Nez Perce also periodically visited the area.

The introduction of Euro-Americans occurred in the mid 1820s as fur trappers and explorers moved through the region. The discovery of gold near Canyon City in 1862 brought a heavy influx of miners and settlers to the John Day basin during the 1860s. Subsequent historic activities in the watershed included homesteading, ranching, railroad logging, and early Forest Service administration.

Evidence of these activities is in the form of archaeological sites that have been documented in the watershed since 1980. These properties include sites that have been evaluated as eligible for the National Register of Historic Places (NRHP) or potentially eligible (and require further evaluation for conclusive determination).

Over one hundred years of land and resource use in the analysis area, in the form of placer mining for gold, railroad logging, grazing of large herds of sheep and cattle and fire exclusion policy has altered the character of the analysis area. In more recent decades, timber management, camping, hiking, fishing, hunting, antler and mushroom gathering, firewood and other wood products, collecting, grazing, and permitted special uses have steadily risen as public interest in them increases.

Mining

Settlement of the Galena watershed began in 1864 with the discovery of placer gold near Elk Creek (Rossiter 1871). In the analysis area, miners used a method of large-scale placer mining called simply '*Hydraulic*,' a term made-up at the time of its use, this method of hydraulic mining was used widely across the Blue Mountains and in the analysis area. This method consisted of systems of flumes and ditches constructed to carry water from the upper reaches of the area streams in a manner that allowed water to be directed by gravity, and fall at a tremendous rate of speed. Then under great pressure was the water was directed from the flumes into a nozzle, called a '*monitor*,' or sometimes called a "*Giant,*" then a high pressure stream of water was used to literally wash away all potential gold-bearing gravels (Watkins, 1971). The result was that much of the soil was washed downstream leaving heavily altered landscapes with deep gullies, washed-out stream banks, and rock piles in streams. Past mining activities of this type have heavily impacted the configuration of many streams and the vegetation composition of stream "edge," within the analysis area.

The major focus of mining remained on the various forms of placer mining until the transcontinental railroad connected with Baker City in 1886 (Lindgren 1901). The improved transportation sparked a hard rock mining boom throughout the Blue Mountains as it suddenly became economically feasible to ship lower grade ores to smelters in Tacoma and San Francisco. The largest hard rock, or lode,

mining operation in the Southeast Galena Analysis area was the *Morning Mine* in the Vinegar Creek drainage. The *Morning Mine* consisted of more than 1200 feet of underground workings and at least one cabin, a blacksmith shop, and a stamp mill on a group of eight claims (ODGMI Bulletin 39, 1948). The *Morning Mine* was located in 1898 and was sporadically active until the government ordered a halt to all gold mining in 1942.Threr were a number of other mines, primarily located in the Vinegar Creek and Blue Gulch drainages. In the late 1890s, a stamp mill was installed at Psyche Butte to process ore taken from mines in the Greenhorn area. In 1933, the *Timms Dredge* began working the gravel of the Middle Fork near Galena, where it stayed until 1939. The dredge was moved to the Dewitt Ranch in the fall of 1939 where it operated until the World War II mining moratorium. The *Timms Dredge* processed about 2500 yards of gravel a day and employed 20 men (ODGMI Bulletin 14-B, 1941). The Lemmon cabin in the Granite Boulder Creek subwatershed is an example of a mining residence and smaller scale mining activity in the 1920s. The cabin was built in the mid 1920s by Ira J. Lemmon to work a gold claim.

Historic mining activity has straightened channels in some stream segments that formerly had a natural tendency to meander through the watershed. This historic activity also reduced the presence of large log barriers, which acted to keep water moving more slowly through the landscape of the watershed. These past effects created low sinuosity (the lack of a natural meandering nature with a slower movement of water off the landscape) and low levels of woody debris. This change has been a contributing factor to cause water to move off the landscape more rapidly than it once did, prior to Euro-American settlement. This mining activity of the past has reduced available water for late seasonal flows, reducing water table recharge, and has caused a reduction in riparian shade as well. Late summer and early fall movement of both wildlife and fish depend upon the availability of water during these critical months. This lack of a meandering nature (or sinuosity), pool frequency, and bank vegetation has resulted in higher water temperatures and fewer cool havens during hot weather, that in turn result in diminished hiding cover from predators for both wildlife and fish. Bull trout populations that were present across the analysis area, in many of the streams are present now only in the coldest of analysis area streams (see Analysis Area Stream Overview, page 131).

Past mining activities have located many significant mineral deposits, however mining and exploring for locatable mineral resources does continue in the AnalysisArea. “Locatable mineral deposits on public domain lands may be prospected for and extracted under the 1872 mining law, as amended and supplemented,” (Appendix F, LRMP). All mining activities are subject to applicable laws. There are active claims in the project area that could become active in the future. Recreational mining (gold panning) continues through the present day.

Logging

The Sumpter Valley Railroad reached the town of Austin in 1905 (Ferrell 1967). The Oregon Lumber Company (OLC) constructed narrow gauge railway from the town of Bates down the Middle Fork of the John Day River toward the mining towns of Susanville and Galena in 1916. The OLC spurs in the project area were used between 1917 and 1947, (see Appendix E Map 4—Historic Railroad Logging) and during this period harvest removed most of the large diameter ponderosa pine, western larch, and Douglas fir trees as well as snags. Past logging within Riparian Habitat Conservation Areas (RHCAs) reduced canopy cover within these important areas, resulting in less shade over streams. Railroad logging gave way to subsequent increases in road construction and road use associated with harvest, affecting streams within the project area (see 1.2.1 Undesired condition, page 11). Additionally, road segments constructed only for harvest acted as sediment sources, delivering increased loads to downhill portions of neighboring streams. Poor road location, improper construction, inadequate culvert size and culvert functioning capacity, as well as a lack of regular road maintenance are examples of conditions that have contributed to sediment problems and have

had impacts with every harvest. In the uplands, the use of skidding equipment for harvesting timber creates soil compaction and disturbance that has contributed to sediment in streams causing related problems. These same actions have decreased soil and moisture-holding vegetation, and in some instances may have decreased soil productivity.

Past logging techniques, in addition to fire suppression, has added to the change in vegetative composition in terms of tree species mix, and stand density. These changes from past actions have changed structural stages and age classes as well. This has had an effect across the landscape of reducing fire resistant trees and allowing more fire intolerant trees to proliferate across the landscape. This changed composition, which exists across the Southeast Galena project area has also created a condition where forest stands, which were once fire-adapted forests, but now have become overstocked stands that are less resistant to insect infestation, disease infection and uncharacteristically severe wildfire. Consequently, change of other vegetation components in competition for nutrients and sunlight has reduced growth of native shrubs and grasses because denser forest stands now dominate the landscape.

Grazing

Grazing has had a major influence on the watershed—not only by domestic livestock, but also grazing by deer and elk. Grazing of large herds of sheep and cattle was a historic use of the project area. Sheep were a major part of grazing in the watershed until about the 1940s. Since then, the majority of grazing has been by cattle. Both sheep and cattle grazing utilized available forage in a "continuous seasons" grazing regime.

Fire Exclusion Policies and Fire regimes

Following Euro-American settlement, fires were suppressed (at least 75 years of fire suppression) and the disturbance regime was altered. Now, particularly, in the Dry Forest types of the project area the fire resistant ponderosa pines are surrounded by younger trees which escaped fire (because of suppression policy for the past 75 years) when these trees were smaller (Hall 1976). Before settlement, forest stands were less susceptible to intense fires and less susceptible to disease and pest epidemics than they are today. These early forest stands were more open and park-like and were comprised of large trees of the early seral species, Ponderosa pine and western larch.

Photo 19—Before settlement and fire exclusion policies began, wildfire in the early forests of the project area typically ran through the understory thinning out most encroaching climax species of Douglas fir and grand fir while the larger early seral species of Ponderosa pine and western larch became dominant.

These tree species had a large overstory component and exhibited a resiliency toward natural disturbances such as wildfire, or insects and disease causing forest pathogens. Records indicate that in early seral forests, disease and insect infestations were less prevalent, and wildfires were significantly smaller. Wildfire in these early forests typically ran through the understory thinning out most encroaching climax species of Douglas fir and grand fir while the larger early seral species of Ponderosa pine and western larch remained relatively unharmed due to their large size, thick bark and the relative open spacing. Additionally, the role of wildfire in these forests before settlement, was characterized by a beneficial invigorating effect to the shrub and plant communities of the forest understory (see3.2.4 Vegetation by Forest Type, page 139, and 1.2.1.4 Undesired Condition: Vegetation Outside Historical Range of Variability, page 14). This fire regime is beneficial to wildlife and wildlife habitat by causing additional vegetative growth that patterns a mosaic effect of open stands of trees with occasional openings across the landscape (see also 3.2.5 High Wildfire Hazard, page 159).

3.4.2 Austin, Bates and Greenhorn

Located on the eastern edge of the Southeast Galena project area, the town of Austin, Oregon, founded in the later part of the 19th century. The railroad reached town in 1905. Austin was once home to the "Austin House," stage stop, on the route to Baker City from John Day. The residents were originally mostly miners, ranchers and loggers. Austin was the hub of this area, until the town of Bates was founded one mile west of Austin with a sawmill. With the building of the sawmill, the community of Bates, Oregon became a thriving timber town that served the railroad logging industry with a general store, tavern, post office, hotel, two churches, and an elementary school. The town was built around a sawmill owned by the Oregon Lumber Company and, later, the mill was sold to the Edward Hines Lumber Company. Historically, this community provided the economic hub for the employees of the Blue Mountain Ranger District (not the current Blue Mountain Ranger District) which was part of what was once the Whitman National Forest. Additionally, employees of the Austin Section of the Oregon State Highway Department, local miners, ranchers, residents of the communities of Galena and Susanville, as well as the remaining residents of the town of Austin formed the community of Bates. Logs were delivered to the Bates sawmill by railroad from the early 1900s to the mid 1940s, then by logging truck until 1975. In the early 1970's, the Edward Hines Lumber Company changed their operations by building a more modern sawmill in the city of John Day, Oregon. Consequently, by late 1975 the sawmill in Bates was closed and the dismantling of both the town and the sawmill had begun.

Greenhorn served nearby mines in the late 1800s and early 1900s. currently there are several residences that are occupied mainly as summer homes. Greenhorn is an incorporated town, possibly one of the smallest in Oregon.

3.4.3 Social and Economic Factors

The social and economic analysis was conducted to describe the impacts of recommended alternatives for the Southeast Galena Restoration Project. The objective of the social impact analysis is to identify potential changes in people's social and cultural conditions that directly or indirectly result from Forest Service actions. The objective of the economic impact analysis is to identify potential impacts to economic conditions such as employment and income. The objective of the environmental justice analysis is to identify potential disproportionate impacts to minority populations, low-income populations and American Indian tribes. The objective of the financial and economic efficiency analysis is to describe economic uses and values and identify potential benefits and costs of alternative proposals for resource management.

Quantitative or qualitative variables or a combination of both related to the social and economic issues were selected to provide a comparison of effects between alternatives. The scale of analysis was determined from the issues and potential impacts surrounding the proposal. Depending on the cause and effect relationships surrounding an issue, the scope of the analysis and scale of interest may vary for each selected social or economic variable. Some overlap occurs between variables and subsequent scales of interest. For example, some issues are focused on community level effects while other potential impacts may be multi-county wide. Some issues reflect regional or national scales of interest.

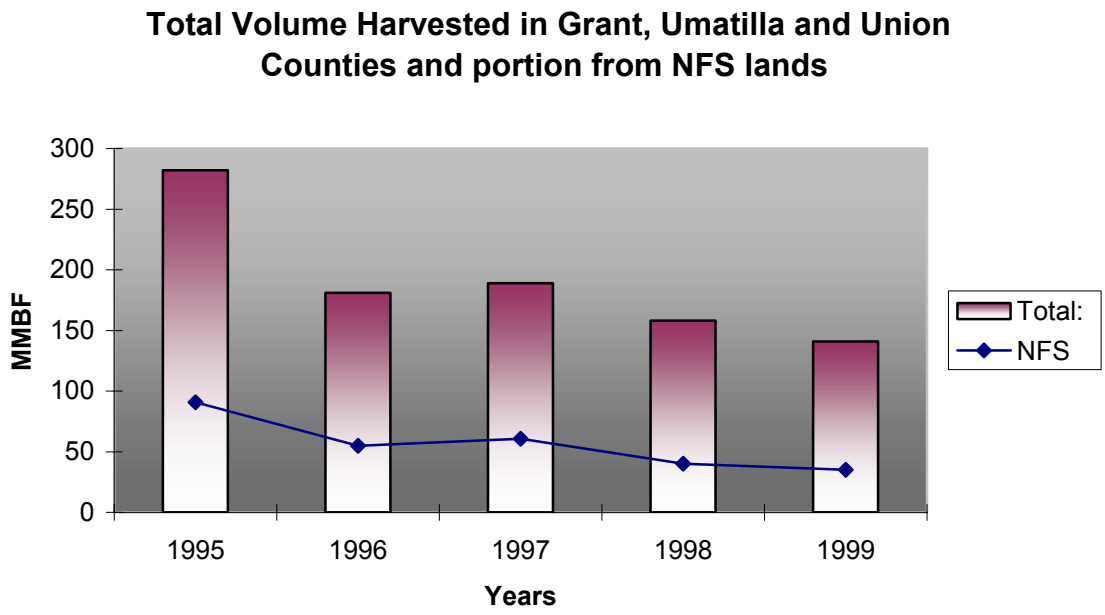
The project activities were examined in terms of categories of activities from Chapter 2.0, such as aquatics (streamside/riparian hardwood protection, planting, rehabilitation, etc.), vegetation (harvest treatments, logging methods, competing vegetation control, prescribed fire, aspen stands, etc.), and infrastructure (road construction, reconstruction, decommissioning, trail work, and removal of dispersed camp areas, etc.). A combination of trend extensions, comparison to findings in the literature, known studies and surveys, institutional experience with previous effects, and economic models were used to estimate the magnitude, duration and intensity of the impact.

Timber-Harvest Related Employment

Timber sales from the Malheur National Forest provide employment opportunities to local communities that are dependent on timber-harvest related employment. Based on log flows from the Malheur National Forest in 1998, mills in Grant, Umatilla and Morrow counties acquired most of the supply. Baker and Union counties acquired about 15 percent of the supply (Oregon Department of Forestry 2000). However of these counties, only Grant, Umatilla and Union counties currently have operating mills. These mills support approximately 705 jobs in associated communities including John Day, Prairie City, Pendleton, Pilot Rock, La Grande, Elgin and North Powder. These figures are subject to change based on modifications to plant operations since April 2001 (Ehringer and Associates 2001).

Total volume available to mills from timber harvesting in Grant, Umatilla and Union counties over the last five years (1995 to 1999) dropped by 50 percent from 282 MMBF to 141 MMBF. Harvesting from all National Forest System (NFS) lands in these counties has contributed between 25-30 percent (40 MMBF) toward the total annual harvest over the same period. The NFS average represents about 10 percent of the current annual production of mills in these counties (Ehringer and Associates 2001).

Figure 11 Total timber Harvest in Grant, Umatilla and Union counties



Logging and wood products related employment in Grant, Umatilla and Union counties has fluctuated over the last five years. Grant County employment in this industry has declined 22 percent, followed by a 17 percent decline in Union County. Umatilla County increased by 8 percent. The economic base of these Counties is predominately agriculture, ranching and forest products industries, with opportunities for tourism development. Grant County's economic base is agricultural services, wood production and federal government with local government, retail trade and services being the top employers in Grant County. Wood products and federal government provide 320 jobs each. Between the three counties in 2000, the lumber and wood products industry employed 1,970 people.

Table 113 Lumber and wood products employment

County	Lumber and Wood Products Employment				
Year	**1996**	**1997**	**1998**	**1999**	**2000**
Grant	440	410	360	360	320
Umatilla	890	910	1010	1020	760
Union	1,030	990	880	860	890

Table 114 Non-farm Payroll

Non-farm Payroll (Average Annual for 2000)	Jobs in Grant County	Jobs in Umatilla County	Jobs in Union County
Wood Products	320	760	890
Other Manufacturing	10	1170	720
Food and Kindred Products	0	2450	0
Construction/Mining	120	1390	330
Transportation/Utilities	140	1920	490
Wholesale Trade	70	1090	430
Retail Trade	460	5880	2150
Finance/Real Estate	100	810	380
Services	360	5500	2060
Federal Govt.	320	830	230
State Govt.	120	1680	1060
Local Govt.	680	4500	1320
TOTAL	2700	27980	10060
Source: State of Oregon Employment Department,			

Declining trends in timber harvesting from National Forest System lands indicate that declines in wood products employment may continue over the next two decades. In the long-term (20-40 years), employment is predicted to stabilize and then increase matching timber harvesting increases. In response to agency decision about carrying capacity and resource protection, historic levels of livestock grazing continue to decline and are expected to decline over the next 20 years. In the future, recreational use is expected to continue to increase as population continues to grow in the region and nationally demand for opportunities continues. Competition for water for hydropower production, irrigation, domestic water supply and instream flow needs is expected to become increasingly controversial and complex to meet the future needs of the ecosystem (Haynes and Horne 1997).

Table 115, illustrates average annual unemployment rates for the past five years in Grant, Umatilla and Union counties.

Table 115 Unemployment statistics

	1996	1997	1998	1999	2000
Grant	12.0%	13.5%	13.9%	12.3%	11.1%
Umatilla	8.4%	8.0%	6.3%	6.7%	6.4%
Union	7.8%	7.9%	7.1%	6.0%	5.2%

Grant County's annual average unemployment rate declined in each of the past two years. In fact, the 2000 annual average jobless rate of 11.1 percent was Grant County's lowest since 1995. However, the improvement in the jobless rate was due not to employment growth, but to people leaving the labor force. The annual average unemployment rate of 5.0 percent for 2000 was Union County was the lowest in the past 20 years. Umatilla County's rate of 6.4 percent was similar to the past three years (Oregon Employment Department 2001).

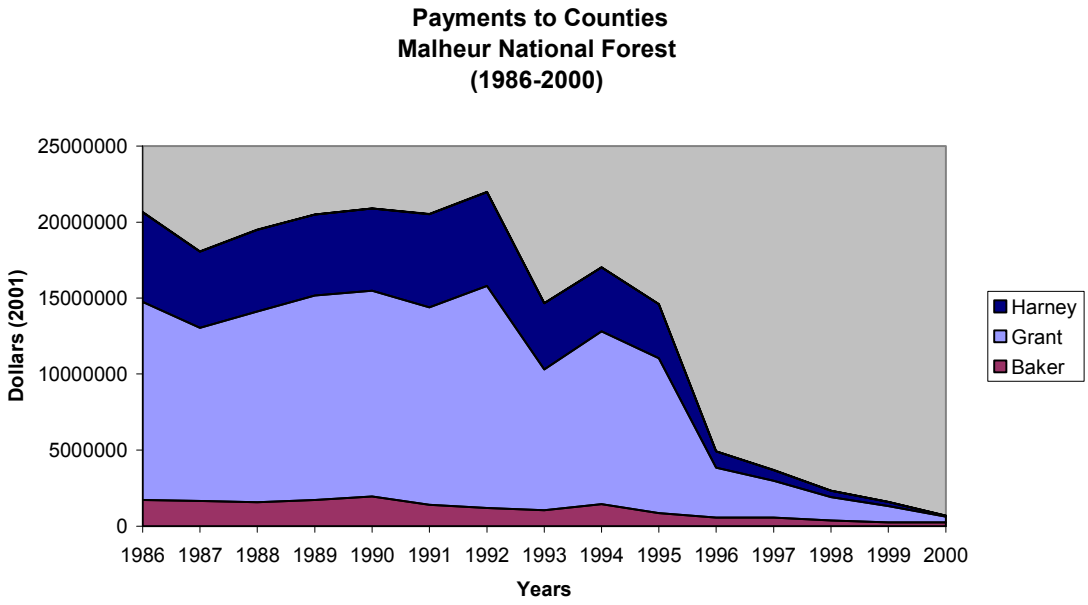
Restoration Opportunities For Local Communities

For purposes of this analysis, "community" describes the spatial location of groups of people living in the rural areas directly adjacent to the Analysis Area (Galena WA, Supplement—2002)or in surrounding Grant County. People are concerned about their ability to adapt to rapid changes such as mill layoffs or closures, and resulting changes in their social organization such as declines in school enrollment from peopling leaving the area to find work.

Declines in timber harvests over the past several years in response to changing national social values and protection of endangered species have subsequently contributed to significant declines in payment levels and the ability of communities to manage their education budgets. Historically, 25 percent of the gross receipts collected by the Forest Service from the use of National Forest System lands and resources (timber sales, grazing permits, campground fees, and other special use permits) were returned to the States as a source of funding for schools and roads. Payments to counties were based on the amount of National Forest System land within a county and comprise an important element of local budgets.

In response to this decline, on October 30, 2000, (Public Law 106-393), H.R. 2389, the Secure Rural Schools and Community Self-Determination Act of 2000 (Act) was signed into law by the President. Counties now have the option of continuing to receive payments under the 25 Percent Fund Act or electing to receive their share of the average of the three highest payments during the years from 1986 to 1999. Refer to the Figure 5 for an illustration of this trend.

Figure 12—Payments to Counties



Twenty-five percent of receipts collected from the Malheur National Forest are distributed primarily to Grant (77 percent) and Harney (20 percent) counties, with a portion allocated to Baker (3 percent) and Malheur (0.03 percent) counties. Malheur County payments are too small to be displayed on the graph.

Due to declines in timber harvests from federal lands in the last several years, several initiatives have evolved to build broader linkages between watershed restoration and healthy communities. In 1999, three million acres in the Blue Mountains was identified as the Blue Mountains Demonstration Area (BMDA) by Oregon Governor Kitzhaber, the Forest Service and over 40 partners to address restoration needs and community concerns. The mission of the BMDA emphasizes watershed restoration in high priority areas while promoting community health by providing "restoration-related employment and resource outputs that are sustainable and consistent with achievement and maintenance of healthy watershed conditions" (USDA 2001a).

Results of analysis on FY1998 and 1999 contracts in the Pacific Northwest indicate that almost half the contracts awarded by the Blue Mountains national forests (based on average award amounts per contract by distance and region) were awarded to firms more than 150 air miles away. Contractors residing in the coastal regions and Western Cascades of Oregon and Washington acquired the majority of the contracts and value (Moseley and Shankle 2001).

Contractors residing in communities surrounding the project area can provide a variety of skills and equipment for road maintenance, reconstruction and construction, culvert replacement, grapple piling, roadside brushing, fish passage, thinning, pruning, cone surveys, fencing, hand piling, and stand exams (USDA 2001c). Preliminary analysis of contracts awarded for these types of work on the Malheur National Forest indicates during the last three years (1998-2000), contractors residing in Grant and Harney counties received 34 percent of the total number of contracts. Reforestation work has provided 40-60 percent of the total value and is typically accomplished by contractors residing outside the area. The average annual dollar value of contracts awarded to 14 average annual local contractors was $372,953 (USDA 2001b).

Population Changes

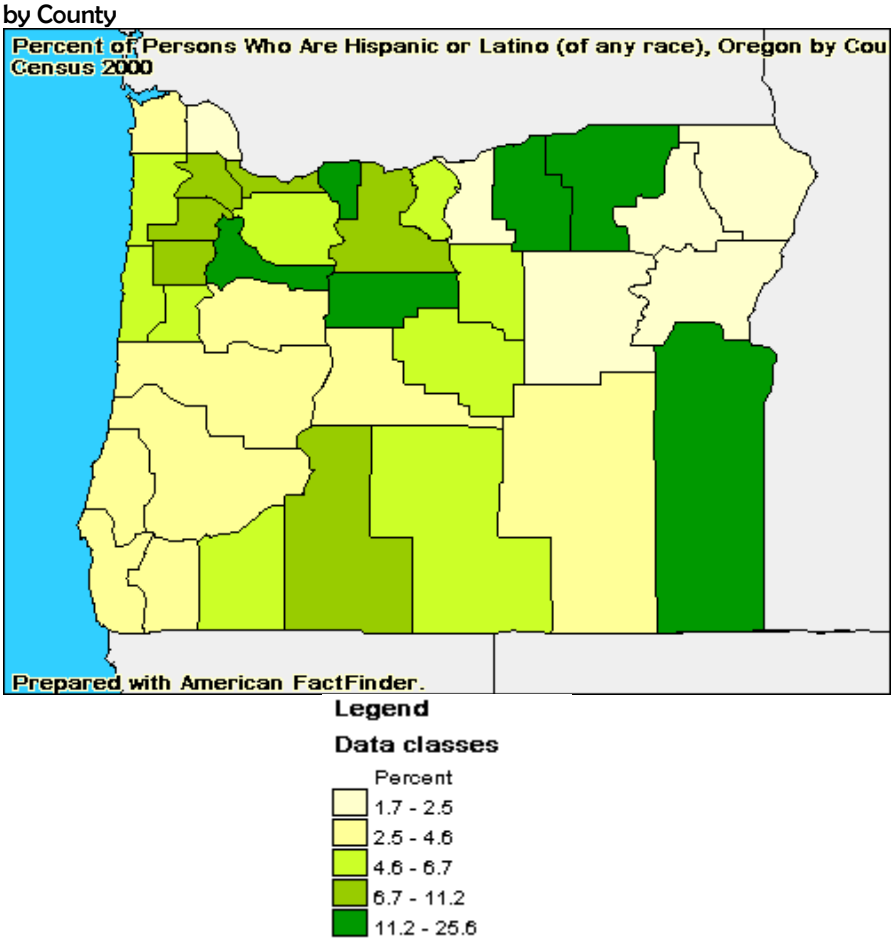
Humans have inhabited the area surrounding the Galena watershed for over 10,000 years. Several American Indian tribes occupied the area or participated in hunting and gathering as neighboring tribes. The primary groups included the Northern Paiute near Prairie City and Canyon City along with Columbia Plateau tribes such as the Umatilla, Tenino, Cayuse, Walla Walla and Nez Perce. European fur trappers and explorers arrived in the mid 1820s, followed by gold miners and settlers in the 1860s.

Residents of Grant County are concerned that past declines in timber-harvest related employment have caused people to move out of the area and affects school enrollment, property taxes and local business viability. Residents surrounding the project area in Grant County live within communities of less than 10,000 people, in unincorporated places, or in open countryside. Population growth in the immediate area has been fairly limited since the 1950's. For example, Grant County (population 7,935) has grown about one percent from 1990 to 2000. Harney County (population 7,600) located south of the project area has grown almost eight percent during the same period while Baker County (population 16,741) to the north has grown over nine percent. Umatilla County (population 70,548) directly north of the area has grown at 19.1 percent almost as fast as the statewide average of 20.4 percent from 1990 to 2000 (U.S. Census Bureau 2001).

Racial groups in the area are predominately white, followed by American Indians depending on the particular county. For example, Malheur County has a larger proportion of other races (25 percent) than Grant County (4 percent). Statewide, white persons represent about 89 percent of the population followed next by Asians (3.7 percent), American Indian/Alaska Natives (2.5 percent), Black or African American (2.1 percent), Native Hawaiian or Pacific Islander (0.5 percent), and other races (5.2 percent). Percentages add up to more than 100 percent because some people report for more than one race (U.S. Census Bureau 2001).

Racially, most Hispanics identify themselves as Caucasian depending on their ancestry that often includes African American and Native American. Hispanic refers to individuals from an ethnic background associated with Mexico, Cuba, Puerto Rico, South and Central American and other Spanish speaking countries. In Oregon, this segment of the population is expected to grow the fastest overall. The following figure illustrates the mixture of Hispanics as a percent of total county populations (Oregon Employment Department 1998).

Figure 8—Percent of Persons Who Are Hispanic or Latino (of any race), Oregon by County



Nationally, future trends in population indicate that as a result of immigration, the racial and ethnic populations will comprise nearly 50 percent of the total in 2050 compared to 18 percent in 1990 (USDA Forest Service 1999b). Some ethnic minorities prefer harvesting and use of nontimber forest products, hunting and fishing for subsistence use, and developed recreation sites to accommodate larger groups and these demands are likely to grow in the future (Cinnamon and others 1999, USDA Forest Service 2000).

Recreation Use

Recreation use in the watershed consists primarily of dispersed activities of viewing scenery, wildlife viewing, hiking, and hunting. Other year-round activities such as snowmobiling, cross-country skiing, ATV use, dispersed camping and horn hunting are also popular pursuits. Hunting big game animals (deer and elk) and fishing are also activities which are popular. Two developed recreation facilities (Middle Fork and Deerhorn) and about 118 dispersed campsites provide a range of opportunities in the area. Recreation places are easily accessed by combination of roads and trails to the project area. Dispersed camping occurs in several areas along streams within riparian areas.

The Davis Creek Trail in the south half of the watershed provides a roaded modified setting for hiking, horseback riding, mountain biking and motorized bikes. Current use of this trail by ATVs is creating unsafe or less than standard conditions for all users due to the narrow width and causing resource concerns at stream crossings. The Blackeye Trail in the Vinegar Hill-Indian Rock Scenic Area provides a semi-primitive, nonmotorized (summer) and motorized (winter) setting for hiking,

horseback riding, mountain biking and snowmobiling. Access to the trailhead and the adjoining Tempest Mine trails has been blocked by a road washout on FR 4559 for the past few years.

Use data on the level of recreation participation and experience levels is not available for the analysis area. Information on regional trends in the Columbia River Basin indicates that hunting, day use, camping, motor viewing and fishing are primary uses of the area (Haynes and Horne 1997). Residents of Oregon, Idaho, and Washington primarily seek these recreation opportunities. The project area provides a supply of primarily undeveloped roaded natural and semi-primitive motorized recreation settings and experiences. The Vinegar Hill-Indian Rock Scenic Area provides semi-primitive nonmotorized opportunities.

Demands for recreation on public lands in the Columbia River Basin region will continue in the future especially in undeveloped and remote settings. Participation in recreation activities in the Basin is projected to increase overall by 2.3 percent per year (Haynes and Horne 1997). Some activities have a higher predicted rate of growth. Participation in all types of recreational fishing nationwide is expected to increase by 36 percent by 2050. Big-game hunting is expected to increase through 2040 although small game hunting has been on the decline. Habitat protection measures and competition from nonnative species may have a greater impact on public participation in these activities in the future (Flather and Hoekstra 1989). Recreation use in the project area is expected to increase for ATVs, camping, and potential increases in trail use. Big-game hunting use will remain stable, but dependant upon Oregon Department of Fish and Wildlife controlled hunt regulations (the number of tags given out may fluctuate from year to year) and fishing use will slightly increase. Other activities such as horn hunting and mushroom collection for personal use will remain the same.

Expenditures for food, equipment, lodging, transportation, licenses and other expenses by recreationists in the project area benefit local communities and regional economies. For example, 20 percent of recreational fishing expenditures in the Columbia River Basin occur in eastern Oregon. Residents of the Basin generate about 70 percent of the fishing activity. Expenditures associated with fish viewing accounts for about $80 million per year in Columbia River Basin (Fluharty 1995). Total spending by visitors to northeastern Oregon has increased by 5.2 percent on average annually in the last ten years compared to a statewide total of 5.7 percent (Dean Runyan Associates 2001).

Nontimber Forest Products

People expressed concern about how the recommended activities would affect personal collection of nontimber forest products such as firewood, wild edible mushrooms and huckleberries. Changes in road access, trail access, harvesting activities, and wildfires would affect nontimber forest products habitat and user's access.

Nontimber forest products include five broad categories: wild food plants such as mushrooms, fruits, nuts and berries; medicinal plants and fungi; floral greenery and horticultural stocks; plants, lichens and fungi used for fiber and dyes; and other chemical plant extracts such as oils and resins. Woody materials such as firewood, post and poles, boughs are also commonly used nontimber forest products (Weigand and others 1999).

Commercial uses of these special forest or nontimber products is a small but growing industry in the Pacific Northwest and has been expanding from the Cascade Range to the eastside. Primary products include floral greenery, Christmas ornamentals, wild edible mushrooms, and other edibles (Schlosser and Blatner 1994). Recreational collection of wild edible mushrooms such as morels and chanterelles has developed into a major commercial industry. Wholesale mushroom companies processed $11.8 million dollars of mushrooms in the eastern portions of Oregon and Washington in 1992 compared to $26.8 million west of the Cascades.

Although data is limited wild edible mushroom harvesting generates seasonal employment. Numbers and duration of employment depend on conditions that are favorable to mushroom reproduction such as fires, but the industry continues to draw pickers, wholesalers, and processors. Asian and European markets purchase over 40 percent of the harvest, and delivery of the products within 24 hours is essential to gaining the highest value (Parks and Schmitt 1997). Conflicts between causal collectors and commercial mushroom pickers have occurred in the past and are likely to continue in the future. Some environmental effects have been reported due to heavy concentrations of pickers living in dispersed campsites on the Malheur National Forest (Volk 1991).

Nontimber forest products also contribute toward social values in terms of livelihood, cultural, and recreational (Emery 1999). For example, users enjoy collecting mushrooms purely for the adventure of finding them, they desire the fresh taste and texture, and participate in groups to collect and harvest as a traditional pursuit. Collection of other nontimber forest products in the project area includes firewood gathering by residents of Grant and Malheur counties, huckleberry picking, and post and poles harvesting. Many firewood gatherers depend on firewood to supplement or provide for subsistence needs for heating materials in the winter. Some users collect firewood either commercially or on a volunteer basis for seniors living in the area and as far away as Ontario.

Special Use Permits and Claims

Road decommissioning reduces access and may reduce these permitted uses. Special uses permitted in the project area besides uses associated with nontimber forest products include livestock grazing, electronic towers, powerlines and other related facilities. Water rights and mining claims also occur in the project area. There has been interest by members of the public in obtaining outfitting and guiding permits in the general area although none are currently permitted.

Livestock Grazing

Cattle grazing is authorized on the Upper Middle Fork allotment and part of the Granite Boulder unit of the Lower Middle Fork allotment in the analysis area. The Upper Middle Fork allotment has not been used for the last several years as a matter of personal convenience by the permittee. In 2000, a temporary permit was authorized for 100 cow/calf pairs to offset areas lost due to the Summit Fire in 1996. The Granite Boulder unit of the Lower Middle Fork allotment has not been used for livestock grazing since the fire. Livestock grazing is currently authorized on the unburned portions of the allotments. Refer to the “Range Resources” section of this DEIS for further information on the range allotments.

Ranchers with federal permits rely on forage from federally managed lands. Grant, Harney and Wallowa counties are highly dependent on forage where the value of cattle reared on forage from federally managed lands represents more than 10 percent of total agricultural sales (Horne and Haynes 1999). Shifts in permitted use of federal grazing allotments change the availability of this forage source. The impact these shifts have on the local economy varies according to the adjustments that local ranchers have to make within their ranch operation.

Individuals and families involved in ranching share social values for their independent lifestyle and hard work, they view their role as caretakers of the land, and attach a sense of identity to the land as their home and their lifestyle. Homesteading values and lifestyles are valid today although some changes have occurred that affect social values. Some ranchers have acquired larger land holdings and some families have outside income from other employment to make ends meet. Some families operate at a loss to maintain what they perceive is a desirable lifestyle (E.D. Hovee & Company 1995).

Grazing Allotments

Today, cattle grazing occurs on two allotments, the Upper Middle Fork and the Lower Middle Fork Allotment both of which are within the project area boundary. The Upper Middle Fork Allotment runs 473 cow/calf pair on 54,673 acres, the Lower Middle Fork Allotment runs 549 cow/calf pair on 58,161 acres. It is estimated that a similar number of cattle graze on privately owned pastures along the Middle Fork of the John Day River. Four ranches manage the private pasture. Two of these ranches (Oxbow and Dunstan) were recently purchased by the Nature Conservancy (and it is assumed they will be managed for wildlife habitat, not cattle production).

Past monitoring data shows that stocking rates are consistent with the amount of forage production within the project area. This data consists primarily of forage utilization data. The Malheur National Forest *Land and Resource Management Plan* specifies allowable use levels for rangeland forage. These allowable use levels were generally not exceeded within the Southeast Galena watershed since 1990. Recent monitoring data has shown isolated problems with excess forage use in areas that cattle tend to prefer. These are isolated problems, which are considered livestock distribution problems and are not due to a shortage of forage. Numbers of cattle authorized to graze the area have been adjusted over the years to keep livestock numbers well below levels, that could be supported by existing forage production. This assures adequate forage for both cattle and wildlife.

Photographs, condition and trend data and professional judgment lead to a conclusion that significant change has occurred over the past 150 years (Upper Middle Fork 2210 files). Prior to European-American settlement of this area, fire played a dominant role in shaping the landscape. Vast areas of open park-like stands of ponderosa pine have been converted to dense, overstocked, dead and dying stands of diseased forest which provide little in the way of forage for grazing animals. Conifers have, now encroached upon areas that were once open meadows and dry rangeland.

Rangeland conditions in the project area are slowly improving, however Primary Rangeland is decreasing. Over time, under current *Land and Resource Management Plan* grazing standards, a slow upward trend in the range condition would be expected. This trend has been established by review of literature and data from the 1930s to the present (USDA FS 1989). However, due to the continued encroachment of timber into the rangelands, the amount of forage available to livestock will gradually decrease over time. This will force livestock to concentrate on a continuously shrinking area of suitable rangeland. If more suitable rangeland is not created by future management projects, or natural disturbance, the number of livestock permitted to graze on this watershed will need to be decreased in the future to avoid unacceptable environmental damage.

Upper Middle Fork Allotment

The Upper Middle Fork Grazing Allotment occupies the majority of the project area. Currently 473 cow/calf pairs are authorized to graze the Upper Middle Fork Allotment from June 1 until October 15. The permittee choose to take non-use in this allotment the last several years for personal convenience, however there was allotment use in 2000. A temporary permit for 100 cow/calf grazed from June 15 to October 1, 2000 in the Caribou unit to make up for lost grazing areas due to the Summit Fire, an uncharacteristically severe wildfire which severely affected most of the Lower Middle Fork allotment. The burned portions of the allotments within the Summit Fire area have been excluded from grazing, through a management decision, for an indefinite period of time.

A deferred rotation grazing system is being used to manage the rangelands on the Upper Middle Fork Allotment. The allotment has been divided into 8 pastures by approximately 45 miles of fence. Two herds of livestock are moved through each of these pastures during the grazing season. Approximately 40 livestock water developments have been constructed on the allotment to provide

water for cattle. The primary purpose of these water developments is to improve livestock distribution by providing water for cattle in areas where water is scarce and to provide cattle with an alternative to watering in streams. These water developments and fences are maintained by the grazing permittee.

There are approximately 49 miles of fish bearing streams within the Upper Middle Fork allotment that support bull trout migratory habitat as well as steelhead migratory and spawning habitat. Through the consultation process for grazing allotments on the Middle Fork John Day River Sub-basin, a grazing monitoring plan and conservation measures are in place to offset the effects of grazing. *The Middle Fork John Day Biological Assessment for Range Allotments* (Malheur National Forest 2001) was prepared in cooperation with the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) to address impacts caused by grazing on riparian systems and for compliance with Endangered Species Act of 1973 (ESA) criteria for bull trout and steelhead. This Biological Assessment is modified yearly, based on the end of year report so adjustments can be made to the conservation measures or grazing system.

Lower Middle Fork Allotment

Part of the Granite Boulder unit of the Lower Middle Fork Allotment is within the Southeast Galena Watershed, which is currently authorized to graze 549 cow/calf pairs between the dates of June 1 to October 15. The Granite Boulder unit has been rested since the Summit Fire burned in 1996.

The only stream in the Lower Middle Fork Allotment within the Southeast Galena watershed is Granite Boulder Creek. This stream has steelhead, bull trout and redband trout spawning areas. All streams within this grazing unit have been consulted in cooperation with the USFWS and the NMFS for compliance with ESA criteria for bull trout and steelhead. Determinations have been made and appropriate conservation measures applied to minimize impacts as stated in the Middle Fork John Day Biological Assessment for Range Allotments (Malheur National Forest 2001).

Facilities

Several overhead electric power lines and poles, buried telephone lines and above ground pedestals occur within or adjacent to the analysis area.

Water Rights

A number of irrigation and mining ditches branch off the Middle Fork of the John Day River and several of its tributaries. Rotary fish bypass screens have been installed and maintained by the Oregon Department of Fish and Wildlife at diversions in streams with anadromous fish. Water withdrawals are permitted under individual water rights filed with the State of Oregon. There are 12 ditch easements within the watershed.

Mining Claims

Today, minimal activity occurs although the watershed has the highest level of activity on the Forest. Mining landscape features such as placer tailings, waste rock piles, hydraulic ditch systems, prospect holes, audits, and shafts, are common throughout most of the subwatersheds in the analysis area. Mining related properties, such as cabins, flumes, and mills or other ore processing localities are also commonplace, particularly near historic claims. There is at least one vertical mine shaft, and several mine adits that are currently open. There are some old ore processing facilities on private land within the watershed. It is unknown if there are chemicals leaching from these and other mine tailings.

Attitudes, Beliefs and Values

People are concerned about protecting and restoring threatened and endangered species, and preserving values associated with enjoyment of the landscape. Management actions may affect people's attitudes, beliefs and value associated with ecosystems. Attitudes reflect people's evaluation of something as favorable or unfavorable. Beliefs reflect what people think is true about something and can be a reason a person has one or more attitudes. Values reflect what people consider to be precious to them. They represent goals or standards of behavior that form the basis for their attitudes and beliefs.

Understanding the attitudes, beliefs and values of the various members of the public, and balancing management decisions among a variety of opinions and interest regarding ecosystem management has changed over time. Anthropocentric views of the forest in which forests are valued because of their utility to humans have traditionally led natural resource management policies. In the past ten years, the biocentric view that people believe in protecting forests because they feel it is important independent of utilitarian motives has increased (Steel 1994).

These differences in views can generally be characterized as commodity and non-commodity values. Commodity values such as timber, minerals, water, and range often contrast with noncommodity values for recreational, ecological and spiritual and aesthetic values. In addition to wide ranging values, people share conflicting opinions about whether the environment should be actively managed to achieve outcomes people desire or passively managed by allowing nature to achieve its own course (Botkin 1990). Most people share a mix of values and perspectives.

Although no surveys of people have been completed for the Southeast Galena Restoration Project, public comments and concerns indicate a range of spiritual and aesthetic values associated with the area

Public opinion surveys are one source of information for understanding people's attitudes, beliefs and values. In a survey of Oregonians and national public and their values regarding natural resources, respondents identified protecting resources for future generations as the most important factor. The three most important factors for eastside residents were a quality place to live, outdoor recreation and wildlife habitat. Factors most important to national interests were wildlife habitat, and ecological health (Brunson and others 1994).

In terms of orientation toward beliefs about managing natural resources, Oregonians and the national public tended to "strongly support a less commodity-based, more ecologically sensitive approach to federal forest management" although this belief was slightly less likely for Eastside residents (Steel and others 1994, Haynes and Horne 1997). Other surveys of residents of the Interior Columbia River Basin reveal top priorities for protection of forests, rangelands and wilderness. Overall, 76 percent of the people favored protecting watersheds, fish and wildlife habitats, endangered species, ecosystems and wilderness. "Most Oregonians want the forestland of the state to be managed for a balance of social, economic and environmental benefits" according to a recent survey commissioned by the Oregon Department of Forestry (Oregon Department of Forestry 2001).

Human Health and Safety

People are concerned about effects to human health and safety of residents living near the watershed due to smoke emissions during burning. Primary issues focused on potential smoke from fires in the high fire hazard areas and concerns with air quality to people residing in Greenhorn Bates, Austin, and Austin Junction areas. Other concerns emphasized health effects to workers from chemical treatments of competing vegetation. Safety concerns to workers and the public about

hazard trees along roadsides were also raised as concerns (see also 3.4.2 Austin, Bates and Greenhorn, page 212).

Timber Management

Timber management has held an important role in this watershed over the past century beginning with the previously mentioned railroad logging along the Middle Fork of the John Day River valley in around 1905. Today, timber harvesting is an vital tool for meeting resource objectives, from thinning overstocked stands, to salvaging fire, wind storm, and insect killed trees.

Locally, lumber and wood manufacturing industries directly account for 18 percent of the total wages in Grant County (Summit FEIS). There is an indirect effect timber industries have on other job sectors, especially retail industries. In the past decade as timber harvesting levels on the Forest have declined, revenue distributed to county schools and road budgets has also declined, as a portion of Federal Timber Sales went to Counties for schools and roads. Schools and roads are no longer funded in this manner as Congressional legislation has altered this method of payment. Retail business continues to benefit from timber industry, as does local government in the form of property taxes.

Within the project area timber sales such as Moe Timber Sale contribute to the local economy and provides vegetation restoration. Should a decision be made to forego the current recommended action, other timber sales may occur after appropriate planning in subwatersheds throughout the project area.

Declining trends in timber harvesting from National Forest System lands indicate that declines in wood products employment may continue over the next two decades. In the long-term (20-40 years), employment is predicted to stabilize and then increase matching an increase in timber harvesting. In response to an agency decision about carrying capacity and resource protection, historic levels of livestock grazing would most likely continue to decline over the next 20 years. In the future, recreational use is expected to continue to increase as population continues to grow in the region and demand for opportunities continues on a national scale. Competition for water used for hydropower production, irrigation, domestic water supply and instream flow needs are expected to become increasingly controversial and complex to meet the future needs of the ecosystem (Haynes and Horne 1997).

The area recommended for commercial harvesting within the Southeast Galena Restoration Project was analyzed to determine the economic viability of harvesting timber by determining the tentative advertised bid rates per hundred cubic feet ($/ccf). This estimate was based on estimates of volume, species, amount of saw timber and fiber material, logging systems costs, haul costs, road maintenance costs, contractual costs, erosion control and other developmental costs, temporary road costs, and specified road construction costs, and the value of timber recommended for removal. The preliminary value of the timber was based on the prices for the same species and material of all sales actually sold within Appraisal Zone 3 (primarily Blue Mountain forests) within the last 12 months.

The tentative advertised bid rates estimated reflect the most current volume, price and costs estimates for this analysis. An initial bid rate was determined by subtracting the costs associated with logging from the base period prices adjusted for the quality of the material and current market conditions. This rate was further reduced per current appraisal methods (Transaction Evidence Appraisal) to allow for competition between bidders to determine the tentative advertised bid rate. The computer software program, TEA_ECON was used to conduct the analysis.

Economic Efficiency

An economic efficiency analysis was completed that focused on identifiable and quantifiable ecosystem benefits and costs for each alternative in terms of the present net value (benefits minus costs) to assess which alternative comes nearest to maximizing net public benefits (36 CFR 219.3). Ecosystem functions provide a broad set of ecosystem services such as clean water or native forest stands that are valuable to both human and nonhuman components of the ecosystem. These ecosystem values may be assessed in economic and non-economic terms. Economic valuation provides a partial measure of the full range of ecosystem values in commensurate terms for assessing economic tradeoffs. Non-economic values are necessarily assessed in terms relevant to other disciplines such as ecology or ethics. Changes in ecosystem services must be measurable and quantifiable in like terms, preferably monetary measures, in order to assess a relevant change in economic value (Bergstrom and Loomis 1999).

This analysis is based on identifiable and quantifiable economic benefits and costs and is more typically a financial comparison between revenues and costs. The objective of the economic efficiency analysis is to show a relative measure of difference between alternatives based on direct costs and values used. All dollar values have been discounted in terms of the present net value (2001 dollars). Discounting is a process whereby the dollar values of costs and benefits that occur at different time periods are adjusted to a common time period so that they can be compared. The real (exclusive of inflation) discount rate of four percent was used in the analysis over the planning period.

Present net value is defined as the present (discounted) net value of project benefits minus the present (discounted) net value of project costs. A benefit-cost ratio is the ratio of present net benefits to present net costs. Present net value is a more appropriate measure for comparison between alternatives when land and productive activities are limiting such as in an environmental analysis of alternatives. A benefit-cost ratio comparison is more appropriate when investment capital is limited, for example when considering budget allocation among a number of different activities. Refer also to the Malheur National Forest, FEIS, Appendix B, for a comprehensive quantification of the net public benefits for the *Land and Resource Management Plan*.

Recreation

Today, many people who enjoy a variety of outdoor activities use the project area. This use takes place in the Middle Fork John Day River Area, despite the historic condition of open park-like stands of large Ponderosa Pines and western larch not being present. People go to the project area for recreation and do not give much thought to how the forest once looked. People experience the area as it is, with many recreational opportunities. Trail uses include mountain biking, snowmobiling, horseback riding and stock packing, ATV users and hikers. Campers use developed campsites and participate in dispersed camping throughout the area. Hunting big game animals (deer and elk) and fishing are also activities that occur. Firewood and Christmas tree cutting, gathering berries, gathering mushrooms, horn hunting (hunting for the shed antlers of deer and elk) and other activities occur as well. Viewing scenery and enjoying the landscape is a part of all of these activities.

Trails developed for recreational use provide users with an interaction in the environment at a slow pace, a closer look at nature, and perhaps a more personal experience. Camping sites are temporary living spaces that envelope the user thoroughly in a forest environment. These places often become special places that are highly valued and sought after due to an experience that is more than simply a visual image or viewing activity. The landscape provides an experience rich in meaning and value.

Access is key to how outdoor recreation resources are used. Recreation sites easily accessed by vehicle have higher visitation rates than those located in remote, roadless areas. See ISSUE 1.4.1—Restricted Access, page 30.

Recreation Opportunity Spectrum (ROS)

The project area has motorized opportunities from roads built during timber harvest and mining activities from past decades; however, Access Management Plans have reduced these roaded opportunities over the last few years. The project area is managed as semi-primitive non-motorized, semi-primitive motorized, roaded modified, and roaded natural. Recreation opportunity acres are divided between the motorized (43,740 acres) in the summer time, (48,329 acres) in the wintertime, and non-motorized (4,589 acres) categories.

Based on the seven elements, the Forest Service assigns one of six ROS settings zones to all National Forest land; four of these apply to the project area.

ROADED MODIFIED (RM)

A natural environment substantially modified, particularly by vegetation and landform alterations. There is strong evidence of roads and /or highways. Frequency of contact is low to moderate.

ROADED NATURAL (RN):

A natural-appearing environment with moderate evidence of the sights and sounds of humans. Such evidence usually harmonizes with the natural environment. Interaction between users may be moderate to high with evidence of other users prevalent. Motorized use is allowed.

SEMI-PRIMITIVE NON-MOTORIZED (SPNM):

A natural or natural-appearing environment of moderate to large size. Concentration of users is low, but there is often evidence of other users. Use of local roads for recreational purposes is not allowed.

SEMI-PRIMITIVE MOTORIZED (SPM):

A natural or natural-appearing environment of moderate to large size. Interaction between users is low, but there is often evidence of other users. The opportunity exists to use motorized equipment.

Table 116 Estimated ROS Acres

ROS Setting	Existing
SPNM/SPM	4,598
Semi-Primitive Motorized(SPM)	10,056
Roaded Natural (RN)	21,769
Roaded Modified (RM)	11,915

Recreation Sites

There are 118 recreation sites including dispersed campsites identified and mapped within the project area. Other sites are present, but are not mapped in a current data base. It is useful to keep in mind that activities vary in importance over time. Therefore, dispersed sites that are presently in use today may not be in the future. So this data is valid only over an intermediate length of time. The majority of dispersed campsites are within riparian areas with little evidence of water quality impacts and concerns. Two sites along County Road 20 have been identified as needing corrective measures as they are causing resource damage to Middle Fork of the John Day River with Threatened fish species (see 1.2.1.3 Undesired Condition: Damaged Aquatic Habitat page 11).

MIDDLE FORK CAMPGROUND

Middle Fork Campground is located on County Road 20 along the Middle Fork John Day River in the Tincup Ck/Little Butte Ck subwatershed. Middle Fork is a developed fee campground with 10 campsites and receives moderate use. This campground is used consistently throughout the use season, but use is higher during the big game hunting seasons. There are 2 newer type vault toilets provided, but no drinking water is available.

This campground has rustic structures with a moderate challenge for access for people with disabilities. The camp-pads are hardened and the road rocked with boulder placement to prevent vehicle access to the Middle Fork of the John Day River. The campground can accommodate vehicles with trailers but there are limited sites for motor homes. A Vegetation Management Plan was done in 1997 with a prescription of 80-120 ft/A basal area with another entry planned in 15-20 years. The stand is generally composed of ponderosa pine with western larch and there are Douglas-fir present as well. The campground is within the Middle Fork John Day River riparian area with minimal impacts to the riverbank. (See Chapter 4 .1.2.1, page)

CAMPGROUNDS: DEERHORN FOREST CAMP (CAMPGROUND)

Deerhorn Forest Camp (Campground) is a non-fee campground with facilities typical of developed campgrounds. Deerhorn is located on County Road 20 along the Middle Fork John Day River, has 5 sites with fire rings, picnic tables, and one vault toilet.

This is a Forest campground but it is not a fee campground and is currently sustaining high use(see Recreation Interface with Aquatic Habitat, page 139). No drinking is water available at this campground.

This campground has rustic structures with a moderate challenge for access for people with disabilities. The road is rocked with only one of the five camp-pads rocked. Only one of the camp-pads is currently developed; the other 4 are undeveloped. The site can facilitate vehicles with trailers, but has limited sites for motor homes. The Forest Camp is within the Middle Fork John Day river riparian area and has some evidence of impacts to bank stability from current use at the upper campsite. This site is continuing to erode approximately 20 feet of riverbank (see Recreation Affects in RHCAs, page 136).

TRAILS AND TRAILHEADS

BLACKEYE TRAIL 243

The Blackeye Trail (number 243) beginning at the Trail Head is 2.4 miles long; with a difficult level and a ROS class of semi-primitive non-motorized[66] (summer); semi-primitive motorized[67] (winter) for snowmobiles. This is a designated foot; horse and bicycle trail with undeveloped snowmobile use in the winter. The route lies in the Vinegar Hill Indian Rock Scenic area. The west end trailhead is located on Forest Road 4559 at Lemon Cabin. The east end trailhead is located on Forest Road 2010219, which is steep and has 12-inch deep ruts in the roadbed. This road is quite difficult to access especially when pulling horse trailers. The existing trails (not including the existing road) are in fairly good condition and only will require maintenance.. The Blackeye trail/trailhead lays in the

[66] **Semi-Primitive Non-Motorized:** A natural or natural-appearing environment of moderate to large size. Concentration of users is low, but there is often evidence of other users. Use of local roads for recreational purposes is not allowed

[67] **Semi-Primitive Motorized:** A natural or natural-appearing environment of moderate to large size. Interaction between users is low, but there is often evidence of other users. The opportunity exists to use motorized equipment.

north half of Galena Watershed in the Granite Boulder, Little Boulder Creek /Deerhorn, and Vinegar Creek subwatershed.

DAVIS CREEK TRAIL/TRIAL HEAD 244

The Davis Creek Trail (number 244), beginning at the Trailhead is 11.8 miles long with a difficult level and a ROS class of Roaded Modified (RM). This is an all purpose trail with a designation of foot, horse, bicycle, and 2-wheeled motorcycles. The route lays in general forest with easy access. The trail is in the south half of Galena watershed in the Davis Creek/Placer Gulch, Little Boulder Creek/Deerhorn, Tincup Creek/Little Butte Creek, and Butte Creek subwatersheds.

All Terrain Vehicles (ATV) currently use the trail and use is currently high and increasing. Due to inadequate trail width current use may not be safe as the entire length does not meet trail guide specifications for ATV use. The entire trail length of 11.8 miles is less than standard width and would require major reconstruction to meet the guides for ATV use. The Davis Creek Trail fords Butte Creek three times and has water quality and fish concerns at each of these crossings due to ATV use. Currently, there is resource damage occurring in other stream crossings along segments of the trail and inadequate bridge crossings (see **ISSUE 1.4.2—Effects of All Terrain** Vehicle (ATV) use; page 31 and Davis Creek Trail; page 136). Two of the three trailheads on the west end are inadequate. Forest Road 2050032/666 for approximately 1.6 miles is a native surface road with some deep potholes. There are limited opportunities for ATV trails in this project area—other than the existing Davis Creek Trail.

DAVIS CREEK BICYCLE TRAIL

The Davis Creek Bicycle Trail is 23.4 miles long with a more difficult level. The biggest portion of trail is on existing open roads and is completely functional, but is need of signing. The bicycle trail is located 10 miles west of Austin Junction on County Road 20 this trail travels through Butte Creek, Tincup Creek, Little Boulder Creek, Deerhorn Creek, Davis Creek, Placer Gulch Creek and Placer Gulch subwatersheds in the Project Area.

TEMPEST MINE TRAIL 256

The Tempest Mine Trail (number 256) beginning at the Trail Head is 3.5 miles long; with a difficult level and a ROS class of semi-primitive non-motorized (summer); semi-primitive motorized (winter) for snowmobiles. This is a designated foot; horse and bicycle trail with undeveloped snowmobile use in the winter. The route lies in the Granite Boulder Creek. The trailhead is located on Forest Road 4559 at Lemon Cabin.

BLACKEYE/TEMPEST MINE TRAILHEAD

In 1998 Lemon Creek blew-out Forest Road 4559 and vehicle access to the trailhead was blocked. The Blackeye and Tempest Mine trails have a common trailhead located at Lemon Cabin on Forest Road 4559. The road was blocked at Forest Road 4559 and 4559283 with a pole barricade. Trail and trailhead access from this point is by foot traveling up Forest Road 4559 for approximately 1.25 miles. The portion of Forest Road 4559 that was converted into part of the trail just past Lemon Cabin crossing Granite Boulder creek needs rehabilitation work done to the roadbed to stop the rutting which is occurring at this location and contributing to water quality concerns. Trailhead concerns include the concern that there is no accessibility for the Lemon family to their Existing cabin

PRINCESS TRAIL/TRAIL HEAD 251

This trail is located in the North half of Galena Watershed in the Granite Boulder subwatershed. Only 1 mile of trail and trailhead lies in the project area.

The Princess Trail is 9.3 miles long; with a more difficult level; a ROS class of semi-primitive nonmotorized (summer); semi-primitive motorized (winter). This is a designated foot, horse and bicycle trail that has undeveloped snowmobile use in winter. The route lies in the Vinegar Hill-Indian Rock Scenic Area with a portion of trail in the Granite Boulder subwatershed. The west end trailhead is located on Forest Road 4500537 at Head O' Boulder Forest Camp. The east end trailhead is located on Forest Road 2010148.

The east end trailhead is on Forest Road 2010148. In the *Land and Resource Management Plan,* management closed Forest Road 2010148 to vehicle access and was converted to a hiker/horse trail. The current trailhead is an undeveloped small turnaround. Planned reconstruction is to occur in the futures, upgrading this trailhead to accommodate 2 vehicles with trailers along with three to five parking slots, and a gate across the road. The road leads to private land, and the landowner has vehicle access under a Closed Road Permit. West end trailhead is on Forest Road 4500537 at Head O' Boulder Forest camp. This trailhead is not within the planning area.

PRINCESS TRAIL BICYCLE TRAIL/251

This trail is located in the North half of Galena Watershed. In the Granite Boulder Creek, Little Boulder Creek/Deerhorn Creek, Vincent Creek, Vinegar Creek subwatersheds.

The Trail is 47.7 miles long with a more difficult level. This bicycle trail is located 2.3 miles from the junction of County Road 20 and Forest Road 2010. The biggest portion of trail is on existing open roads and is in need of signing.

VINCENT SNOWMOBILE TRAIL/257

North half of Galena Watershed. In the Vincent Ck and Vinegar Ck subwatersheds. The Trail is 12 miles long. Route lies on Forest Road 2010 and Forest Road 618. The trail is under an Memorandum of Understanding(MOU)with the Sumpter Valley Snowmobile Club for maintenance requirements and grooming.

BRIDGE CREEK SNOWMOBILE TRAIL 256

This trail is located in the South half of Galena Watershed in the project area in the Davis Creek/Placer Gulch subwatershed. The Trail is 9 miles long and its Route lies on Forest Road 011, 033, 570, 485 and 361.

The trail is under an MOU with the Sumpter Valley Snowmobile Club for maintenance. Trail is not a groomed trail.

VINEGAR HILL-INDIAN ROCK SCENIC AREA

The Vinegar-Hill-Indian Rock Scenic Area has 4,137 acres that falls within the Project Area, this portion of the 17,234 acre scenic area is part of 13,322 acres administered by the Blue Mountain Ranger District of the Malheur National Forest. Two other National Forests share the remaining one third of administrative responsibilities of this area. The area is drained by the Middle Fork of the John Day River on the Malheur National Forest, the North Fork of the John Day River on the Umatilla National Forest portion, and the Burnt Powder River on the Wallowa-Whitman National Forest

portion. The recreation experience in Vinegar Hill-Indian Rock Scenic Area has a Recreation Opportunity Spectrum (ROS) classification of semi-primitive non-motorized and semi-primitive motorized during the winter, (see definitions page 228). This area is managed for semi-primitive non-motorized guidelines and the Recreation Opportunity Spectrum (ROS) boundary will remain the same. The Vinegar Hill-Indian Rock Scenic Area is indicated as an area providing "outstanding natural aesthetics" and should be, "preserved and protected." The *Land and Resource Management Plan* indicates retention as the visual quality objective for this area. The Summit Fire burned a significant portion of this area.

3.4.4—Heritage Resources

Currently, the Southeast Galena project area contains 135 heritage resource sites. The documentation of these properties has occurred during surface surveys that were conducted in the Butte Tincup/Little Butte, Vinegar, Vincent, and Little Boulder/Deerhorn subwatersheds in support of restoration projects. A majority of the cultural resource properties in the planning area are mining and railway logging related sites. Many of these sites occupy large segments of the landscape and provide forest visitors with a visual connection to key periods in the history of northeastern Oregon.

The prehistoric sites in the Southeast Galena Project area are exclusively lithic scatter properties that are valued in light of their potential to provide scientific data to anthropological and paleo-environmental research efforts. These lithic scatters are generally small (less than 5 acres) and display sparse assemblages of formed stone tools, reduction flakes, and occasionally ground stone. Several display potential for buried archaeological deposits.

The landscape of the Southeast Galena planning area has been highly influenced by mining activities, which began in 1864 and continue, at far less active levels to the current day. Mining landscape features such as placer tailings, waste rock piles, hydraulic ditch systems, prospect holes, adits, and shafts, are common throughout most of the subwatersheds in the planning area. Built mining related properties, such as: cabins, flumes, and mills or other ore processing localities are also commonplace, particularly near historic claims. Mining related resources could be considered valuable due to their data potential and/or their ability to visually convey their associations with important historic events or people.

Railroad logging has also played a prominent role in the history of the watershed. The Oregon Lumber Company constructed narrow gauge railway from the town of Bates down the Middle Fork of the John Day River toward the mining towns of Susanville and Galena in 1916. Use of the Middle Fork line was discontinued in 1945. Railroad logging site types in the project area include: linear segments of railroad grade in various conditions, trestles and other earthwork engineering features, and remnant logging camp/temporary occupation sites. Spurs of this system extend from the mainline up major tributaries of the Middle Fork such as Vinegar Creek, Flat Creek, and Butte Creek. Remnant railroad logging camps are located in the Vinegar Creek and Flat Creek drainages.

Table 117 Documented cultural resource sites in the Southeast Galena Project area by subwatershed.

Subwatershed	Prehistoric sites	Historic mining sites	Historic RR logging sites	Miscellaneous Historic sites
Placer/Davis	2	17	8	1
Tincup/Little Butte	9	3	6	1
Granite/Boulder	2	10	0	1
Little Boulder/Deer Horn	6	4	7	0
Vincent	2	13	4	0
Vinegar	3	18	2	0
Butte	2	5	1	1

3.4.5—Roads (see Appendix G Map 33 Existing Condition)

Both open and closed roads that are improperly located frequently impact stream conditions. In Riparian Habitat Conservation Areas (RHCAs), roads may restrict stream meandering nature of streams (or sinuosity). In addition, roads can reduce riparian vegetation which provide fish habitat and wildlife refuge. Some road segments act as sediment sources, delivering increased loads to downhill portions of neighboring streams. Poor road location, improper construction, inadequate culvert size and functioning capacity, as well as a lack of road maintenance are examples of the conditions, which have contributed to these sediment problems. Generally, roads alter, concentrate, and intercept water flow across the landscape, augmenting peak flows in spring, and reducing late summer flows during a naturally dry time when water is needed most. Many of the roads were built on former railroad grades that were the means of early logging in the project area.

The *Land and Resource Management Plan* (LRMP) for the Malheur National Forest (1990) displayed projected timber harvest of over 200 MMBF annually. Amendments to the plan, listing of Threatened, Endangered and Sensitive species, and other recent developments have drastically constrained the amount of annual timber harvest from the Forest. As a result, the opportunities to reconstruct and maintain roads in conjunction with timber harvest activities have declined drastically during the past decade. In addition, the Cooperative Work Forest Service (CWFS) trust funds that are accumulated through deposits generated from log haul have also declined drastically within the same timeframe. A cursory comparison between the Forest funds available for road maintenance a decade ago, relative to what is available currently, indicates that the total dollar figure has not changed significantly. However the Forest has taken on the road management for the Snow Mountain District, which added over 2000 miles of roads, and the dollars per mile needed to accomplish the work has increased steadily with inflation. This has resulted in the Malheur National Forest having far less funding ability, with the responsibility to maintain a significantly larger number of road miles. Consequently, in recent years most of the available funding has been directed towards maintaining the Forest Arterial and Collector roads (Level 3 to 5 roads), that receive the highest traffic use. In the interim, the maintenance needs of local roads (Level 1 and 2 roads) have been mostly deferred, because the funds to maintain the roads to standards are simply unavailable. The overall result is that most of the Forest road system is in a downward or deteriorating condition. This applies to most of the Level 3 to 5 roads, and even more to the Level 1 and 2 roads. Recent road condition surveys indicate a majority of the roads in the Southeast Galena project area need to be reconstructed to meet both user safety needs as well as water quality concerns. Adverse effects of roads can include contributing sediment to streams, disturbing big game (during hunting season,

harsh winters, and calving seasons), removing forest land from production, increasing the spread of noxious weeds, and changing the recreational experience. Benefits of roads can include opening areas for recreation users, allowing access for commodity utilization, and allowing access for resource management. The Southeast Galena Project Area also includes a relatively large number of roads that are either no longer needed for management, or are causing unacceptable resource impacts. Given the existing funding situation for road maintenance such roads are logically the first consideration for decommissioning. Existing open road densities in the Southeast Galena project area, generally meet, or exceed *Land and Resource Management Plan* Standards. The Galena Watershed includes 450 miles of system roads, of which about 267 miles are within the project area. This may represent substantially more roads than are needed for all users of this area. Some of the existing roads are located in riparian areas, and many of these roads are contributing to stream sedimentation, increased stream temperature, and are not suitable for future access. In some instances, use of unsurfaced roads during wet weather in spring and fall is adding to the level of stream sedimentation. At the end of this document see Appendix G Roads Analysis, and Map 32 existing condtion.

3.4.6—Local Communities

Some people feel that restoration work can provide long-term employment for local residents who have traditionally been employed by timber-harvest related employment. Restoration activities require skilled labor and equipment that can support employment in local communities. The definition of communities can generally be characterized as either geographically based places, or like-minded groups of people who form relationships or communities of interest, or a combination of both (Society of American Foresters 1989, Beckley 1998). Most of the concern related to restoration related employment raised during scoping focused on communities in Grant County.

For purposes of this analysis, “community” describes the spatial location of groups of people living in the rural areas directly adjacent to the Southeast Galena Project area or in surrounding Grant County. People in these communities have expressed concern about their ability to adapt to rapid changes in their environment from mill layoffs or closures, and resulting changes in their social organization such as drop in school enrollment as the population declines from people leaving the area to find work..

Photo 20—Austin, Oregon viewed toward project area.

Remaining in the Austin/Bates area are a number of local residents of the town of Austin; employees of the Austin Section, of the Oregon State Highway Department; fire crews made up of summer employees of the U.S. Forest Service, stationed at the Blue Mountain Work Center; a tavern, restaurant, store and gas station called, "The Austin House," and several homes built on permitted lands managed by the Malheur National Forest. Currently, approximately less than thirty-five people live within a five mile radius of Austin.

The town of Greenhorn was once a timber and mining town, as well. Today, residents who remain are mainly involved in mining activities, or are part-year summer-home residents. Greenhorn is located only three to four air miles northeast of the Southeast Galena project area. Approximately 15 home sites exist and phone service was recently provided. The town of Greenhorn is incorporated, although there are very minimal services for the three permanent residents.

3.4.7—Social Values and Beliefs

Information about people's attitudes, beliefs and values and their changing perceptions about past, present and future needs and expectations is important to fully understand the impact of the project proposal on the human dimension.

Although no surveys of people have been completed for the Southeast Galena Restoration project area, public comments and concerns indicate a range of spiritual and aesthetic values associated with the area. For example, scenic quality is particularly emphasized in the Vinegar Hill-Indian Rock Scenic Area, and the Dixie Butte Roadless Area provides opportunities for solitude and personal renewal. Some "places" such as Lemon Cabin are referred to by a variety of people associated with the project in the context of geographic, cultural or historical values.

In a survey of Oregonians and national public and their values regarding natural resources, respondents identified protecting resources for future generations as the most important factor. The three most important factors for eastside residents were a quality place to live, outdoor recreation and wildlife habitat. Factors most important to national interests were wildlife habitat, and ecological health (Brunson and others 1994).

In terms of orientation toward beliefs about managing natural resources, Oregonians and the national public tended to "strongly support a less commodity-based, more ecologically sensitive approach to federal forest management" although this belief was slightly less likely for residents of Eastern Oregon (Steel and others 1994, Haynes and Horne 1997). Other surveys of residents of the Interior Columbia River Basin reveal top priorities for protection of forests, rangelands and wilderness. Overall, 76 percent of the people favored protecting watersheds, fish and wildlife habitats, endangered species, ecosystems and wilderness. Most people want a protective ecosystem approach and do not favor commodity production as the primary management of public lands (Rudzitis et al 1995). Beliefs held by members of local communities which have been accustomed to economic advantage from commodity values derived from National Forest land often differ from regional and national opinions, of those who have no economic stake locally. The viewpoint in local communities, therefore, would hold a different outlook from any notion of passive or non-use values prevalent in national values, beliefs, or attitudes.

3.4.8—American Indian Tribes

American Indian Tribes are concerned about effects to their treaty rights and interests in the area. Changes in road access, trail access, vegetation treatments may affect tribes treaty rights and interests.

The Confederated Tribes of the Warm Springs Reservation; and the Confederated Tribes of the Umatilla Reservation; as well as the Burns Paiute Tribe retain rights (see **1.5.1—Applicable Laws and Treaties**, page 35) in the Middle Fork area. These American Indian Tribes—all use the Malheur National Forest, for hunting, fishing, gathering, and religious purposes. Many still use traditional areas in the region (including the project area) for hunting fishing and gathering (see 3.2.6.4.6—Culturally Significant Plants, page 202). Chokecherry is an example of an important traditional food. Hunting for a variety of mammals and fishing with a current emphasis on trout are important subsistence activities for tribal members. Access by road is important especially for elders with limited mobility (Burns Paiute Tribe 2001).

The USDA Forest Service shares in the federal government's overall trust responsibility to Indian tribes where treaty or other legally defined rights apply to National Forest System lands. In redeeming this shared responsibility, the agency assists in carrying out the intent of the treaties and other obligations, by operating in a just and responsive way; making efforts to adjust the management of National Forest System lands in favor of the concerns of the respective Indian Tribes, as far as practicable, while still maintaining a responsibility to all the people—the general public. These actions and adjustments need to be carried out through consultations with tribal officials or their designees, on a government-to-government basis (McConnell 2001).

3.4.9—Environmental Justice

The population of the area is predominately white, followed by American Indians depending on the particular county. The region is sparsely populated, and contains low populations of minorities. Ethnic minorities include Hispanic groups and distribution of minority groups varies widely across northeastern Oregon (refer back to Figure 3).

Poverty rates provide some indication of the percentage of the population in surrounding communities with low-incomes. All of the counties surrounding the project area have higher than average populations living in poverty except Gilliam (9.4 percent) and Morrow (7 percent). The other counties have average poverty rates of 19.6 percent (Malheur), 16.8 percent (Baker), 15.6 percent (Umatilla), 15.6 percent (Asotin), 14.8 percent (Harney), 14.5 percent (Grant), 14.5 percent (Walla Walla), 13.1 percent (Wallowa), 13.9 percent (Union), 12.5 percent (Wheeler), 12.5 percent

(Columbia), and 10.9 percent (Garfield). The Oregon statewide average rate of persons living below poverty is 11.6 percent (Oregon Employment Department 2001).

Data regarding minorities or people with disabilities employed in the region in the timber, mining, ranching, road construction, forestry services and recreation sectors is unavailable. Some firms contracted by the Forest Service for reforestation work have traditionally hired Hispanic workers that comprise a migratory workforce in the area. A certain amount of contracts are reserved for award to minority businesses under the USDA Office of Small and Disadvantaged Business Utilization and the Small Business Administration although overall contract amounts to these groups has declined since 1998 (USDA 2000).

Hispanics—Information on uses of National Forest System lands by Hispanics in the project area is unavailable, but surveys of users in the Southwest and California reveal that families with extended members as part of the social unit seek recreation opportunities that fit all ages for maximum number of people and interactions. Short, intense trips typically on major holidays to specific developed spots are common. Subsistence harvest of natural resources such as trees, shrubs, herbs, grasses, roots, tubers, berries and large and small game are important for food, fuel, building materials, tools, clothing and medicine (Garcia 1999).

African Americans—African American use of the analysis area is unknown, but studies indicate this group recreates mostly in parks and forests closest to urban areas with developed facilities (Johnson 1999).

Asian and Pacific Islanders—Past information on uses by Asian and Pacific Islands include commercial mushroom harvesting and developed camping associated with this activity. Family groups typically camp together or in large groups sometimes occupying entire sites. Established Asian and Pacific Islander American groups collect mushrooms as a fall ritual for personal use (Otani and Shon 1994).

Persons with Disabilities—Universally accessible sites are important to meet the standards for the Americans with Disabilities Act (ADA). The primary concern raised during public scoping referred to maintaining motorized access for scenic driving, wildlife viewing or big-game hunting. Accessible facilities include one toilet at Deerhorn Campground, and two accessible toilets and two designated parking sites at the Middle Fork Campground in the project area. Many disabled persons value undeveloped areas and enjoy experiencing the natural world as a place they can escape the societal stigma of other people (McAvoy and Lais 1999).

CHAPTER 4.0—ENVIRONMENTAL CONSEQUENCES

4.1 Introduction

Chapter 4.0: Environmental Consequences and Chapter 3.0 Affected Environment (page 111) form the *scientific and analytic basis* for the summary comparison presented in Chapter 2.0 of this document beginning on page 38. Chapter 4.0 presents the predicted effects of all alternatives, presenting the predicted attainment, or non-attainment of the project objectives and the effects on the quality of the human environment. Additionally, predicted effects of how environmental impacts effect significant issues (see 1.4 Issues Studied in Detail, page 30) and the consequences of recommended action, alternative action and no action would result from future implementation.

This Chapter focuses on the following eight types of effects where applicable:

- Direct, indirect, and cumulative effects
- Adverse effects that cannot be avoided
- Relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity
- Irreversible and irretrievable commitment of resources that would be involved if each of the alternatives were implemented.

This Chapter has the following four major sections:

- **4.2—Predicted Attainment of Recommended Objectives, page 239.**
- **4.3—Predicted Effects on Relevant Resources of All Alternatives—by Significant Issue, page 327.**
- **4.4—Socio-Economic Effects, page 429.**

In determining the effects outlined in this chapter, there were a number of assumptions and current trends that were highlighted by the team in setting the situation at which time these effects were analyzed. This list is not necessarily complete but does give one the foundation of how and where anticipated effects and what predicted outcomes or results were derived.

ASSUMPTIONS—HARVEST

- Values for the percentage of activity areas detrimentally disturbed by yarding systems are based on commonly accepted estimates: up to 20% for tractor yarding and 10-12% for cable yarding, and 3-5% for helicopter logging
- Tractor and skyline estimates include road segments adjacent to activity areas and since these road segments are included in the discussions about effects of roads, detrimental disturbance are probably overestimated by about 3%.

ASSUMPTIONS—ROADS

- The need for a basic transportation system will continue to exist;
- Available maintenance dollars will remain static or increase only marginally in the foreseeable future;
- Roads can adversely affect water quality and riparian habitat;
- Road conditions can present a hazard to users, and a liability to the Forest;
- Users include recreational, administrative, fire protection, permittee, contractors, special uses, miners, etc.;
- Benchmarks are at 5, 10, 25, 50, 100, and 125 years (after signed decision notice or date of first timber sale) and use of these benchmarks will vary among the resources.
- Recreational use and associated vehicle traffic will increase moderately in the foreseeable future.

ASSUMPTIONS—VEGETATION

- The climate will be within the current range of variation.
- The Forest Vegetation Simulation (FVS) model can be used to compare between alternative treatments.
- The Desired Condition is approximated by the Historic Range of Variation.
- To compare alternatives with a common measure, all treatments are assumed to occur in the same year.
- Current insects and diseases will continue to inhabit the forest and populations will fluctuate depending on stand conditions.
- Current human values will continue to be the same in the future.
- Some of the current trends in forest stand composition, structure, and density, assuming no further management would occur, are as follows:
  - Structural stages do not reflect the HRV, due to stand conditions natural disturbances are expected to continue to reduce the amount of old forest structure.
  - Young forest multi-strata structural stage is expected to decrease due to lack of resistance to natural disturbances.
  - Growth is currently slow, and growth rates will continue to decline due to overstocking and because of overstocking the development of a large tree component as present during historical conditions will take a long time.
  - Species composition is skewed towards late-seral species on many sites, and will not change until a major disturbance recycles the forest stands back to the stand initiation stage.
  - The resiliency and sustainability of the forest is declining at the present time, and will continue until there is a stand replacing disturbance.
- Long-term projections become estimates at best, however, results do show trends compared to where the resources are today.
- Once a forest stand is treated, low intensity fire will safely be applied to the landscape periodically.

4.2—Predicted Attainment of Recommended Objectives

This portion this document presents the predicted effects of all alternatives, presenting the predicted attainment, or non-attainment of the project objectives (desired conditions) as they are applied to1.2.2 , on page 21, and the effects on the quality of the human environment.

4.2.1 Treatment Objectives for Early Season Peak and Near Peak Stream Flows

Across the landscape, peak and near peak stream flows in early spring are prolonged reducing water availability for late season flows. See ***1.2.2.1 Desired Condition: Lower Peak*** Flows*, page 21.*

Table 118 Peak Flows

STATEMENT OF NEED	DESIRED RESTORATIVE OUTCOME OR OBJECTIVE
A need exists within the project area to capture and hold water for longer periods of time, making water available in late summer/early fall to improve fish and wildlife habitat.	By implementing aquatic, vegetation, and infrastructure projects, cool water is held for longer periods of time across the project area and is available in late summer/early fall for fish and wildlife species.

4.2.1.1—Alternative 1—Early Season Near and peak flows—No Action

The watershed risk associated with multiple small soil and hydrologic disturbances dispersed across the planning area would continue. Under these conditions a high intensity, short duration storm such as a 5 yr. event (0.5 in./hr rainfall for about 15 min.) is likely to cause several of these disturbances to become connected, further concentrating surface flows and accelerating run-off and increasing probability of additional mass movement.

High elevation meadows where sheep grazed historically causing resource damage, would show little change in soil accumulation and development, which occurs over geologic time. Vegetation would remain relatively unchanged. Erosion risk would remain elevated. With more time and little change in conditions occurring, there is increased probability that another debris torrent or similar event would occur in one of drainages identified in Chapter 3.0 - Affected Environment.

Exposed mineral soil associated with mine tailings would continue to show little change in soil accumulation and development, which occurs over geologic time. There would be little dead or alive ground cover. Overland flows would be concentrated and erosion risk locally and in connection with other disturbance would remain elevated.

With time these risks would increase or decrease depending on the type of disturbance. For instance, the 5000 acres of previous harvest where compaction is the primary disturbance would continue to heal until, about 50 years after harvest occurred, the soils would no longer be considered detrimentally compacted. Soil texture, while not fully restored, would no longer be measurably limiting plant growth or contributing to the concentration of overland flow.

Headward expansion and scouring of intermittent channels, ephemeral draws, and rills and gullies would generally continue.

Roads would continue to concentrate flows and sediment to stream channels as described in the Affected Environment. Erosion paths associated with roads, either as direct sources or as conduits, would be likely

to increase downward and headward, extending the drainage network and capturing and concentrating a larger percentage of overland flow. The percentage increase would depend on the additional ground eroded which would be dependent on both snow melt and the occurrence of high intensity localized, short duration storms. Roads would continue to intercept subsurface flows for the lifetime of the roads. There would be some increase in the number of small slope movements due to the continuation through time of saturated soil conditions, proportional to the percentage of at risk soils compared to the Forest level. An average of one event a year would continue to occur on these soils.

Stream-road crossings would remain in their current condition and numbers, contributing sediment and concentrating surface flows to streams, with the stream channels remaining vulnerable to detrimental interactions of water, sediment and wood. Current culvert placement is also holding the channels in degraded, or down cut elevations of stream reaches, thereby keeping flood planes disconnected.

ATV use of the Davis Creek Trail stream-trail crossings would continue increasing risks similar to those described for stream-road crossings. Cross-country ATV travel would continue at the current or an increased level; effects at stream crossings would be similar to those described except that more stream banks would be detrimentally impacted.

Use at the 5 dispersed camp sites known to be impacting riparian areas would continue, probably with detrimental impacts increasing in area or becoming more concentrated in smaller areas.

Coarse woody material and riparian hardwood shrubs would continue to occur in low numbers. Coarse woody debris numbers would be expected to increase after year 50 in Dry Forest and fewer in Moist Forests as riparian stands aged. Riparian hardwood shrubs would contribute little to bank stability because their numbers are expected to remain low and existing plants to be low in vigor given current browsing levels by large ungulates (cattle deer and elk) and disconnected flood planes.

Water absorption and storage is expected to remain about the same throughout the project area with some areas recovering naturally following coarse woody material recruitment and some areas developing accelerate erosion. Stream channels would generally remain disconnected from associated floodplains for the next 10-50 years, including large meadows along the Middle Fork at Caribou Creek and along Vincent Creek. As coarse woody material gradually increases from year 50 to year 125 and increases more rapidly following year 125, water absorption, storage and release would move toward potential. Similar recovery rates are expected along Granite Boulder, Butte and Davis creeks and along some segments of Vinegar Creek. Other segments of Vinegar Creek would continue to adjust, moving toward potential over the next 50 or more years.

The conditions described above would continue to contribute to the chronic disturbance of the project area. Generally chronic disturbance rates would be expected to decline gradually over the next 50 years, if no other ground disturbing activities were recommended . Recovery would continue after year 50 to year 125 and beyond as coarse woody material was recruited into stream channels and they began to move toward channel potential. Roads would continue to intercept groundwater and channel flow for their lifetime. During the period of time that chronic disturbance remained elevated, the risk of debris torrents or other mass movements would remain elevated proportionally.

4.2.1.2—Early Season Near and peak flows—Alternative 2

Overland and in-channel flow is expected to be slowed and captured by soil and riparian areas on 1,492 acres beginning about one year after implementation. Similar changes would occur along about 113 miles of stream and in areas associated with the 115 in-stream fish structures (see Map 8—Stream and Riparian Rehabilitation for Action Alternatives). Coarse woody material placed on sparsely vegetated or eroded hillslopes, particularly in Vincent and Vinegar subwatersheds, is expected to slow overland flow and capture sediment, improving infiltration and reducing run-off. Fencing or coarse woody material placed around

degraded riparian meadows and seep/springs throughout the project area is expected to promote the recovery of these areas and increase the water storage capacity associated with them. Placement of in-channel coarse woody debris expected to trap sediment, creating in-channel storage (hyporheic) zones in the moderate and steeper gradient streams. Channel/flood plain rehabilitation would create about 15 acres of wetland or moist riparian storage area along lower Vincent and Caribou Creeks and along the Middle Fork of the John Day River using several levels of treatment. Channels would be reconnected to floodplains by developing increased channel meander and reconnecting side channels. Straightened channels would be re-routed and in-stream structures would promote channel meander. Stream channel rehabilitation in Vincent Creek would include reconnecting multiple side channels, decommissioning a valley bottom road and modifying existing structures intended to maintain the current location. Sediment inputs are expected to increase at the time of installation and in the first year following implementation and return to pre-activity levels by about year 3.

Increased capture of overland flows, including peak and near peak flows, would begin in the first year after implementation and would continue to become effective over 10-50 years or over 125 or more years, depending on the location. Because more water would be stored on the hill slopes, in riparian areas, and behind in-channel features, more water would be available for late season base flows. Water availability would increase in proportion to the rate of recovery of storage areas and their size. Less water is expected to leave the project areas during spring melt and storm events.

Thinning prescriptions are expected to have no measurable effect on water yield. Most of the treatment prescriptions would result in thinned stands in which changes in interception of precipitation, and in snow sublimation, accumulation and melting are generally not measurable. Water quantity and timing are unlikely to be affected by these prescriptions as the remaining vegetation is expected to use the resources formerly going to support additional trees by year 5.

About 1,690 acres of openings created by shelterwood harvests, may alter interception of precipitation and snow sublimation, accumulation and melting. Studies from the Blue Mountains are inconclusive a to the actual extent of the effect on water yield. The amount of recommended harvest is too small (3% of the project area) to have measurable effects across the project area. Overland flow and subsurface flows from these areas may contribute to increased peak and near peak flows at immeasurable, declining levels until the forest stand or other vegetation occupies the site. Interception and snow processes are expected to begin recovery in these areas immediately following planting. Salvage would have no effect since the trees are already blown down.

Harvest in tractor and cable units and the development of landings under all harvest systems (about 1,383 acres of detrimental soil disturbance) is expected to influence water absorption, storage and release, probably at levels that are difficult to observe. Even with common mitigation, skid trails, cable corridors (to a lesser extent) and landings subtly alter the landscape's ability to process water, reducing the amount that infiltrates and flows through the soils below the surface, altering the rates of subsurface flow, and bringing subsurface flow to the surface. These processes are affected first by the scale or total amount of disturbance recommended ; under Alternative 2 (see Table 119) the amount of disturbance is second highest among the action alternatives. Second the risk that concentrated surface flows would develop is increased proportionately to the concentration of disturbance with units yarded by ground-based systems receiving the most concentrated disturbance followed by units yarded by skyline and then units yarded by helicopter. Under Alternative 2, about 50% of the harvest area or 5,090 acres are recommended for ground-based yarding and nearly 25% of the harvest area, or 2,110 acres for cable yarding. Although helicopter units tend to have little to no disturbance in the units themselves, landings tend to be larger, potentially concentrating proportionately greater amounts of surface flow from landings.

Watershed processes are, also, affected by the types of soils on which the various yarding systems occur since soils higher in clay or sand, for instance, absorb, store and transport water differently. These conditions are worsened by logging-related disturbance. The effects on watershed processes are also

proportional to the amount of sensitive soils impacted. Alternative 2 has the second highest amount (735 acres) of sensitive soils detrimentally disturbed by yarding activities and, along with Alternative 5 the highest amount of sensitive soils detrimentally disturbed by tractor yarding (467 acres). Also, under Alternative 2, 383 acres of tractor detrimental disturbance is on clayey soils and 118 acres of cable on serpentine, granitic, and miscellaneous soils. The disturbance recommended under Alternative 2 is expected to contribute to higher peak and near peak flows that are longer in duration. The effects of these activities are expected to be second in magnitude among the action alternatives, although the magnitude is unknown. As a greater proportion of water is removed earlier in the year, less water is expected to be available for late season base flows.

Table 119 Harvest Area and Estimated Area of Detrimental Disturbance (Acres)

SOIL TYPE	LOGGING SYSTEM	**ALT. 2** HARVEST AREA♠	**ALT. 2** EST. DIST. ♠
Inclusions, clayey-non-forested	T	972	195
	S	144	15
	H	187	9
Clayey, forested soils	T	538	108
	S	0	0
	H	15	1
Ash over clayey soils	T	407	81
	S	171	17
	H	1,260	64
Residual serpentine	T	19	2
	S	37	4
	H	4	1
Ash over serpentine	T	143	29
	S	197	20
	H	119	6
Ash over granitics	T	73	14
	S	263	27
	H	32	3
Miscellaneous soils	T	203	40
	S	346	35
	H	148	8
Other soils	T	2,861	573
	S	823	83
	H	1,038	51
TOTAL		**10002**	**1,384**

NOTES: ALT. = Alternative **T =** Tractor Skidding **S =** Skyline Yarding **H =**Helicopter Yarding
EST. DIST. = Estimated Disturbance♠ based on acres calculated in 2000.

Post-Sale activities expected to have negligible effects on hydrologic function include hand piling and burning on 1,850 acres, competing vegetation control on 900 acres, pocket gopher control on 1,690 acres, noxious weed treatment on 1.3 acres because these activities do not directly influence soil water movement or overland flow.

Prescribed fire on 11,370 acres outside mechanically treated units and 12,380 acres within mechanically treated units, as mitigated, is not expected to result in measurable changes in overland flow or soil water movement. The capacity of soils to absorb water (infiltration) is not altered by prescribed fire. Leaving a layer of organic material on the soil (forest floor) ½" deep is expected to prevent the concentration of overland flows and to maintain water absorption rates. Similarly, it is expected that overland flows would not be concentrated and water absorption rates would be maintained in RHCAs when prescribed fire enters these areas.

Planting on 1,930 acres is not expected to accelerate the recovery of precipitation interception and snow processes in the openings associated with regeneration harvests by decreasing the time until a forest stand occupies the site. Planting is expected to move water yields and timing toward the natural conditions faster, although not at a rate that is measurable due to the small area affected by this prescription.

Post-harvest activities which are likely to affect soil water movement or water absorption are subsoiling on 190 acres, and the construction of either hand (37.6 miles) or machine fire-line (11.6 miles). Subsoiling is expected to increase infiltration rates and reduce overland flow concentrations on 190 acres where yarding is expected to have caused these processes and soil conditions to have been altered detrimentally.

Subsoiling is expected to contribute to the reduction of peak and near peak flows at undetectable levels, compared to post-yarding conditions. The increase in overland flows and reduction in absorption are not expected to be measurable but are expected to contribute to increased peak and near peak flows and reduced base flows.

The construction of both machine and hand fire-line is expected to accelerate and concentrate overland flows and reduce water absorption, especially on sensitive soils and subsoils with high or very high erosion potential, naturally low ground cover, and slow absorption rates. Although these effects are likely to be immeasurable, they contribute to increased soil disturbance and affect hydrologic function.

The aspen restoration projects including the use of fire are expected to influence soil water movement and overland flow in ways similar to those described for planting and prescribed fire.

Roads and trails influence water quantity and timing by intercepting surface and subsurface flows, altering flow paths, and accelerating the removal of water from the landscape as described in the Chapter 3.0—Affected Environment. Generally, these effects are proportional to the dimensions of the road segment and to the location of the road on the landscape.

Recommended decommissioning of 67 miles of road is expected to promote the recovery of hydrologic function (capture, storage and safe release of precipitation) beginning in the first year after implementation, with the recovery process continuing beyond year 50. Fifty-five miles would be decommissioned on the sensitive soils, proportionately decreasing the risk further. Recommended decommissioning of 205 stream-road crossings is expected to reduce risk of detrimental interactions among water, sediment and woody debris at engineered crossings which result in further acceleration of run-off and loss of in-stream storage areas and storage areas adjacent to channels following the year of implementation. In year 1, removing culverts may introduce up to 0.5 cubic yards of sediment to stream channels at each location. Capture, storage, and release of precipitation at near normal rates is expected to occur in some areas, depending on local conditions, as soon as year 50 and in other areas after year 125.

Decommissioning of 3 stream-ATV trail crossings and 3 dispersed campsites in RHCAs (see Alternative Comparison Table 68 Chapter 2.0, page 103) are expected to have effects similar to those described for road decommissioning, but smaller in scale. Capture, storage, and release of precipitation at near normal rates is expected to occur in some areas, depending on local conditions, as soon as year 10 and in other areas after year 50. Construction of two stream-ATV crossings and of three dispersed sites would move ground disturbance from fish-bearing perennial streams to intermittent streams and from within RHCAs to hill slopes. These new crossings and campsites are expected to be designed and constructed to a standard that reduces local disturbance compared to former sites. In addition, the relocation of dispersed sites is expected to diffuse the direct effects of the ground disturbance associated with these recreational sites on RHCAs since the sites would be removed from RHCAs. The relocation of ATV crossings from perennial to intermittent streams is not expected to alter measurably risk or size of detrimental interactions between water, sediment and woody debris. Reconstruction of 9 bridges and 6 fords (stream crossings) and improvements at 2 dispersed camp sites in RHCAs are expected to reduce risks of detrimental water, sediment, and woody debris interactions at the crossings and to reduce the concentration of flows from the campsites and crossings.

The recommended construction of 4 new crossings across ephemeral draws and 0.12 miles of road in RHCAs will contribute to an increased risk of detrimental interactions between water, sediment and woody debris, that would result in accelerated run-off. The net decrease in road crossings is 205crossings. The net decrease in roads is 46 miles of road, 22 miles of which are located in RHCAs.

Roads also intercept subsurface water flows, which contribute to late season flows and route this water off hill slopes more rapidly than undisturbed soils. The overall net effect of the recommended activities is to reduce subsurface water interception along 49 miles of road. This assumes that 67 miles of road would be decommissioned and that 18 miles of new road with similar effects on the interception of subsurface flow would be constructed.

Aquatic projects, road decommissioning, road relocation away from streams and RHCAs, and road reconstruction are expected to decrease chronic disturbance and move the project area toward hydrologic potential. Some projects such as the cutting of commercial and pre-commercial timber or sub-soiling are expected to be neutral or to move the project area slightly towards hydrologic potential. Other activities, such as yarding, landing development, and fire line construction introduce soil and hydrologic disturbance that adds to the chronic disturbance and moves the project away from hydrologic potential, although the disturbance declines over about 50 years during which the project area is moving toward potential.

Impacts from decommissioning and reconstructing roads, such as those associated with culvert removal or replacement and sub-soiling are expected to begin decreasing after one year and to be unobservable after about 5 years. Soil recovery in the road prism is expected to begin immediately following implementation. Water movement through the former road prism is expected to approach natural potential by about year 50.

When changes in water absorption and storage capacity result in large enough changes in peak and near peak flows and, conversely, summer base flows, flows alter the geomorphology of stream channels. It is expected that the alteration in water absorption, storage and concentration described for the aquatic recommended actions, road decommissioning, road relocation, and road reconstruction, especially in the headwaters, would reduce the risk of debris torrents, similar mass movements, or other sediment, water, wood interactions at road crossings. It is expected that this reduction in risk would be countered by an increase in risk caused by the increased disturbance described for some of the activities included in the vegetation and infrastructure projects, much of which, with the exception of new roads, is expected to recover in about 50 years. The net change in disturbance is expected to decrease chronic disturbance and to move the project area toward hydrological potential over about 125 years or longer.

Prescribed fire on 11,370 acres outside mechanically treated units and 12,380 acres within mechanically treated units and connected recommended treatments are expected to reduce wildfire hazard as described in the 2.5.4 VEGETATION section (See Implementation Tool—Mechanical Treatment, page 59; and 2.5.4.2 Implementation Tool—Fire Treatment page 70). Reduction in fire hazard decreases potential for uncharacteristically severe wildfire and the extent of soil damage from such wildfire. Reduction in soil damage is expected to result, post-wildfire, in more areas where water absorption and storage capacity are maintained and in fewer areas of concentrated overland flow. The change in post-fire water quantity and timing would be smaller than under the No Action Alternative.

The rehabilitation projects recommended for eroding hill slopes, riparian areas, and stream channels work together to capture, store, and slowly release water from the landscape.

4.2.1.3—Early Season Near and peak flows—Alternative 3

Hill slope and stream channel conditions would be treated by the watershed and fish habitat projects (see Appendix E, Map 8—Stream and Riparian Rehabilitation for Action Alternatives). Overland and in-channel flow is expected to be slowed and captured by soil and riparian areas on 1492 acres, along about 110 miles of stream, and in association with the 36 existing in-stream fish habitat structures recommended for modification. Effects of these projects would be the same as those described for Alternative 2. Channel/floodplain rehabilitation projects and placement of large woody material for in-stream fish habitat, requiring the use of heavy equipment, would not be implemented. Water absorption and storage capacity in-channel, in the 15 acres of valley bottoms in Vincent and Caribou drainages influenced by these channels, and in the riparian areas associated with the in-stream fish structures would remain at the current level, which is estimated to be less than half of potential.

Effects of thinning and salvage prescriptions are expected to have no measurable effect on water yield as discussed for Alternative 2. The effects of shelterwood harvest are the same as described for Alternative 2.

Timber yarding in tractor and cable units and the development of landings under all harvest systems (about 1,156 acres of detrimental soil disturbance) is expected to negatively influence water absorption, storage and release, probably at levels that are difficult to observe. Even with common mitigation, skid trails, cable corridors (to a lesser extent) and landings subtly alter the landscape's ability to process water, reducing the amount that infiltrates and flows through the soils below the surface, altering the rates of subsurface flow, and bringing subsurface flow to the surface. These processes are affected first by the scale or total amount of disturbance recommended ; under Alternative 3 (see Table 120) the amount of disturbance is lowest among the action alternatives which include commercial harvest. Second the risk that concentrated surface flows would develop is increased proportionately to the concentration of disturbance with units yarded by ground-based systems receiving the most concentrated disturbance followed by units yarded by skyline and then units yarded by helicopter. Under Alternative 3, 55% or 4580 acres are recommended for ground-based yarding and 20% or 1720 acres for cable yarding. Although helicopter units tend to have little to no disturbance in the units themselves, landings tend to be larger, potentially concentrating proportionately greater amounts of surface flow. Watershed processes are, also, affected by the types of soils on which the various yarding systems occur since soils higher in clay or sand, for instance, absorb, store and transport water differently. The clayier soils, especially those with clayey subsoils tend to absorb, store, and release less water, causing more surface flow to concentrate and increasing the risk that concentrated flows would cause erosion or reach stream channels earlier. These conditions are worsened by logging-related disturbance. The effects on watershed processes are also proportional to the amount of sensitive soils impacted. Alternative 3, of the action alternatives with commercial harvest, has the lowest amount (587 acres) of sensitive soils detrimentally disturbed by yarding activities. Also, under Alternative 3, 383 acres of tractor disturbance is on clayey soils and 148 acres of cable on serpentine, granitic, miscellaneous, and clayey soils. Tractor yarding would not occur on 28 acres of ash over serpentine soil and skyline yarding would be reduced on about 21 acres of sensitive soil (miscellaneous, clayey, and granitic) (see Table 120). The disturbance recommended under Alternative 3 is expected to contribute to higher peak and near peak flows that are longer in duration to a lesser extent than under Alternatives 2 and 5. As a larger proportion of water is removed earlier in the year, less water is expected to be available for late season base flows.

Table 120 Harvest Area and Estimated Area of Detrimental Disturbance (Acres)

SOIL TYPE	LOGGING SYSTEM	**ALT. 3** HARVEST ACRES	**ALT. 3** EST. DIST.
Inclusions, clayey-nonforested	T	942	188
	S	108	11
	H	133	6
Clayey, forested soils	T	537	108
	S	0	0
	H	13	1
Ash over clayey soils	T	407	81
	S	131	13
	H	90	5
Residual serpentine	T	19	2
	S	37	4
	H	4	1
Ash over serpentine	T	115	23
	S	192	20
	H	119	6
Ash over granitics	T	66	14
	S	216	22
	H	32	3
Miscellaneous soils	T	201	40
	S	269	27
	H	112	6
Other soils	T	2,284	457
	S	771	78
	H	617	30
TOTAL		**7418**	**1,156**

NOTES: ALT. = Alternative **T =** Tractor Skidding **S =** Skyline Skidding
H =Helicopter Yarding **EST. DIST. =** Estimated Disturbance

As described for Alternative 2, post-sale activities such as hand piling and burning on 840 acres and noxious weed treatment on 1.3 acres are expected to have negligible effects on hydrologic function.

Prescribed fire on 10,640 acres outside mechanically treated units and 10,610 acres within mechanically treated units, as mitigated, is not expected to result in measurable changes in overland flow or soil water movement as described for Alternative 2. The capacity of soils to absorb water (infiltration) is not altered by prescribed fire. Leaving a layer of organic material on the soil (forest floor) ½" deep is expected to prevent the concentration of overland flows and to maintain water absorption rates. Similarly, it is expected that overland flows would not be concentrated and water absorption rates would be maintained in RHCAs when prescribed fire enters these areas.

Planting on 1,450 acres is expected to accelerate the recovery of precipitation interception and snow processes in the openings associated with regeneration harvests by decreasing the time until a forest stand occupies the site.

Post-harvest activities, which are likely to affect soil water movement or water absorption include subsoiling on 190 acres, yarding tops attached on 4,730 acres and the construction of either hand (28 miles) or machine fire line (8.5 miles). The effects are similar to those described for Alternative 2.

The construction of both machine and hand fire line is expected to accelerate and concentrate overland flows and reduce water absorption. Risks are higher on sensitive soils.

The aspen restoration projects including the use of fire are expected to influence soil water movement and overland flow in ways similar to those described for planting and prescribed fire.

The effects are the same as those described for Alternative 2 except slightly smaller. About one half mile (0.5 miles of reconstruction of roads in RHCAs) less as well as 1 mile of new construction less than Alternative 2 is recommended . By foregoing reconstruction of these road segments, it is expected, that the current interception of subsurface flows and concentration of flows in the roadway to be maintained. Interception of flows along the newly constructed roads would be slightly less than under Alternative 2.

Chronic disturbance would not be alleviated on 3 miles of stream, in the 15 acres of valley bottom associated with these channel segments, and in the areas where 79 new, in-stream fish habitat structures are recommended . These areas would continue to contribute to the departure from hydrologic potential. The remaining aquatic projects, road decommissioning, road relocation away from streams and RHCAs, and road reconstruction is expected to decrease the chronic disturbance and move the project area toward hydrologic potential. Some projects such as the cutting of commercial and pre-commercial trees or sub-soiling are expected to be neutral or to move the project area slightly toward hydrologic potential. As under Alternative 2, other activities, such as yarding, landing development, and fire line construction would introduce a smaller amount of soil and hydrologic disturbance. The total increase in disturbance associated with Alternative 3 is less than that associated with Alternative 2, however the long term benefits will also be less than those associated with Alternative 2. As under Alternative 2, much of the disturbance declines over about 50 years during this time the project area is moving toward natural potential. New roads add to the chronic disturbance and departure from potential for the lifetime of the road and are expected to be the same as for Alternative 2.

As under Alternative 2, it is expected that the alteration in water absorption, storage, and concentration due to the recommended actions of road decommissioning, road relocation, and road reconstruction, especially in the headwaters, would reduce the risk of debris torrents or other similar soil movements. Drainage, road crossings interaction concerns would also be reduced but to a lesser extent than for Alternative 2 since a smaller area is being treated. As under Alternative 2, it is expected that this reduction in risk would be countered by the increase in risk caused by the increased disturbance described for some of the activities included in the vegetation and infrastructure projects. This increase in disturbance is expected to be smaller than that for Alternative 2 since harvest is recommended for a smaller area. Much of which, with the exception of new roads, is expected to recover in about 50 years. The net change in disturbance is expected to decrease chronic disturbance, at about the same level as Alternative 2. The difference between Alternatives 2 and 3 is that the remaining chronic disturbance would be different. Under Alternative 3, current aquatic and riparian conditions, which contribute to increased peak and near peak flows and to smaller summer base flows in Granite Boulder, Vinegar, Butte, Davis, and Vincent creeks and along the Middle Fork at the Caribou confluence, would remain. A smaller amount of new disturbance (related to timber harvest) would be added to the chronic disturbance. It is not expected that the chronic conditions along most of the streams listed above would improve naturally until about year 125, because natural large woody recruitment is expected to be low based on the relatively young age of riparian stands adjacent to these streams and the health of the trees.

Prescribed fire on 10,640 acres outside mechanically treated units and 10,610 acres within and connected recommended treatments are expected to reduce wildfire hazard as described in the 2.5.4 VEGETATION section (see Implementation Tool—Mechanical Treatment, Page 59; And 2.5.4.2 Implementation Tool—Fire Treatment page 70).

4.2.1.4—Early Season Near and peak flows—Alternative 4

Hillslope and stream channel conditions would be treated by the watershed and fish habitat projects (see Appendix E, Map 8—Stream and Riparian Rehabilitation for Action Alternatives). Overland and in-channel flow is expected to be slowed and captured by soil and riparian areas on 1,492 acres, along about 110 miles of stream, and in association with the 36 existing in-stream fish habitat structures recommended for

modification. Effects of these projects would be the same as those described for Alternative 2. Channel/floodplain rehabilitation projects and placement of large woody material for in-stream fish habitat, requiring the use of heavy equipment, would not be implemented.

Pre-commercial thinning is expected to have no measurable effect on water yield as discussed for Alternative 2. The aspen restoration projects including the use of fire are expected to influence soil water movement and overland flow in ways similar to those described for planting and prescribed fire. No other mechanical treatment of forest vegetation is recommended .

No harvest is recommended or landing development is recommended . There would be no increase in chronic disturbance on sensitive or other soils attributed to yarding of timber or to post-harvest activities.

Road decommissioning and reconstruction effects would be the same as those described for Alternatives 2 and 3. The effects of relocating a 3 segments of road and includes 2.2 miles of new road construction, while decommissioning about 67 miles of road, including about 24 miles of road in RHCAs and 205 stream-road crossings are the same as described for Alternative 2.

As described for Alternative 2 the recommended activities either increase or decrease chronic disturbance and departure from hydrologic potential of the project area. As described for Alternative 3 chronic disturbance on 3 miles of stream, in the 15 acres of valley bottom associated with these channels segments, and in the areas where 79 new, in-stream fish habitat structures are recommended would not be alleviated. The remaining aquatic projects, road decommissioning, road relocation away from streams and RHCAs, and road reconstruction are expected to decrease chronic disturbance and move the project area toward hydrologic potential as described for Alternative 2. Cutting pre-commercial trees is expected to be neutral or to move the project area slightly towards hydrologic potential. The increase in disturbance, under Alternative 4, compared to Alternative 2 and 3, is expected to be smaller as most activities recommended under Alternative 4 move the project area toward hydrologic potential after the first two years. Only the construction of hand line and the construction of new road (which replaces road segments causing greater hydrologic disturbance) move the project away from hydrologic potential in a declining trend for about 50 years or for the lifetime of the road. The net reduction in road milage under this Alternative is 67 miles, the greatest under the action alternatives.

As under Alternative 2, it is expected that the alteration in water absorption, storage, and concentration described for the aquatic recommended actions would reduce the risk of debris torrents, similar mass movements, or other sediment, water, wood interactions at road crossings but to a lesser extent than for Alternative 2 since a smaller area is being treated. Unlike the other action alternatives, this reduction in risk is countered by a relatively small amount of new disturbance as described above. The net reduction in disturbance and movement toward hydrologic potential is represented by the improvement expected on 1,492 acres and 110 miles of stream with increased risk occurring on 2.2 miles of road, which because of its location and reconstruction would be lower than the risk associated with the current road segments. Also, some of the current, chronic disturbance would not improve naturally for about 125 years (as described under Alternative 3), compared to Alternative 2.

Prescribed fire on 17,230 acres outside precommercial thinning units and 1,930 acres within precommercial thinning units and connected recommended treatments are expected to reduce wildfire hazard as described in the 2.5.4 VEGETATION section (see Implementation Tool—Mechanical Treatment, Page 59; and 2.5.4.2 Implementation Tool—Fire Treatment page 70).

4.2.1.5—Early Season Near and peak flows—Alternative 5

Effects of the aquatic projects are the same as those described for Alternative 2.

The effects of thinning prescriptions are expected to be the same as described for Alternative 2 except that they would occur over a larger area as shown in Table 121.

The effects of shelterwood harvests are expected to be the same as those described for Alternative 2.

Timber yarding in tractor and cable units and the development of landings under all harvest systems (about 1494 acres of detrimental soil disturbance or about 30%) is expected to negatively influence water absorption, storage and release, probably at levels that are difficult to observe but there will be more impact from this alternative than any other. Even with common mitigation, skid trails, cable corridors (to a lesser extent) and landings subtly alter the landscape's ability to process water, reducing the amount that infiltrates and flows through the soils below the surface, altering the rates of subsurface flow, and bringing subsurface flow to the surface. These processes are affected first by the scale or total amount of disturbance recommended ; under Alternative 5 (see Table 121.) the amount of disturbance is highest among the action alternatives. Second the risk that concentrated surface flows would develop is increased proportionately to the concentration of disturbance with units yarded by ground-based systems receiving the most concentrated disturbance followed by units yarded by skyline and then units yarded by helicopter. Under Alternative 5, 55% or 6,320 acres are recommended for ground-based yarding and 15% or 2,610 acres for cable yarding. Although helicopter units tend to have little to no disturbance in the units themselves, landings tend to be larger, potentially concentrating proportionately greater amounts of surface flow. Watershed processes are, also, affected by the types of soils on which the various yarding systems occur since soils higher in clay or sand, for instance, absorb, store and transport water differently. The clayier soils, especially those with clayey subsoils tend to absorb, store and release less water, causing more surface flow to concentrate and increasing the risk that concentrated flows would cause erosion or reach stream channels earlier. These conditions are worsened by logging-related disturbance. The effects on watershed processes are also proportional to the amount of sensitive soils impacted. Alternative 5 has the highest amount (733 acres) of sensitive soils disturbed by yarding activities and, along with Alternative 2 the highest amount of sensitive soils disturbed by tractor yarding (467 acres). Also, under Alternative 5, 383 acres of tractor disturbance is on clayey soils and 154 acres of cable on miscellaneous, clayey, serpentine, and granite soils. The disturbance recommended under Alternative 5 is expected to contribute to higher peak and near peak flows that are longer in duration. The effects of these activities are expected to be first in magnitude among the action alternatives. As a greater proportion of water is removed earlier in the year, less water is expected to be available for late season base flows.

As under Alternative 2, post-sale activities which are expected to have negligible effects on hydrologic function include hand piling and burning on 1,970 acres, competing vegetation control on 1,320 acres, pocket gopher control on 2,600 acres, noxious weed treatment on 1.3 acres because these activities do not directly influence soil water movement or overland flow.

Prescribed fire on 10,780 acres outside of mechanically treated units and 13,990 acres within mechanically treated units, as mitigated, is not expected to effect peak and near peak flows as described under Alternative 2. Effects of planting are expected to be similar to those described for Alternative 2. Effects of the aspen restoration projects are similar to those described for Alternative 2.

As under Alternative 2 some post-harvest activities are likely to affect soil water movement or water absorption as described for Alternative 2, expect that a greater area would be disturbed as shown in Table 121 and contributing to reduced water absorption and storage and increased concentration of surface flows.

The construction of both machine (20.6 miles) and hand (57.1 miles) fireline is expected to have effects similar to those described for Alternative 2.

As described for Alternative 2, generally, the effects of infrastructure projects are proportional to the dimensions of the road segment and to the location of the road on the landscape.

Recommended decommissioning of 64 miles of road and of 252 stream-road crossings is expected to have effects similar to those described for Alternative 2. Effects are also proportional to the amount of decommissioning occurring on sensitive soils, which is 3 miles fewer than under Alternative 2. It is expected that pulling culverts would result in up to 0.5 cu. Yd. of sediment entering streams at each location.

Table 121 Harvest Area and Estimated Area of Detrimental Disturbance (Acres)

SOIL TYPE	LOGGING SYSTEM	ALT. 5 HARVEST ACRES	ALT. 5 EST. DIST.
Inclusions, clayey-nonforested	T	1,003	201
	S	171	18
	H	183	9
Clayey, forested soils	T	538	108
	S	0	0
	H	15	1
Ash over clayey soils	T	407	81
	S	401	40
	H	849	43
Residual serpentine	T	19	2
	S	37	4
	H	4	1
Ash over serpentine	T	143	29
	S	197	20
	H	119	6
Ash over granitics	T	73	14
	S	266	27
	H	32	3
Miscellaneous soils	T	201	40
	S	443	45
	H	200	11
Other soils	T	3,341	669
	S	771	78
	H	1166	58
TOTAL		**10584**	**1,503**

NOTES: ALT. = Alternative **T =** Tractor Skidding **S =** Skyline Skidding
H =Helicopter Yarding **EST. DIST. =** Estimated Disturbance

Decommissioning of 3 stream-ATV trail crossings and 3 dispersed campsites in RHCAs are expected to have effects similar to those described for Alternative 2. The construction of 6.1 miles of new ATV trail is expected to detrimentally, but in an unquantifiable manner affect capture, storage, and release of precipitation along its length for the lifetime of the trail.

The recommended construction of 10 new crossings and 1.4 miles of road in RHCAs will contribute to an increased risk of detrimental interactions between water, sediment and woody debris, that would result in accelerated run-off. Since 2.5 times more locations are recommended than under Alternative 2, the risk is likely to be similarly increased. Also, the construction of new stream crossings and new roads is expected to result in the production of a pulse of sediment in the first year, which would decline to a stable amount over the first 5 years. The net reduction in road crossings is 248 and the reduction of road miles in RHCAs is 26 miles.

Under Alternative 5 the balance of these activities is different from that described for Alternative 2. First, the aquatic projects and road reconstruction reduce chronic disturbance and move the area toward hydrologic potential after the first 1-3 years the same as or similar to the reduction described for Alternative 2. Activities with neutral effects are similar to those described for Alternative 2.

Additions to chronic disturbance under Alternative 5, which moves the area away from hydrologic potential to a greater extent than Alternative 2, include six fewer miles of road decommissioning, four more miles of new road construction, 10 more miles of open and closed roads (combined), and more area in skid trails or cable corridors, landings, and fire line. This includes six new stream crossings and 0.5 miles of new road

construction in RHCAs. The activities, except for new road construction and stream-road crossings, generally recover over 50 years. New roads add to the chronic disturbance and departure from potential for the lifetime of the road or the crossing.

It is expected that the alteration in water absorption, storage, and concentration described for the aquatic recommended actions, road decommissioning, road relocation, and road reconstruction, especially in the headwaters, would reduce the risk of debris torrents, similar mass movements, or other sediment, water, wood interactions at road crossings nearly to the same extent as Alternative 2 does. It is expected that this reduction in risk would be countered by an increase in risk caused by the increased disturbance described for some of the activities included in the vegetation and infrastructure projects, much of which, with the exception of new roads, is expected to recover in about 50 years. The net change in disturbance is expected to decrease chronic disturbance and to move the project area toward hydrological potential over about 125 years or longer.

Prescribed fire on 10,780 acres outside of mechanically treated units and 13,990 acres within mechanically treated units and connected recommended treatments are expected to reduce wildfire hazard as described in the 2.5.4 VEGETATION section (see Implementation Tool—Mechanical Treatment, page 59; and 2.5.4.2 Implementation Tool—Fire Treatment page 70).

4.2.2 TREATMENT OBJECTIVES FOR HIGH STREAM TEMPERATURES

A number of streams do not meet Federal Clean Water Act standards and are on the 303(d) List of Water Quality Limited Waterbodies (1998). See ***1.2.2.2 Desired Condition: Lower Stream*** Temperatures*, page 22.*

Table 122 Water Temperatures

STATEMENT OF NEED	DESIRED RESTORATIVE OUTCOME OR OBJECTIVE
A need exists to lower stream temperatures that are on the State of Oregon *303(d) List of Water Quality Limited Waterbodies (1998)* to comply with *Federal Clean Water Act* and State standards.	With the implementation of aquatic, vegetation, and infrastructure projects, improved habitat conditions that lower and maintain stream temperatures are in a condition that sustains viable populations of fish.

Many of the same impacts discussed in section 4.2.1 Undesired Condition: High Peak Flows has the same type of influence on this section of High Stream Temperatures. Therefore, an understanding of the anticipated impacts under High Peak Flows will give a good foundation for understanding of the interrelationship of these two sections. These sections could have been combined but due to the sensitivity of the 303(d) List of Water Quality Limited Waterbodies, this undesired conditions was separated.

4.2.2.1—HIGH STREAM TEMPERATURES—ALTERNATIVE 1—NO ACTION

Under this alternative the watershed conditions described in the Chapter 3.0 - Affected Environment would continue to be present.

Peak and near peak flows are expected to continue to occur early and continue longer. Late season base flows would continue to be longer in duration and a smaller in magnitude as described in the previous section. Hill slope and stream channel characteristics are expected to continue with rapid runoff. Riparian storage capacity would continue to be reduced from historic level with irrigation ditches continuing to divert water from the landscape. Shade would continue to be below potential and not meet Forest Plan standards along many drainages throughout the project area. Due to these continuing conditions, water temperatures would remain elevated.

The overall aquatic characteristic trends would continue to be degraded for the next 50 years with some slow improvements in vegetation occurring. Temperatures in Davis, Vincent, Caribou, Butte, Granite Boulder Creeks and along the MFJDR are not expected to substantially improve since water storage areas along these channels, requiring the use of heavy equipment, would not be rehabilitated. Natural recovery in these areas is expected to start at an observable level about year 50 as coarse woody material is recruited in those stream segments containing conifers and other hardwoods and is expected to become established by about year 125. The dampening of the overall trend of recovery is expected to be less than any action alternative due to projects not being implemented that would create meander, which would not accelerate the recovery process.

4.2.2.2—HIGH STREAM TEMPERATURES-ALTERNATIVE 2

Under this alternative, conditions described in Chapter 3.0 - Affected Environment would be treated. Some projects may effect stream temperatures i.e. prescribed fire reducing existing vegetation. This impact, with proper implementation, would be undetectable.

Stream temperatures are generally expected to decrease over time as a result of activities which promote shade recovery and the absorption, storage, and late season release of water through drainage and upland improvements. A slight decline in riparian habitat may occur in the first year following implementation of watershed projects, however, changes are likely to be undetectable initially. As the net storage capacity increases over the next 2 to 125 years (see previous Peak Flow discussion), as existing soil disturbance recovers over 50 years, and as shade provided by hardwood planting and protection to better maintain water temperatures recovers at 10 and later years, the greatest change is expected to occur after year 10 and before year 50.

Roads, trails, and dispersed campground projects would contribute, cumulatively to the above improvements by reducing sediment sources and recovering current road locations to riparian shade habitat through road decommissioning projects. Stream temperature improvements may not be detectable for 10 to 25 years as pools developed by the newly established meandering nature of streams and shade then becomes more evident to help maintain water temperatures. The greatest improvement is expected in the 50 plus years as water is absorbed in the uplands and established pools, and shade becomes more prevalent from hardwoods and conifers.

4.2.2.3—High Stream Temperatures-Alternative 3

Under this alternative, some of the recommended activities are expected to cause disturbance possibly affecting water temperatures, however, to lesser degree due to the design of Alternative 2 reducing potential short-term impacts from recommended projects.

Shade is expected to improve over time as described in the plantings and protection of hardwoods as in Alternative 2.

Vegetation projects are expected to affect peak and near peak flows and summer base flows similarly to Alternative 2 except that the scale and magnitude of project results are expected to be less effective in Alternative 3 because no heavy equipment would be used to improve channel meander and create in-stream structures.

Effects from road, trail, and dispersed campground projects would be the same as those described for Alternative 2 (see previous Peak Flows descriptions).

4.2.2.4—High Stream Temperatures-Alternative 4

Shade is expected to be improved over time as described for Alternative 2 and 3.

Vegetation projects are expected to have a neutral effect on peak and near peak flows, and summer base flows due to only prescribed fire and pre-commercial thins being implemented. No harvest would occur as in Alternatives 2 or 3, therefore, effects would be less.

In-stream project effects would generally be the same as those described for Alternative 2 and 3 except that fewer new roads would be constructed, reducing the amount of subsurface flow interception. The decommissioning of roads would result in the same impacts and benefits as in Alternatives 2 and 3.

The overall trend development is expected to be similar to that described for Alternative 2 except that the decline in temperatures in Davis, Vincent, Caribou, Butte, Granite Boulder Creeks and along the MFJDR is not expected to be as great since water storage areas along these channels, requiring the use of heavy equipment, would not be rehabilitated. Natural recovery in these areas is expected to start at an observable level about year 50 as coarse woody material is recruited and to become clearly established by about year 125 as more coarse woody material falls into the streams, based on the age of the riparian stands.

4.2.2.5—High Stream Temperatures-Alternative 5

Shade is expected to be improved over time as described for Alternative 2.

The effects of vegetation projects are expected to affect peak and near peak flows and summer base flows similarly to Alternative 2 except that the scale would generally be greater as described for Alternative 5 under Peak Flows.

Effects would generally be the same as those described for Alternative 2 except that more soil and hydrological disturbance is expected to occur due to additional tractor skidded acres and less helicopter yarded acres.

The introduction of a greater amount of soil and hydrological disturbance associated with some of the recommended actions, as compared to Alternative 2, is expected to dampen recovery trends for the first 25 years, and to, possibly, dampen it for a longer period than under Alternative 2 due to the increase in ground disturbing activities

4.2.3 TREATMENT OBJECTIVES FOR AQUATIC HABITAT

Some stream segment conditions are outside an expected range for fish species. *See* ***1.2.2.3 Desired Condition: Functioning Aquatic*** Habitat*, page 22*

STATEMENT OF NEED	DESIRED RESTORATIVE OUTCOME OR OBJECTIVE
A need exists to recover aquatic habitat with emphasis on channel meander and riparian shade to improve aquatic and terrestrial habitat.	By implementing aquatic and infrastructure projects, riparian conditions of channel meander and diverse vegetation will be improved providing riparian habitat needed for dependent fish and wildlife.

AREA ACCESS PLAN

A major influence on the aquatic habitat is that of the transportation system. For today's resource management agenda, roads are an intricate part for the caring of the land and providing access to the land for multiple uses (cf. Appendix G Roads Analysis).

Since 1995, the majority of the watershed has had a comprehensive Access and Travel Management (ATM) Plan analyzed and implemented. In 1994, the Lower Middle Fork ATM Plan was implemented. This ATM plan covered the north side of the Middle Fork John Day River from the Forest boundary east to Granite Boulder Creek. In 1995, the Upper Middle Fork ATM Plan was implemented. This was also on the north side of the Middle Fork John Day River and covered the area from Granite Boulder Creek east to the Forest boundary with the Wallowa-Whitman National Forest. In 1996, the Northside Middle Fork ATM Plan was implemented. This covered the area south of the Middle Fork John Day River from Highway 7 west across Dixie Butte, along the Dixie/Wickiup spring divide, south along West Fork Lick Creek and Camp Creek to the Middle Fork John Day River. The Summit Fire Recovery Project EIS updated the Lower Middle Fork ATM Plan. Based on several issues related to watershed health, sediment reduction, and impacts to fish and wildlife habitat, 125 miles of roads were identified for decommissioning (removal from the transportation system). A common objective of all ATM plans in the watershed was to decommission native surface roads within RHCAs that were not identified to be brought up to a higher standard or were not needed for future management activities.

The results of implementing several different alternative proposals on the Access and Travel Management Plan for the *Analysis Area (Galena WA, Supplement—2002)*are displayed on the following table.

Table 123 Access and Travel Management Plan inside Project Area♠

	ALT. 1	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Total Miles	267	219	218	202	228
Total Road Density (miles per square mile)	3.45	2.83	2.82	2.61	2.95
Open Road Miles♣	132	91	91	89	164
Open Road Miles with RHCAs	33	24	24	24	32
Closed Road Miles♣	135	128	127	113	64
Closed Road Miles within RHCAs	27	12	12	12	4
Open Road Density (miles per square mile) ♣	1.71	1.18	1.18	1.15	2.12
Decommissioned Road Miles	0	67	67	67	62
New Construct Road Miles	0	18	17	2	22
Reconstruct Miles – Minor/Major	0	128/37	128/37	128/37	130/41

NOTE: ALT. = Alternative **RHCA =** Riparian Conservation Areas **TS =** Timber Sale

♠ For all of the action alternatives, about 25 miles of road maintenance or reconstruction work is planned for roads or road segments outside the project area that are needed to access areas inside the project area. These miles are not included anywhere on this table.

♣There are about 12.5 miles of roads recommended for Seasonal Closure (December through March) under alternatives 2, 3, and 4. These road miles are included as closed miles in the table, and not as open miles. There are no seasonal closures recommended under alternative 5.

4.2.3.1—Alternative 1

Under this alternative, the undesired aquatic habitat conditions described in Chapter 1.0 would continue. Shade would continue to be below potential and not meet Forest Plan standards on many stream segments. As a result water, temperatures would continue to be elevated and not meet standards.

Peak flows and near peak flows are expected to continue to occur earlier and are expected to be larger. Consequently, late season flows are expected to be lower and longer in duration. Hill slope and stream channel characteristics are expected to promote rapid runoff. Riparian storage capacity would continue to be reduced. Irrigation diversions would remain, and 267 total miles of roads would continue to intercept subsurface flows. Consequently, peak and near peak flows would remain larger and longer in duration; summer base flows would remain low and longer in duration, and stream temperatures are likely to remain elevated. Risk of large-scale erosion events occurring would remain elevated. These events tend to widen channels and expose more stream flow to radiant heat.

4.2.3.1(ATM)—Alternative 1—Access Travel Management

Use would continue on most or all of the roads that remain open. A few roads may close naturally as a result of encroaching vegetation and very little use. It is not likely that maintenance funding will be sufficient to maintain all of the roads. Overall, road conditions, including those located within RHCAs would have a continued downward trend. Road surface and drainage conditions would continue to degrade, resulting in increased adverse impacts to water quality and riparian habitat. Average Daily Traffic (ADT) numbers on open roads will gradually increase over time, as a result of a predicted moderate increase in the amount of recreational use.

4.2.3.2—Alternative 2

Under this alternative, conditions affecting stream shade and water yield described in the Chapter 3.0 - Affected Environment would be treated—except irrigation diversions would remain (in all of the action alternatives). At the same time, some of the recommended activities are expected to cause disturbances that would result in reduced shade or altered water yields and elevated water temperatures.

Shade is expected to improve over time as both planted (and protected) and naturally occurring hardwood shrubs grow. No measurable change would be evident for about 10 years after implementation. Stream shade along about 20% of the planted streams is expected to meet Forest Plan standards before year 50, and along the rest of the stream lengths, to be closer to meeting the standards. As summer base flows increase in size and low flows decrease in duration, stream temperatures are less likely to be reduced.

Vegetation projects affect peak and near peak flows and summer base flows as described in Section 4.2.1. As aquatic projects are implemented, expected results include an increase in summer base flows and shorter duration of low flow conditions. As this occurs, it is expected that stream temperatures are less likely to be elevated, primarily as a result of increased retention of water across the landscape.

Removal or improvement of culverts restricting fish passage on fish bearing streams and decommissioning of over 24 miles of road in RHCAs would promote the recovery of shade along the adjacent stream segments by year 50. Decommissioning of six ATV trail stream-crossings, and relocation of three dispersed camp sites are expected to have similar effects.

The recommended construction of one perennial crossing would contribute to the loss of shade in the immediate area when implemented. Approximately of 18 miles of new roads are needed for management. However, 5.5 miles of these roads are needed to replace (relocate) roads that are currently impacting aquatic habitat. Further aquatic enhancement would occur as the result of decommissioning over 24 miles of existing roads in RHCA areas.

Cumulatively, aquatic habitat would improve as a result of these projects, particularly in 50 plus years. Stream temperatures are expected to decrease over time, as a result of activities that promote shade recovery and the absorption, storage and late season release of water. The temperature decline is expected to start in the first year following implementation of watershed projects, although changes are likely to be gradual and initially undetectable. Storage capacity is expected to increase over the next 2 to 125 years (see Peak Flow discussion), because of soil disturbance recovery in the next 50 plus years, and as shade recovers at 10 plus years. The greatest change is expected to occur after year 10 and before year 50.

4.2.3.2 (ATM) & 4.2.3.3 (ATM)—Alternatives 2&3—Access Travel Management

In implementing the recommended access plan for both Alternatives 2 and 3, the following roadwork inside the planning area would be accomplished during the first five-year period:

- The new road construction (approximately 18 miles for Alternative 2, 17 miles for Alternative 3), including relocated roads, would be essentially complete;
- The reconstruction work associated with harvest activities (approximately 106 miles for both Alternatives 2, and 3) would also be essentially complete;
- The reconstruction work not connected with harvest activities (approximately 59 miles for Alternative 2, and 3) is expected to be about 20% complete;
- The decommissioning work (approximately 67 miles for both of these alternatives) is 50% complete, including a major portion of the road miles located within RHCAs;
- Road closures to be completed with harvest activities are about 20% complete, and road closures not associated with harvest activities are about 50% complete.

There is about 25 miles of road maintenance and reconstruction recommended outside of the planning area in order to access areas inside of the planning area. This work is all associated with recommended timber harvest, and would occur concurrently with the reconstruction work recommended inside the planning area.

Use would continue on all of the open roads. Because many newly constructed and reconstructed roads require only minimal maintenance, and decommissioning of many other roads is already underway, available maintenance funding would probably be sufficient to maintain most of the remaining roads.

Overall road conditions would be significantly improved. Road surface and drainage conditions would have been improved on many roads, resulting in a reduction of road related impacts to water quality and riparian habitat. ADT numbers on roads that remain open are higher, as a result of reduced open road density and a predicted moderate increase in the amount of recreational use.

The following work would be accomplished within approximately 10 years following the beginning of implementation:

- All of the new road construction, including relocated roads is complete;
- The reconstruction work associated with harvest activities is completed;
- The reconstruction work not connected with harvest activities is about 80% complete.
- The decommissioning work is 100% complete, including all of the miles located within RHCAs;
- Road closures to be completed with harvest activities and those not associated with harvest activities are essentially 100% completed.

Use continues on all of the existing open roads. Because many system roads have been decommissioned, and most of the remaining system roads are either newly constructed or reconstructed and require only minimal maintenance, available maintenance funding would probably be sufficient to maintain virtually all of the roads for at least an additional five year period.

Overall open and closed road conditions have a substantial upward improvement trend. Road surface and drainage conditions have been improved on most roads, resulting in a substantial reduction of road related impacts to water quality and riparian habitat. ADT(Average Daily Traffic) numbers on roads that remain open are higher, as a result of reduced open road density and a predicted moderate increase in the amount of recreational use.

4.2.3.3—Alternative 3

Under this alternative conditions described in the Affected Environment would be treated. At the same time some of the recommended activities are expected to cause disturbance that would contribute to elevated water temperatures.

Shade is expected to improve over time as described for Alternative 2.

The vegetation projects are expected to affect peak and near peak flows and summer base flows similarly to Alternative 2 except that the scale would generally be smaller as described for Alternative 3 in under Peak Flows.

4.2.3.4—Alternative 4

Under this alternative conditions described in the Affected Environment would be treated. At the same time some of the recommended activities are expected to cause disturbance that would contribute to elevated water temperatures.

Shade is expected to improve over time as described for Alternative 2.

Generally these projects are expected to have a neutral effect on peak and near peak flows and summer base flows as described for Alternative 3 under Peak Flows.

Effects would generally be the same as those described for Alternative 2 except that fewer new roads would be constructed, reducing the amount of subsurface flow interception compared to Alternatives 2 and 3.

The overall trend development is expected to be similar to that described for Alternative 2 except that the decline in temperatures in Davis, Vincent, Caribou, Butte, Granite Boulder creeks and along the MFJDR is not expected to be as great, since enhancement of water storage areas along these channels (which would require the use of heavy equipment) is not recommended in this alternative. Natural recovery in these areas, based on the age of the riparian stands, is expected to start at an observable level about year 50 as coarse woody material is recruited, and to become clearly established by about year 125 as more coarse woody material falls into the streams. Very little dampening of the overall trend of recovery is expected since very little new soil and hydrological disturbance would result from the recommended activities.

4.2.3.4 (ATM)—Alternative 4—Access Travel Management

In implementing the recommended access plan for Alternative 4, the following work would be accomplished during the first five-year period:

- The road relocations (approximately 2.2 miles) are complete;
- The road reconstruction work (approximately 165 miles) is approximately 10% to 20% complete;
- The decommissioning work (approximately 67 miles) is approximately 50% complete, including most or all of the miles located within RHCAs;

Road closures are about 50% complete.

Use would continue on most or all of the roads that remain open. A few roads may close naturally as a result of encroaching vegetation and very little use. Available maintenance funding would probably not be sufficient to maintain a major portion of the roads because only 10 to 20% of the needed reconstruction work will have been accomplished.

Overall open and closed road conditions would have a downward trend. Road surface and drainage conditions on many roads would have degraded and result in increased adverse impacts to water quality and riparian habitat. ADT numbers on roads that remain open are higher, as a result of reduced open road density and a predicted moderate increase in the amount of recreational use.

The following work would be accomplished within approximately 10 years following the beginning of implementation:

- The reconstruction work is approximately 50% complete;
- The decommissioning work and road closures are 100% complete, including all of the miles located within RHCAs.

Use would continue on most or all of the roads that remain open. A few roads may close naturally as a result of encroaching vegetation and very little use. Available maintenance funding will probably not be sufficient to maintain all of the roads, because half of the needed reconstruction work would not yet be done.

Overall open road conditions would probably have at least a slight downward trend. While conditions on the roads that have been reconstructed would be improved, on many of the other roads, road surface and drainage conditions would have degraded. For these roads, the results would be increased adverse impacts to water quality and riparian habitat. ADT numbers on roads that remain open are higher, as a result of reduced open road density and a predicted moderate increase in the amount of recreational use.

4.2.3.5—Alternative 5

Shade is expected to improve over time as described for Alternative 2.

The vegetation projects are expected to affect peak and near peak flows and summer base flows similarly to Alternative 2 except that the scale would generally be greater as described for Alternative 5 under Peak Flows.

Effects would generally be the same as those described for Alternative 2 except that more soil and hydrological disturbance is expected to occur as described for Alternative 5 under Peak Flows. The introduction of a greater amount of soil and hydrological disturbance associated with some of the recommended actions i.e. additional tractor skidding, as compared to Alternative 2, is expected to dampen improvement trends as compared to Alternative 2 in the first 25 years and possibly longer.

4.2.3.5 (ATM)—Alternative 5—Access Travel Management

In implementing the recommended access plan for Alternative 4, the following work would be accomplished during the first five-year period:

- The new road construction including relocated roads (approximately 22 miles) is essentially complete;
- The reconstruction work associated with harvest activities (approximately 109 miles) is also essentially complete;
- The reconstruction work not connected with harvest activities (approximately 62 miles) is approximately 20% complete;
- The decommissioning work (approximately 62 miles) is 50% completed including about most of miles located within RHCAs;
- Road closures to be completed with harvest activities are about 20% complete, and road closures not associated with harvest activities are about 50% complete.

There is about 25 miles of road maintenance and reconstruction recommended outside of the planning area in order to access areas inside of the planning area. This work is all associated with recommended timber harvest, and would occur concurrently with the reconstruction work recommended inside the planning area.

Use continues on all of the open roads. Because many newly constructed and reconstructed roads would require only minimal maintenance, and decommissioning of many roads is already underway, for the short-term available maintenance funding will probably be sufficient to maintain almost all of the roads.

Overall open and closed road conditions would be significantly improved. Road surface and drainage conditions would have been improved and result in a reduction of road related impacts to water quality and riparian habitat. ADT numbers on roads that remain open are slightly lower despite a predicted moderate increase in the amount of recreational use, because the miles of open roads have increased.

The following work would be accomplished within approximately 10 years following the beginning of implementation:

- All of the new road construction including relocated roads is complete;
- The reconstruction work associated with harvest activities is complete;
- The reconstruction work not connected with harvest activities is approximately 80% completed;
- The decommissioning work is 100% complete including all of the miles of roads located within RHCAs;
- All recommended road closures are complete.

Use continues on all of the existing open roads. Because many newly constructed and reconstructed roads will require only minimal maintenance, and decommissioning of many roads is completed, for the about the

next five years available maintenance funding would probably be sufficient to maintain virtually all of the roads. Because of an increase in miles of open roads, the maintenance funding needed beyond that five-year period is higher than the other action alternatives, and will probably not be sufficient to maintain all of the open and closed roads.

4.2.4 TREATMENT OBJECTIVES FOR VEGETATION OUTSIDE HRV

Vegetation conditions are outside the HRV for the current climatic period. See1.2.2.4 Desired Condition: Forest Stands Moving Toward Resilient Conditions, page 24.

AND

4.2.5 TREATMENT OBJECTIVES FOR HIGH WILDFIRE HAZARDS

Uncharacteristically severe wildfires are likely to occur. See 1.2.2.5 Desired Condition: Reduced Risk of Severe Wildfire, page 25

Table 124 HRV

STATEMENT OF NEED	DESIRED RESTORATIVE OUTCOME OR OBJECTIVE
A need exists to alter deteriorating forest stands within the project area toward historical forest stand structures, composition, and density to create resilient forest stands that can safely tolerate natural disturbance factors such as infections, infestations, and wildfire.	By implementing vegetation and infrastructure projects, resilient plant life dominates the project area that now has the ability to withstand endemic disturbance regimes of insect infestation, disease infections, and wildfire.

Table 125 Fire Hazard

STATEMENT OF NEED	DESIRED RESTORATIVE OUTCOME OR OBJECTIVE
A need exists to change stand structure, landscape vegetation patterns, and species composition to replicate historic vegetation conditions and reduce the likelihood of uncharacteristically severe wildfire destroying multiple resources and opportunities for human use.	By implementing vegetation and infrastructure projects, fire adapted forest stands once again dominate the landscape in a mosaic pattern where wildfires normally burn with low intensity over most of the area in Dry and Moist Forest types.

Dry Forests were once forested by open park-like stands of large early seral tree species (ponderosa pine and western larch). Lightning and Native Americans ignited fires that burned frequently; consuming ground fuel, reducing the amount of shade tolerant understory trees, and scorching the lower branches. With little fuel on the ground, the fire intensity was low, and since the height of the bottom of the live crown was high enough to keep the ground fire from reaching the crowns, crown fire occurred infrequently. The thick bark on the trees insulated the cambium from the heat of the frequent, low intensity ground fires that occurred. The low stand densities allowed the trees to grow with good vigor and to withstand bark beetle attacks and to outgrow mistletoe infections. The relative lack of shade tolerant late seral species (Douglas-fir and grand fir) reduced the amount of host species for tussock moth and spruce budworm, maintaining these damaging insects at low levels.

Moist forests were historically a mixture of open park-like stands and denser forests that included both early-seral and late-seral tree species, reflecting the variability caused by a mixture of fire regimes and other disturbances. Fires would burn patches up to 2000 acres in size, of which 80% would be an underburn, and 20% would be stand replacement intensity. The patchwork of structural stages and the higher proportion of early-seral species reduced the amount and distribution of host species (Douglas-fir and grand fir) for spruce budworm and Douglas-fir tussock moth, restricting the size and intensity of

defoliating insect outbreaks. These are the same host species that are susceptible to the more damaging root and stem diseases. The result was that the stands were able to withstand periodic disturbances from fire, insects, and disease; exhibiting good resiliency and long-term sustainability.

Species conversion will reduce the amount and distribution of late-seral species in the planning area. That will reduce the severity and extent of insect outbreaks, and reduce the incidence and spread of disease. Thinning will reduce the stocking levels in the overstory and understory, improving tree vigor, which will improve forest resiliency. Prescribed fire will reduce the amount of natural in-growth, reduce dead fuel loading, and scorch the lower live limbs, reducing the torching potential and crown fire potential, which will reduce fire severity and size.

Prescribed burning will be done to stands that are stocked with a majority of species including ponderosa pine, western larch, and Douglas-fir and which may contain understories of grand fir or western juniper that have become established as a result of fire exclusion. A low intensity ground fire is planned to meet the objectives of fuel reduction, vegetation treatment and resource protection. Burn intensities should be varied on a site specific basis depending on weather, fuel, topographic, and tree characteristics that would result in no more than 30 percent crown scorch of the dominant and co-dominant trees. The scorching of the lower live branches up to 20 feet above the ground is desirable because this reduces ladder fuels into trees. By reducing ladder fuels in this manner the chance of a future wildfire would be reduced. Mosaic burning including some unburned areas is desirable in order to have diversity in ground vegetation stages and retain desirable tree regeneration.

4.2.4.1 & 4.2.5.1—Treatment objectives for HRV and High Wildfire Hazards—Alternative 1

This alternative does not treat any stands by commercial harvest, pre-commercial thinning, or prescribed fire.

- 0 acres of commercial thin
- 0 acres of modified commercial thin
- 0 acres on understory removals
- 0 acres of shelterwood/commercial thin
- 0 acres of salvage harvest
- 0 acres of pre-commercial thin associated with harvest
- 0 acres of modified pre-commercial thin associated with harvest
- 0 acres of pre-commercial thin outside harvest
- 0 acres of modified pre-commercial thin
- 0 acres of burn/fuel treatment associated with harvest
- 0 acres of prescribed fire outside harvest units

Desired Condition

Since there would be no treatment to reduce overstocking or to shift the species composition, the stands would continue to become more overstocked, growth would continue to slow, and the trees would become increasingly susceptible to disturbance from insects, disease, and fire. The more crowded and dense the timber stands become over time increases the likelihood and potential severity of catastrophic disturbance events such as uncharacteristically severe wildfire. The overall resiliency to withstand natural disturbances would continue to decrease.

The slowing of tree growth would cause the development of old forest structural stages to be slowed, increasing the time until trees develop into the large size classes. Stands at increased risk to disturbance

could be "reset" to earlier structural stages by disturbances, further reducing the amount of medium sized tree stands available to grow into large trees. Disturbances would continue to be at a larger scale than historically occurred, with "out of scale" adverse effects to water, fish, wildlife, vegetation, and other resources.

Stands would not be within the Historical Range of Variability (HRV) for stand structure.

Structural Stages

There is currently a lack of old forest stand structures due to timber harvest, fires, and other disturbances. Due to the slow growth rates, development of old forest stand structures will take approximately 110 years in the existing ponderosa pine stands, and over 60 years in the existing mixed conifer stands. There is an increasing risk of large-scale, stand-replacing fires that would set back structural stage development, resulting in large areas of young trees and longer time spans (150-200 years) to develop old forest structures.

Table 126 Existing Structural Stages in Percent

FOREST TYPE	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
Dry HRV	5-15	5-25	5-10	5-10	5-15	30-55	5-15
Existing	5	42	3	7	30	1	12
Moist HRV	10-30	5-10	10-20	10-20	10-20	5-15	15-40
Existing	7	6	4	5	39	5	34
Lodgepole HRV	5-30	5-10	5-50	5-15	5-15	5-10	5-15
Existing	0	2	13	42	31	0	12
Cold HRV	20-25	5-10	5-20	5-10	20-30	5-10	15-25
Existing	0	16	9	0	57	0	18

Aspen

Quaking aspen stands will continue to be encroached on by conifers, leading to decline in vigor and numbers. Lack of protection from grazing by cattle and wildlife will reduce the numbers of suckers that are able to grow into trees, in many cases almost eliminating reproduction. The few stands presently remaining will continue to decline and eventually disappear.

Understory Vegetation

Mountain mahogany will continue to be encroached on by conifers, leading to decline in vigor and numbers. Other shrubs, which were adapted to sprout after frequent fires and need sunlight, will continue to decline as the stands become more closed. Pine grass, and other ground vegetation, will continue to decrease in vigor and forage quality with increasing shade and lack of nutrient cycling provided by burning.

Resiliency and Sustainability

Overstocked forest stands will continue to slow in growth and decrease in vigor as stand density continues to increase. Late seral species will continue to increase occupancy in mixed conifer stands. The quantity and vigor of grasses and shrubs in the understory will continue to decline due to the shading and competition for nutrients and water.

Insect Risk

Risk of attack by bark beetles will increase as the trees lose vigor and are less able to pitch out the beetles. As more attacks become successful, the population increases to outbreak levels, killing and damaging

larger pockets of trees. Risk of outbreaks of defoliating insects would continue to increase as the stand composition continues to shift to more late seral species. Large scale applications of insecticides are felt to be ineffective since the habitat for the insect remains and the natural populations are available to periodically reach outbreak levels (Mason 1998, Powell 1994). Widespread defoliation and mortality would increase the fuel loads greatly. The dense, slow growing stands would remain a high risk for fir engraver attacks; further increasing mortality and fuel loading.

Disease Risk

Dwarf mistletoe infections can be expected to increase as trees slow in height growth and the crowns grow closer together. Stem and root diseases would continue to spread in the host fir trees, causing increasing mortality.

Fire Hazard and Risk

The primary stand attributes that control fire behavior are surface fuel condition, crown bulk density, and crown base height (Graham 1999).

The amount, type, and arrangement of ground fuels are classified using fuel models developed by the National Forest Fire Laboratory. The primary Fuel Models present are Fuel Model 9 (Timber With Loosely Compacted Litter) for the Dry Forest and Fuel Model 10 (Timber With Heavy Litter) in the Moist Forest. Prior to fire exclusion, the area with these fuel models was mostly Fuel Model 2 (timber with grass under story) due to low conifer stocking levels. The result of the change from the period before fire exclusion is that now slower spreading wildfires, but wildfires with a longer duration, which burn with higher severities due to the accumulation of fuels greater than 3 inches in diameter. The no action alternative will result in little change in the amount of fuel models 9 and 10 that are currently present and a decrease in Fuel Model 11 (Activity Created Slash From Previous Management Activities) due to decomposition over a time period of between 10 and 20 years. Fuel Model 13, which represents the blow down of timber in Vincent Creek, will continue to exist as an area that would burn with extreme severity during a wildfire but the rates of spread would decrease after the material 3 inches and less decompose over the next 20 years.

The increase in stand density in ponderosa pine stands will increase the likelihood of crown fire by increasing the stand crown-bulk density. Insect and disease mortality will increase the standing and down fuel loadings, increasing fire intensity and severity. Stands with an understory or live crowns that are currently close to the ground will continue to have a hazard of ground fires moving up into the crowns along the fuel ladder. These stands will continue to be susceptible to torching from wildfire, increasing the hazard of crown fire. Stands with no fuel treatments burn at a higher severity and with more crown scorch than similar stands that have been treated to reduce stand densities and fuel loads (Pollet 1999).

In stands with a high proportion of fir trees, there would continue to be a high hazard for uncharacteristically severe wildfire due to the high flammability of late seral species stands. The increase in stand density will increase the likelihood of crown fire by increasing the stand crown density. Insect and disease mortality will increase the standing and down fuel loadings, increasing fire intensity and severity. Stands with an understory will continue to have a hazard of ground fires moving up into the crowns along the fuel ladder created by these smaller trees.

The crown fire hazard remains at 66 percent of the Dry Forest type and at 60 percent for the Moist Forest type. The species mix does not change towards less flammable species, the density is not reduced, and the ladder fuels are not reduced. The area remains at the current high hazard for uncharacteristically severe wildfire. As trees grow and biomass increases, the crown fire hazard will continue to increase. In 50 years, almost all stands will be at a high crown fire hazard without periodic under burning. Only with periodic under burning and mechanical treatment, that could reduce stand densities and reduce fire sensitive species, or with the advent of wildfires that may likely cause uncharacteristically severe wildfire—can stocking be maintained where it is appropriate.

Table 127 Percentage of Crown Fire Hazard by Forest Type

CROWN FIRE HAZARD	DRY FOREST	MOIST FOREST	LODGEPOLE FOREST	COLD FOREST
High	66%	60%	98%	84%
Low-Moderate	34%	40%	2%	16%

Wildfire Hazards at the Watershed Scale

Similar projects are recommended or are being implemented to improve forest sustainability and resiliency throughout the Middle Fork John Day Sub-Basin. If this alternative is selected, the effect will be to maintain a center of insect and disease activity that could spread outside the Southeast Galena project area. If the fire risk were not reduced, fires starting in the Southeast Galena area would be more likely to escape initial attack and become large, uncharacteristically severe wildfires.

The Forest Types (see page 139) covers about 86 percent of the Galena Watershed. About 53 percent of the Forest Types contain high crown fire hazards with ladder fuels and many patches of moderate to heavy ground fuels. This is after stand replacement fires of 1994 and 1996 burned approximately 30 percent of the watershed. The North Fork John Day River Watershed, on the north side of the Galena Watershed, also has similar dense stands with ladder fuels throughout much of the area. This adjacent watershed, had about 24 percent of the area burned in 1996 Tower Fire. To the south of the Galena Watershed the Camp Creek Watershed has higher proportion of dense tree stocking than the above two watersheds this is because in this area there has been no stand replacing fires since fire exclusion began. The cumulative effect is that all of these watersheds have large areas with fuel conditions that are excessively outside the Historical Range of Variability (see page 6). Because of these existing conditions, large uncharacteristically severe wildfires can spread into the adjacent watersheds from the project area, or from these adjacent watersheds into the project area and create large areas with damaged resource conditions that are unlike historic wildfire fire behavior patterns in either extent or magnitude.

Public Safety and Property

If the high fire hazard area south of the Middle Fork is not treated and the roads that are in poor condition in the same area are not improved to provide adequate access for fire fighting equipment—loss to privately owned lands and structures in Bates, Austin, and Austin Junction areas may occur.

The high fire hazard area located in the upper Vinegar Creek drainage that was the result of the 1998 blow down consists of several hundred acres of down timber which has been wind thrown due to this event. This area would not be treated by this Alternative 1. A fire burning into or starting from these fuel conditions would be difficult and dangerous to control and could easily become a large conflagration threatening private property and structures particularly in the vicinity of the town of Greenhorn.

Air Quality

The no action alternative would have the least immediate impact on air quality, as there is no prescribed burning. However, all biomass remains available for consumption by wildfires and it will continue to accumulate, increasing the potential for large amounts of smoke during the summer months, when diurnal inversions can concentrate smoke at low elevations when wind cannot effectively transport and disperse this smoke. These smoke concentrations can have high particulate levels that can cause health problems, or violate summertime Class I air quality visibility standards for Wilderness areas should uncharacteristically severe wildfire occur.

4.2.4.2 & 4.2.5.2—Treatment objectives for HRV and High Wildfire Risk—Alternative 2

This alternative includes:

- 5,720 acres of commercial thin
- 1,230 acres of commercial thin in connectivity corridors
- 880 acres on understory removals
- 1,690 acres of shelterwood
- 250 acres of salvage harvest
- 1,480 acres of precommercial thin associated with harvest
- 750 acres of precommercial thin in connectivity corridors associated with harvest
- 680 acres of precommercial thin outside harvest areas
- 200 acres of precommercial thin in connectivity corridors outside harvest areas
- 2,590 acres of burn/fuel treatment associated with harvest
- 12,380 acres of prescribed fire within mechanically treated units
- 11,370 acres of prescribed fire outside mechanically treated units

The overstocked stands that are thinned will respond over several years, adding more crown area and increasing individual tree growth. The thinning will also shift the species composition, as it will give preference to the early seral species. The shelterwood harvest and the understory removal treatment are designed to remove many of the grand fir and Douglas-fir. Ponderosa pine, western larch, and western white pine that are in the stand are to be retained, thinning out any overstocked clumps.

The stands selected for treatment are 50% of the total area identified that is in need of treatment. The stands not treated would have the same effects as discussed for the No Action alternative.

Desired Condition

Commercial thinning in overstocked stands would enable the remaining trees to respond by increasing their crowns and roots, increasing their ability to utilize nutrients, sunlight, and water. Growth would increase and the trees would grow into old forest structural stages sooner. The increased vigor of the trees would decrease their susceptibility to disturbance from insects and disease; and lessen the likelihood and potential severity of bark beetle outbreaks and mistletoe infestation. The decreased stand density, the increase in size, and the increase in the height to the bottom of the live crown will reduce the chances of torching and the potential for catastrophic crown fires. The overall resiliency to natural disturbances would be increased.

The increased tree growth would cause the development of old forest structural stages to accelerate, decreasing the time until the trees grew into the large size classes by 40 to 60 years. Stands would be resilient to disturbance and would not be “reset” to earlier structural stages by disturbances, enabling them to continue to grow into large trees. Disturbances would be closer to the historic scale of small patches and clumps of trees removed.

Stands dominated by late seral species trees are planned for shelterwood treatments. The shelterwood treatments would remove many of the late-seral species trees from stands, retaining the early-seral species that are there, and reforesting openings with early-seral species. This will shift the species composition closer to the historic composition. The result would range in appearance from a commercial thin to a shelterwood harvest, depending on the existing stand species composition. Treated stands would be more adapted to the natural disturbances that exist, increasing the overall resiliency to natural disturbances. Resilient stands would decrease the risk that disturbance would “reset” the stands to earlier

structural stages, enabling them to continue to grow into large trees. Disturbances would be closer to the historic scale of 200 to 2,000 acres.

The stands that resemble commercial thinning would respond by increasing their crowns and roots, increasing an ability to utilize nutrients and water. Growth would increase and the trees would grow into old forest structural stages sooner. The increased vigor of the trees would decrease their susceptibility to disturbance from bark beetles and mistletoe. The decreased density, increase in tree size and height of the live crown, and reduction in fuel loading will lessen the chances of stand replacing fire. The increased tree growth would cause the development of old forest structural stages to accelerate, decreasing the time until the trees grew into the large size classes by 40 to 50 years. Stands would be resilient to disturbance and would not be "reset" to earlier structural stages by disturbances, enabling them to continue to grow into large trees. Future disturbances would be closer to the historic scale.

The stands that resemble shelterwood treatments would be replanted to early-seral species seedlings. The shelterwood trees left in the stand would be retained as legacy trees to provide a degree of vertical structure. With the reduced competition they would grow well and be resistant to disturbance from insects, disease, and fire. The seedlings would grow rapidly, and with proper spacing control, would develop into large trees in approximately 125 years. They would be resistant to insects and disease, but susceptible to fire until they are about 30 years old.

Removing the understory from selected old forest multi strata stands would create old forest single stratum stands, with no net loss of old forest structure. This will reduce competition to the larger trees in the stands; improve the stand resiliency by reducing susceptibility to insects, disease, and wildfire; and allow for future stand maintenance by underburning.

Salvage of wind thrown trees in the Vinegar Creek drainage would reduce the fire hazard in that area and to the Greenhorn town site located to the northeast (down wind of the prevailing wind direction). It would also clear the site for reforestation by planting and may reduce the breeding sites for spruce and Douglas-fir bark beetles.

The thinning treatments in connectivity corridors will improve stand conditions somewhat, but not to the degree as the standard thinning and thinning/shelterwood treatments. It is anticipated that an additional thinning will be necessary to maintain the stands in good condition, and to remove additional late-seral trees. If not thinned again in the future, growth will slow and it would take an additional 20 to 40 years to reach the old forest structural stage.

Structural Stages

There is currently a lack of old forest stand structures due to timber harvest, fires, and other disturbances. Development of old forest stand structures in the thinned stands, with the increased growth rates, will take about 50 years. The modified thinning will take an additional 20 to 40 years to develop old growth characteristics. This compares with the 110 years that a stand without treatment is expected to take to develop old growth characteristics.

Shelterwood treatments are expected to result in old forest structural stages in 20 years, compared with 60 years with not treatment. More importantly, there is a decreased risk of large-scale disturbances such as insect defoliators or stand-replacing fires that would set back structural stage development, both for the treated stands and surrounding stands.

Stands treated would be, or would be growing towards, the Historical Range of Variability (HRV) for stand structure.

Table 128 Effects of Alt. 2 Treatments on Dry Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5-15%	5-25%	5-10%	5-10%	5-15%	30-55%	5-15%
Existing	5%	42%	3%	7%	30%	1%	12%
10	5%	43%	2%	13%	24%	4%	9%
50	5%	24%	2%	7%	24%	24%	14%
75	5%	20%	2%	7%	24%	28%	14%
125	5%	20%	2%	7%	24%	34%	9%
Note: This table is for comparison only and only shows the effects of the treatments in this alternative, not the changes due to future growth or stand structure altering disturbances.							

Table 129 Effects of Alt. 2 Treatments on Moist Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	10-30%	5-10%	10-20%	10-20%	10-20%	5-15%	15-40%
Existing	6%	6%	4%	6%	39%	5%	34%
10	6%	6%	4%	10%	35%	5%	34%
50	6%	4%	4%	6%	35%	7%	37%
75	6%	3%	4%	6%	35%	8%	37%
125	6%	3%	4%	6%	35%	11%	34%
Note: This table is for comparison only and only shows the effects of the treatments in this alternative, not the changes due to future growth or stand structure altering disturbances.							

Aspen

Quaking aspen stands will be released from competition by conifers, leading to an increase in vigor and numbers. Protection from grazing by cattle and wildlife will increase the numbers of suckers that are able to grow into trees, increasing the size of aspen patches.

- At year 5 of this project, most aspen stands will be fenced, and suckers will be growing without being browsed. Some may be up to 1 inch diameter and 8 to 12 feet tall. The genetic diversity of aspen clones across the landscape will be maintained.
- At 10 years regeneration will be well established, and many stems will be large enough to resist ungulate browsing as fences deteriorate. If the stand is regenerating vigorously, there may be hundreds to thousands of stems present.
- At 25 years, stems will have self-thinned, and the survivors should exhibit rapid growth. By this stage, the large trees are relatively immune to ungulate damage, and have probably contributed enough energy to the root system to sustain vigorous re-growth of suckers if the overstory stems are destroyed by fire or windstorms.
- Any stands that did not regenerate initially will probably have been lost from the landscape.
- At 50 years the initial "new" growth is approaching maturity at 30 to 60 foot height and maximum crown cover. The root system will have expanded, providing the opportunity for the whole stand to expand, if the suckers are not vulnerable to browsing.
- At 100 years the project-initiated stems will be decadent and in decline if there have been no regeneration events, such as fire, in the meantime. Suckers and young stems will be growing up to replace the older stems, especially if stimulated by low intensity fire.

Understory Vegetation

Thinning would reduce the conifers encroaching on mountain mahogany, increasing the shrub vigor and numbers. Other shrubs, which were adapted to sprout after frequent fires and needing sunlight, will increase as the stands become more open. Pine grass, and other ground vegetation, will increase in vigor and forage quality with decreasing shade and increased nutrient cycling provided by burning.

Resiliency and Sustainability

Approximately 51% of the area diagnosed for treatment is recommended for thinning and regeneration. Ponderosa pine stands will increase in growth and vigor as the stand density is reduced. The quantity and vigor of grasses and shrubs will increase due to the reduction in shading and competition for nutrients and water. Species composition changes in mixed conifer stands will be towards early-seral species that are more resistant to insects and diseases and are not as susceptible to fire damage and crown fires.

Insect Risk

The additional light and warmth in thinned stands is inhospitable for bark beetles, providing an immediate degree of protection to the trees. As the trees respond over the next several after the thinning, their increased vigor will allow them to withstand attempted beetle attacks by successfully pitching out the invading insects. As fewer attacks are successful, the population outbreaks will decrease to low levels, reducing the amount or size of pockets of mortality. The reduction in the proportion of late-seral species will reduce the extent of defoliation by spruce budworm and Douglas-fir tussock moth (Mason 1998, Powell 1994).

Disease Risk

The increased height growth rates will allow the remaining trees to outgrow dwarf mistletoe infections, gradually decreasing the amount of crown infected. The increased spacing will reduce the lateral spread of mistletoe. The removal of late seral species during the thinning operations will reduce the amount of trees susceptible to root diseases. Eventually allowing the disease to fade to a minor role in the forest.

Fire Hazard and Risk

The primary stand attributes that control fire behavior are surface fuel condition, crown bulk density, and crown base height (Graham 1999).

The primary fuel models present are fuel model 9 (timber with loosely compacted litter) for the Dry Forest and fuel model 10 (timber with heavy litter) in the Moist Forest. The amount of area with fuel model 9 increases by 5% from the no action alternative due to the prescribed burning of areas with older activity created slash. The area in fuel model 10 decreases by 5% with a corresponding increase in fuel model 5 (short shrub), which has a much lower spread rate and intensity. There is only a 2% increase in fuel model 2 as a result of the under story removal treatments which leave large trees with a light under story more typical of conditions that existed prior to fire exclusion. The other stand treatments in the Dry Forest do not reduce tree-stocking levels enough to result in fuel model 2. Fuel model 11 (activity slash) is temporarily increased to 14 % until prescribed burning reduces it to 3%. Fuel model 13, which represents the blow down of timber in Vincent Creek, is eliminated through treatment.

The risk of severe wildfire will be diminished, as thinning from below will reduce the number of smaller trees in the stand, and will remove many of the late seral species in the understory, reducing the ladder fuels that allow ground fire to climb into the crowns. Thinning and associated slash treatment will significantly lower crown bulk densities and redistribute fuel loads, decreasing fire intensities (Agee 1993, Alexander 1988, Alexander and Yancik 1977) and reducing the crown fire potential (Coulter 1980, Dennis 1983, Rothermel 1991, Schmidt and Wakimoto 1988). Thinning will also eventually increase the diameter and bark thickness, which will reduce the amount of fire damage and mortality. The reduction in insect and disease mortality will reduce the amount of standing and down fuel created, decreasing fire intensity and severity. Live crowns will be higher off the ground as a result of thinning from below and scorching from prescribed burning, reducing the risk of torching and crown fires. Mechanical fuel treatment is the most important component for reducing fire hazard. Sites with mechanical fuel treatment appear to have drastically reduced fire severity during wildfires compared to sites treated only with prescribed fire only (Pollet 1999).

Shelterwood treatments in stands with a high proportion of fir trees will decrease the risk of large scale, high severity fires since the proportion of late-seral species, which are highly flammable, will be reduced. Grand fir and other shade tolerant species tend to have long and heavy crowns, creating stands with high crown

bulk densities (Brown 1978, Rothermel 1983). After treatment, it would take extreme weather conditions to sustain a crown fire in western white pine and western larch dominated stands due to their much lower crown bulk densities (Graham 1999). The risk of torching and crown fires due to presence of a fir understory with live crowns close to the ground will be greatly reduced by removing most of the fir understory.

Stands would be dominated by western larch, with lesser amounts of ponderosa pine and western white pine, depending on the site. In stands that resemble shelterwood regenerations, the primary species to be planted are western larch, ponderosa pine, and western white pine. These stands will be quite open with low crown bulk densities that are not likely to support crown fires while the regeneration is short (Graham 1999). As the stand grows, pre-commercial thinning the understory in the future will reduce the potential for crown fire by lowering the understory crown bulk densities.

The reduction in the amount of thin barked late seral species will reduce the amount of mortality due to bole scorch. The reduction in insect and disease mortality will reduce the amount of standing and down fuel created, decreasing fire intensity and severity.

Crown fire hazard would be reduced by 22 percent, for the Dry Forest and by five percent for the Moist Forest. The treatment areas are large enough to provide conditions where crown fires in untreated areas can become ground fires soon after entering the treated areas. This is because tree crowns are not dense enough to carry fire from crown to crown unless under extreme weather conditions, and ladder fuels are removed from treatment areas through mechanical treatment and prescribed fire. Torching of individuals and groups of trees would still be possible due to species attributes, tree size or ground fuel conditions. With the increased opportunity for the wildfires to remain on the ground, or return to the ground if a crown fire, there would be increased safety for fire fighters due to less fire intensity and better opportunities for safety zones. For stands thinned to 60 basal area per acre, high crown fire hazard would be reached again within 50 years. Forest stands thinned to 80 square feet of basal area per acre (such as the recommended modified commercial thin) and the pre-commercial thin outside of harvest units, high crown fire hazard would be reached again within 25 years. The units with the combination shelterwood/commercial thin prescriptions would reach high crown fire hazard within 50 years assuming a follow-up pre-commercial thin in 25 years.

All sub watersheds, except for Granite Boulder, have treatments that reduce the crown fire hazard in large enough areas to help prevent crown fires and to allow crown fires from adjacent untreated areas to drop back to the ground. Additional thinning will be needed in the future to maintain the effects of reduced crown fire hazard.

Table 130 Percentage of Crown Fire Hazard by Forest Type

CROWN FIRE HAZARD	DRY FOREST	MOIST FOREST	LODGEPOLE FOREST	COLD FOREST
High Existing	66%	60%	98%	84%
High Alternative 2	44%	55%	2%	84%

Wildfire Risk at the Watershed Scale

Similar projects are recommended or are being implemented to improve forest sustainability and resiliency throughout the Middle Fork John Day Sub-Basin. If this alternative is selected, the effects will be much the same across the sub-basin, with the Southeast Galena area treated more intensively. There will less chance of insects and disease activity that could spread outside the Southeast Galena project area, those that started outside the area would find conditions less hospitable in the Southeast Galena project area. Initial attack on fires starting in the Southeast Galena area would be more likely to be successful and the fires would not be as likely to become large, uncharacteristically severe wildfires.

This alternative reduces high crown, fuel ladder and ground fuel hazards on about 8 percent of the watershed through mechanical treatment and reduces ground fuels and ladder fuels through prescribed burning on an additional 9 percent of the watershed. If the recommended future Northwest Galena project does a proportionate level of treatment, high crown, ladder and ground fuel hazards would be reduced by a total of about 7 percent through mechanical treatment and another 7 percent of the watershed would have reduced ground fuel and fuel ladders through prescribed burning. The cumulative effect of Southeast Galena and Northwest Galena fuel reduction projects would be a treatment of a total of 31 percent of the watershed of which about 15 percent would be lowering of the crown fire hazard. The distribution of the treated areas would break up the continuity of the high hazard fuels. This will result in fires being lighter in severity over the treated areas, safer to suppress, and more likely to be prevented from spreading between areas of high hazard fuels and spreading between watersheds. Prescribed burning at intervals within the natural cycle for the fire regimes will be needed to maintain treated areas within the historic range of variation. This will reduce the need to use mechanical treatment in the future for fuels reduction.

Public Safety and Property

The high fire hazard area south of the Middle Fork is treated with a combination of treatments and the poor roads in the same area are improved to provide adequate access for fire fighting equipment. This greatly reduces the high fire hazard adjacent to privately owned lands and structures in the Bates, Austin, and Austin Junction areas.

The high fire hazard area located in the upper Vinegar Creek drainage that was the result of the 1998 blow down consists of several hundred acres of down timber. This alternative would treat the area by salvaging the wind thrown timber. The high hazard of a catastrophic fire destroying the private property and structures in the vicinity of the town site of Greenhorn would be greatly reduced.

Air Quality

Slash produced by commercial thinning on tractor and skyline yarded units will be brought to landings and can be made available for chipping for fiber or as fuel for cogeneration plants. Both options have a positive effect on air quality as the smoke from burning slash on site is greater than in a clean burning power plant or when used as fiber. Slash resulting from harvesting on other units is planned to be either broadcast burned or piled and burned and the burning will be under weather conditions that will meet air quality standards. Prescribed burning will be done in areas not harvested to reduce existing natural fuels, and will also be done in weather conditions that allow air quality standards to be met.

This alternative will reduce the total fuels in the planning area, reducing the amount available for consumption in future wildland fires. This would reduce the amount and duration of pollutants produced by a wildland fire; as well as reducing the fire intensity, allowing for faster control. The amount of smoke produced during the summer months and during inversion periods would be reduced, improving visibility and reducing health problems. The summertime Class I air quality visibility standards for Wilderness areas are more likely to be met.

4.2.4.3 & 4.2.5.3—Treatment objectives for HRV and High Wildfire Risk—Alternative 3

This alternative includes:

- 4,390 acres of commercial thin
- 900 acres of commercial thin in connectivity corridors
- 550 acres on understory removals
- 1,240 acres of shelterwood

- 250 acres of salvage harvest
- 1,150 acres of precommercial thin associated with harvest
- 620 acres of precommercial thin in connectivity corridors associated with harvest
- 680 acres of precommercial thin outside harvest areas
- 200 acres of precommercial thin in connectivity corridors outside harvest areas
- 10,610 acres of burn/fuel treatment within mechanically treated units
- 10,640 acres of prescribed fire outside mechanically treated units

The stands selected for treatment are 38% of the total area identified that is in need of treatment, compared to the Recommended Action which treats 50% of the same area. Alternative 3 would treat approximately 75% of the stands that the Recommended Action treats. Stands that are not treated would be subject to the same effects as discussed for the No Action Alternative.

Prescribed burning will not take place in the Little Butte and a portion of the Deerhorn drainages due to lack of stand mechanical treatment and access.

Desired Condition

Alternative 3 would have about 1660 acres less commercial thinning, about 450 acres less shelterwood, about 330 acres less understory removal, and about 460 acres less precommercial thinning than the recommended action. The effects of this alternative would correspond to treating about 75% of the Recommended Action.

Structural Stages

Approximately 75% of the stands will be treated compared to stands treated by Alternative 2. Development of old forest stand structures in the commercially thinned stands will be the same as in Alternative 2. There is also a proportionate increased risk of uncharacteristically severe wildfire that would set back structural stage development, both for the treated stands and surrounding stands, compared to Alternative 2.

Table 131—Effects of Alt. 3 Treatments on Dry Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5-15%	5-25%	5-10%	5-10%	5-15%	30-55%	5-15%
Existing	5%	42%	3%	7%	30%	1%	12%
10	5%	42%	3%	11%	26%	2%	11%
50	5%	28%	3%	7%	26%	17%	14%
75	5%	25%	3%	7%	26%	20%	14%
125	5%	25%	3%	7%	26%	23%	11%
Note: This table is for comparison only and only shows the effects of the treatments in this alternative, not the changes due to future growth or stand structure altering disturbances.							

Table 132—Effects of Alt. 3 Treatments on Moist Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	10-30%	5-10%	10-20%	10-20%	10-20%	5-15%	15-40%
Existing	6%	6%	4%	6%	39%	5%	34%
10	6%	6%	4%	9%	36%	5%	34%
50	6%	5%	4%	6%	36%	6%	36%
75	6%	5%	4%	6%	36%	6%	36%
125	6%	5%	4%	6%	36%	8%	34%
Note: This table is for comparison only and only shows the effects of the treatments in this alternative, not the changes due to future growth or stand structure altering disturbances.							

Aspen

The effects of this alternative would be similar to the Recommended Action, since both alternatives would treat the aspen stands to the same degree (see page, 269).

Understory Vegetation

The effects on the understory will reduced from the Recommended Action, since Alternative 3 only treats 75% of the area. In Alternative 3 there will be no benefit in the Little Butte and Deerhorn drainages that will not be burned.

Resiliency and Sustainability

Approximately 36% of the area diagnosed for treatment is recommended for thinning and regeneration to improve resiliency and sustainability. Alternative 3 treats about 25% less of the area compared with the Recommended Action (Alt. 2). Ponderosa pine stands will increase in growth and vigor as the stand density is reduced. The quantity and vigor of grasses and shrubs will increase due to the reduction in shading and competition for nutrients and water. Species composition changes in mixed conifer stands will be towards early-seral species that are more resistant to insects and diseases and are not as susceptible to fire damage and crown fires.

Insect Risk

The effects of this alternative would correspond to approximately 25% less acres than the Recommended Action.

Disease Risk

The effects of this alternative would correspond to approximately 25% less acres than the Recommended Action.

Fire Hazard and Risk

The risk of uncharacteristically severe wildfire would be reduced on about 25% less acres than the Recommended Action. In addition, the inability to use prescribed fire south of the Middle Fork in the Little Butte and Deerhorn drainages would leave fire hazards rather than a reduction of fuels when compared with the Recommended Action.

The primary fuel models present are Fuel Model 9 (timber with loosely compacted litter) for the Dry Forest and Fuel Model 10 (timber with heavy litter) in the Moist Forest. The amount of area with Fuel Model 9 increases by 5% from the no action alternative due to the prescribed burning of areas with older activity created slash. The area in Fuel Model 10 decreases by 2% with a corresponding increase in Fuel Model 5 (short shrub) which has a much lower spread rate (fires spread rate) and intensity. There is only a 1% increase in Fuel Model 2 as a result of the under story removal treatments which leave large trees with a light under story, a condition that is more typical of conditions which existed prior to fire exclusion. The other stand treatments in the Dry Forest do not reduce tree-stocking levels enough to result in Fuel Model 2. . Fuel Model 11 (activity slash) is temporarily increased to 11 %, until prescribed burning reduces it to 3%. Fuel Model 13, which represents the blow down of timber in Vincent Creek, is eliminated through treatment.

The crown fire hazard would be reduced by 16 percent and that is six percent less effective than Alternative 2 for the Dry Forest. For the Moist Forest, the crown fire hazard would be reduced by 4 percent and that is one percent less effective than Alternative 2. Otherwise, the effects are the same as described for Alternative 2, except for the Little Butte Creek portion of the Tincup/Little Butte Creek subwatershed, which would not be effective for reducing crown fire potential next to the large, high crown fire hazard area of the Dixie Butte Roadless Area.

Table 133—Percentage of Crown Fire Hazard by Forest Type

CROWN FIRE HAZARD	DRY FOREST	MOIST FOREST	LODGEPOLE FOREST	COLD FOREST
High Existing	66%	60%	98%	84%
High Alternative 3	50%	56%	2%	84%

Wildfire Risk at the Watershed Scale

The effects of Alternative 3 would be to a lesser degree than Alternative 2 since it doesn't treat as many acres. Similar projects are recommended or are being implemented to improve forest sustainability and resiliency throughout the Middle Fork John Day Sub-Basin. If this alternative is selected, the effects will be much the same across the sub-basin, with the Southeast Galena area treated somewhat more intensively. There will less chance of insects and disease activity that could spread outside the Southeast Galena project area. Initial attack on fires starting in the Southeast Galena area would be more likely to be successful and the fires would not be as likely to become large, uncharacteristically severe wildfires.

The reduction for high crown, fuel ladder and ground fuel hazards through mechanical treatment is about 7 percent of the watershed. If the Northwest Galena project does a proportionate level of treatment, high crown, ladder and ground fuel hazards would be reduced through mechanical treatment by a total of about 5 percent. Prescribed burning treatments outside mechanically treated units would be about the same as with alternative 2. The cumulative effect of Southeast Galena and Northwest Galena fuel reduction projects would be a treatment of a total of about 30 percent of the watershed that would separate areas of high fuel hazards. In comparison with Alternative 2, Alternative 3 would have 3 percent more of the watershed, or 3800 acres, with a high crown fire hazard so it is less effective in reducing the threat of large fires. However, fires would be lighter in severity and safer to suppress over the treated areas. Prescribed burning at intervals within the natural cycle for the fire regimes will be needed to maintain treated areas within HRV. This will reduce the need to use mechanical treatment in the future for fuels reduction.

Public Safety and Property

Alternative 3 provides most of the hazard reduction that Alternative 2 does in the area south of the Middle Fork, reducing the high fire hazard adjacent to privately owned lands and structures in the Bates, Austin, and Austin Junction areas.

Alternative 3 provides the same degree of fire hazard reduction as Alternative 2 does in the upper Vinegar Creek area.

Air Quality

The effects are similar to Alternative 2, except the amount of area treated is approximately 75% of that treated by Alternative 2. Therefore, the air quality benefit of Alternative 3 is expected to be only 75% of that provided by Alternative 2.

4.2.4.4 & 4.2.5.4—Treatment objectives for HRV and High Wildfire Risk—Alternative 4

This alternative includes:

- 0 acres of commercial thin
- 0 acres of commercial thin in connectivity corridors
- 0 acres on understory removals
- 0 acres of shelterwood
- 0 acres of salvage harvest
- 0 acres of precommercial thin associated with harvest
- 0 acres of precommercial thin in connectivity corridors associated with harvest
- 2,090 acres of precommercial thin outside harvest areas
- 640 acres of precommercial thin in connectivity corridors outside harvest areas
- 1,930 acres of burn/fuel treatment associated with precommercial thinning
- 17,230 acres of prescribed fire outside harvest units

The stands selected for treatment are 13% of the total area identified that is in need of treatment, compared to the Recommended Action that treats 50%. Alternative 4 would treat only about 25% of the stands that the Recommended Action treats, and only the understory would be treated, not the overstory. The benefits of just thinning the understory would be much less. The stands not thinned would have the same effects as discussed for the No Action alternative.

Prescribed burning will not take place in the Little Butte and Deerhorn drainages due to lack of stand mechanical treatment and access.

Desired Condition

Alternative 4 would do no commercial harvesting. The stands selected for treatment are 13% of the total area identified with a need of treatment, with the treatment being less effective than those that harvest larger trees. The stands not precommercial thinned would have the same effects as discussed for the No Action alternative.

The precommercial thinning is about 300 acres less than the Recommended Action. The effects for this alternative would be significantly less than the Recommended Action.

The modified precommercial thinning treatment will improve stand conditions somewhat, but not to the degree as the standard thinning treatments. It is anticipated that the next thinning will need to be done at an earlier time to maintain the stands in good condition.

Structural Stages

There is currently a lack of old forest stand structures due to timber harvest, fires, and other disturbances. Only a small portion of the stands treated by the Recommended Action are treated by this alternative, and those that are treated will be only precommercial thinned rather than treating the medium sized trees. Development of old forest stand structures in the thinned stands, with the slight increase in growth rates over a short time only, will take about 100 years. This compares with the Recommended Action that can develop old forest stand structure in approximately 50 years. The time to develop old forest structure in the mixed conifer stands is comparable to the No Action alternative. There is a slightly decreasing risk of uncharacteristically severe wildfire that would set back structural stage development, but it is essentially the same as the No Action alternative.

Table 134—Effects of Alt. 4 Treatments on Dry Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5-15%	5-25%	5-10%	5-10%	5-15%	30-55%	5-15%
Existing	5%	42%	3%	7%	30%	1%	12%
10	5%	42%	3%	9%	28%	1%	12%
50	5%	42%	3%	9%	28%	1%	12%
75	5%	42%	3%	7%	28%	3%	12%
125	5%	42%	3%	7%	28%	3%	12%
Note: This table is for comparison only and only shows the effects of the treatments in this alternative, not the changes due to future growth or stand structure altering disturbances.							

Table 135—Effects of Alt. 4 Treatments on Moist Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	10-30%	5-10%	10-20%	10-20%	10-20%	5-15%	15-40%
Existing	6%	6%	4%	6%	39%	5%	34%
10	6%	6%	4%	7%	38%	5%	34%
50	6%	6%	4%	7%	38%	5%	34%
75	6%	6%	4%	6%	38%	6%	34%
125	6%	6%	4%	6%	38%	6%	34%
Note: This table is for comparison only and only shows the effects of the treatments in this alternative, not the changes due to future growth or stand structure altering disturbances.							

Aspen

Quaking aspen stands will be released from competition by small conifers, leading to a minor increase in vigor and numbers. The medium sized trees would still suppress the aspen. Protection from grazing by cattle and wildlife will increase the numbers of suckers that are able to grow into trees, increasing the size of aspen patches. Effects would be the same as the recommended action (see page, 269).

Understory Vegetation

Precommercial thinning would reduce the number of smaller conifers encroaching on mountain mahogany, slightly increasing the shrub vigor and numbers. Other shrubs, which were adapted to sprout after frequent fires and needing sunlight, will increase as the stands are burned and become more open. Pinegrass, and other ground vegetation, will slightly increase in vigor and forage quality with decreasing shade and increased nutrient cycling provided by burning. There will be no benefit in the Little Butte and Deerhorn drainages that will not be burned.

Resiliency and Sustainability

Approximately 13% of the area diagnosed for treatment is recommended for thinning to improve resiliency and sustainability. Alternative 4 treats only about 25% of the area compared with the Recommended Action (Alt. 2) and precommercial thinning is not near as effective in changing undesirable conditions as the more intensive treatments in Alt. 2. Ponderosa pine stands will increase slightly in growth and vigor as the understory stand density is reduced. The quantity and vigor of grasses and shrubs will increase due to the reduction in shading and competition for nutrients and water.

Insect Risk

There would be a slight improvement in the resistance to bark beetles in the precommercial thinned stands, but the increase would be small compared to the other action alternatives. Experience has shown that when late seral species make up less than 25% of the stand composition, defoliation is very light with little effect to tree growth or survival. This alternative will not reach that amount in most mixed conifer stands; therefore, defoliation will not be reduced very much. The incidence of fir engraver would be reduced in

proportion to the amount of fir that is reduced, and the remaining fir trees would be slightly healthier and less susceptible to attacks.

Disease Risk

There would be little improvement, related to the amount of late seral species removed during the precommercial thinning. Stem and root diseases may be actually increased, as the cut stumps can serve as infection pathways to the remaining fir trees in the stand. Dwarf mistletoe will not be reduced to any great degree by the precommercial thinning. The burning could show gradual improvement over time, as infected overstory trees are more susceptible to torching. Regardless, infected overstory trees will remain to infect the understory trees and nearby overstory trees.

Fire Hazard and Risk

The risk of fire hazard will be slightly diminished, as thinning from below will reduce the number of smaller trees in the stand, and will remove many of the late seral species in the understory, reducing the ladder fuels that allow ground fire to climb into the crowns. The reduction in the amount of thin barked late seral species will also reduce the amount of mortality due to bole scorch. The reduced amount of burning, especially south of the Middle Fork, will result in a higher hazard for large stand replacement fires.

The primary fuel models present are fuel model 9 (timber with loosely compacted litter) for the Dry Forest and fuel model 10 (timber with heavy litter) in the Moist Forest. The amount of area with fuel model 9 increases by 5% from the no action alternative due to the prescribed burning of areas with older activity created slash. The area in fuel model 10 is not changed. There is no change in fuel model 2. Fuel model 13, which represents the blow down of timber in Vincent Creek drainage is not treated.

Alternative 4 reduces the crown fire hazard the least of any action alternative by retaining 70 percent of the area in a moderate to high crown fire hazard.

The crown fire hazard would be reduced by five percent and that is 17 percent less effective than Alternative 2 for the Dry Forest. For the Moist Forest, the crown fire hazard would be reduced by one percent and that is 4 percent less effective than Alternative 2. The crown fire hazard would reach high crown fire hazard within 25 years for all treatment units. Fires would be lighter in severity and safer to suppress over the treated area but not as likely to be prevented from spreading between areas of high hazard fuels and spreading between watersheds as with Alternative 2.

Table 136—Percentage of Crown Fire Hazard by Forest Type

CROWN FIRE HAZARD	DRY FOREST	MOIST FOREST	LODGEPOLE FOREST	COLD FOREST
High Existing	66%	60%	98%	84%
High Alternative 4	61%	59%	2%	84%

Wildfire Risk at the Watershed Scale

The effects of Alternative 4 would be to a much lesser degree than Alternative 2 since it doesn't include any commercial harvest. Similar projects are recommended or are being implemented to improve forest sustainability and resiliency throughout the Middle Fork John Day Sub-Basin. If this alternative is selected, the effect will be to maintain a center of insect and disease activity that could spread outside the Southeast Galena project area. If the fire risk were not reduced, fires starting in the Southeast Galena area would be more likely to escape initial attack and become large, uncharacteristically severe wildfires.

The reduction for high crown, fuel ladder and ground fuel hazards through mechanical treatment is about 2 percent of the watershed. If the Northwest Galena project does a proportionate level of treatment, high crown, ladder and ground fuel hazards would be reduced through mechanical treatment by a total of about 5 percent. Prescribed burning treatments outside mechanically treated unit would be about 20 percent of the watershed when combined with Northwest Galena which is more than alternative 2 because there is less mechanical treatment. The cumulative effect of Southeast Galena and Northwest Galena fuel reduction

projects would be a treatment of a total of about 27 percent of the watershed that would separate areas of high fuel hazards. In comparison with Alternative 2, Alternative 4 would have 11 percent more of the watershed, or about 14,000 acres, with a high crown fire hazard so it is less effective in reducing the threat of large fires. However, fires would be lighter in severity and safer to suppress over the treated area but not as likely to be prevented from spreading between areas of high hazard fuels and spreading between watersheds as with alternative 2. Prescribed burning at intervals within the natural cycle for the fire regimes will be needed to help maintain treated areas within HRV. This will reduce the need to use mechanical treatment in the future for fuels reduction but less than all the other action alternatives. This is because prescribed fire without mechanical treatment will not reduce stand densities enough to move the stands towards the historical range of variation or to reduce the crown fire hazard, other than reduce the opportunity for the fire to jump up into the crowns.

Public Safety and Property

Alternative 4 provides only a small portion of the hazard reduction that Alternative 2 does in the area south of the Middle Fork. There is no thinning of larger trees and the access is not improved. The high fire hazard adjacent to privately owned lands and structures in the Bates, Austin, and Austin Junction areas is only slightly reduced compared to No Action.

Alternative 4 provides no fire hazard reduction in the upper Vinegar Creek area, which was the result of the 1998 blow down. The hazard of an uncharacteristically severe fire destroying the private property and structures in the vicinity of the town site of Greenhorn is not reduced by this alternative, which would be identical to the effects of the No Action alternative.

Air Quality

The amount of fuels reduced through mechanical treatment and burning is the least of all the action alternatives. Only about 25% of the area treated by Alternative 2 is thinned by this alternative, and only smaller, noncommercial sized trees are cut. Prescribed burning is reduced to 84% of that planned for Alternative 2. Therefore, the air quality benefit of Alternative 4 is expected to be only 25% of that provided by Alternative 2.

4.2.4.5 & 4.2.5.5—Treatment objectives for HRV and High Wildfire Risk—Alternative 5

This alternative includes:

- 7,060 acres of commercial thin
- 220 acres of commercial thin in connectivity corridors
- 1,220 acres on understory removals
- 2,600 acres of shelterwood
- 250 acres of salvage harvest
- 2,200 acres of pre-commercial thin associated with harvest
- 40 acres of pre-commercial thin in connectivity corridors associated with harvest
- 880 acres of pre-commercial thin outside harvest areas
- 0 acres of pre-commercial thin in connectivity corridors outside harvest areas
- 13,990 acres of burn/fuel treatment within mechanically treated units
- 10,780 acres of prescribed fire outside mechanically treated units
- The overstocked stands that are thinned will respond over several years, adding more crown area and increasing individual tree growth.

This alternative treats more of the stands identified as needing treatment to meet the desired condition than the other alternatives. The stands selected for treatment are 57% of the total area identified that is in need of treatment. This is an increase over Alternative 2, which treats about 50% of the stands in need of treatment. The stands not treated would have the same effects as discussed for the No Action alternative.

Desired Condition

Alternative 5 would mechanically treat about 15% more acres than Alternative 2. In addition, the amount of thinning in connectivity corridors is greatly reduced from the recommended action, with the effect that growth will be increased, and time to grow to the next structural stage will be shorter with this alternative. The effects of the increase in the amount of understory removal will be increased over that of the recommended action.

This alternative thins about the same amount as Alternative 2. Thinned stands would respond by increasing their crowns and roots, increasing their ability to utilize nutrients and water. Growth would increase and the trees would grow into old forest structural stages sooner. The increased vigor of the trees would decrease their susceptibility to disturbance from insects, disease, and fire; and lessen the likelihood and potential severity of catastrophic disturbance events. The overall resiliency to natural disturbances would be increased.

The increased tree growth would cause the development of old forest structural stages to accelerate, decreasing the time until the trees grew into the large size classes. Stands would be resilient to disturbance and would not be "reset" to earlier structural stages by disturbances, enabling them to continue to grow into large trees. Disturbances would be closer to the historic scale.

Alternative 5 would increase the thinning/shelterwood treatment by approximately 910 acres, and increase understory removal on an additional 340 acres. The effects for this alternative would be similar to the recommended action, with an approximate 30% increase in the benefit from the additional degree of thinning and removal of late seral species and the increased understory removal.

Removing late seral species from stands, retaining the early seral species that are there, and reforesting openings with early seral species will shift the species composition closer to the historic composition. Treated stands would be more adapted to the natural disturbances that exist, increasing the overall resiliency to natural disturbances. Resilient stands would decrease the risk that disturbance would "reset" the stands to earlier structural stages, enabling them to continue to grow into large trees. Disturbances would be closer to the historic scale.

Stands treated would be, or would be growing towards, the Historical Range of Variability (HRV) for stand structure and composition.

This alternative comes the closest to meeting the Desired Condition of all of the alternatives. It harvests the most areas in need of species conversion and thins most stands to the desired density. The few thinning treatments in connectivity corridors that are in this alternative will improve stand conditions somewhat, but not to the degree as the standard thinning treatments. It is anticipated that an additional thinning will be necessary to maintain the stands in good condition. If not thinned again in the future, growth will slow and it would take an additional 20 years to reach the old forest structural stage.

Structural Stages

There is currently a lack of old forest stand structures due to timber harvest, fires, and other disturbances. Development of old forest stand structures in the thinned stands, with the increased growth rates will take about 50 years. There is a decreasing risk of uncharacteristically severe wildfire that would set back structural stage development, both for the treated stands and surrounding stands.

Table 137—Effects of Alt. 5 Treatments on Dry Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5-15%	5-25%	5-10%	5-10%	5-15%	30-55%	5-15%
Existing	5%	42%	3%	7%	30%	1%	12%
10	5%	43%	2%	17%	20%	5%	8%
50	5%	21%	2%	7%	20%	28%	17%
75	5%	20%	2%	7%	20%	29%	17%
125	5%	20%	2%	7%	20%	38%	8%
Note: This table is for comparison only and only shows the effects of the treatments in this alternative, not the changes due to future growth or stand structure altering disturbances.							

Table 138—Effects of Alt. 5 Treatments on Moist Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	10-30%	5-10%	10-20%	10-20%	10-20%	5-15%	15-40%
Existing	6%	6%	4%	6%	39%	5%	34%
10	6%	6%	4%	11%	34%	6%	33%
50	6%	4%	4%	6%	34%	8%	38%
75	6%	4%	4%	6%	34%	8%	38%
125	6%	4%	4%	6%	34%	12%	34%
Note: This table is for comparison only and only shows the effects of the treatments in this alternative, not the changes due to future growth or stand structure altering disturbances.							

Aspen

The effects of this alternative would be similar to the effects described in Alternative 2 (Recommended Action, see page, 269), since both alternatives would treat the aspen stands to the same degree.

Understory Vegetation

The effects of this alternative would be similar to the Recommended Action, but to a proportionately larger degree since more stands would be treated.

Resiliency and Sustainability

Approximately 59% of the area diagnosed for treatment is recommended for thinning and regeneration. Ponderosa pine stands will increase in growth and vigor as the stand density is reduced. This alternative treats about 20% more area than the Recommended Action. Thinned ponderosa pine stands will increase in growth and vigor as the stand density is reduced, with more stands thinned to the optimal stocking level. The quantity and vigor of grasses and shrubs will increase due to the reduction in shading and competition for nutrients and water. This alternative treats approximately 50% more of the mixed conifer stands with the species conversion prescription than the Recommended Action. Treated stands will be more vigorous growing due to stocking level control, and the increased percentage of early seral species will be more resistant to insects, disease, and fire damage. The quantity and vigor of grasses and shrubs will increase due to the reduction in shading and competition for nutrients and water.

Insect Risk

The amount of bark beetle damage in ponderosa pine stands would be reduced by approximately 25% from the Recommended Action. This would be due to the increased use of the standard thinning rather than the

modified thinning prescription. The host tree species for spruce budworm, tussock moth, and fir engraved will be reduced more than in the Recommended Action. Experience has shown that when late seral species make up less than 25% of the stand composition, defoliation is very light with little effect to tree growth or survival. The incidence of fir engraver would also be reduced as the proportion of fir is reduced, and the remaining fir trees would be healthier and less susceptible to attacks. Stands not treated would benefit from the reduction of host species in nearby stands, which would lessen the severity and size of outbreaks.

Disease Risk

Stem and root diseases will be reduced to a greater degree than the Recommended Action since about 35% more of the area will be treated to reduce the primary host (late seral species). The removal of late seral species during the thinning operations will reduce the amount of trees susceptible to root diseases. Eventually allowing the disease to fade to a minor role in the forest. Thinning will increase height growth rates which will allow the remaining trees to outgrow dwarf mistletoe infections, gradually decreasing the amount of crown infected. The increased spacing will reduce the lateral spread of mistletoe.

Fire Hazard and Risk

The hazard of stand replacing fire will be diminished on more acres and to a greater degree, compared to the Recommended Action. The amount of mechanical treatment is increased and the amount of burning is the same as the Recommended Action.

The crown fire hazard is reduced by 26 percent and that is 4 percent more effective than Alternative 2. Otherwise, the effects are similar to those described for Alternative 2.

Alternative 5 reduces the area in high crown hazard risk from 66% to 40% for the Dry Forest. This alternative reduces the area in high crown hazard risk from 60% to 54% for the Moist Forest. A stand replacing event is least likely with this alternative because the stand conditions that reduce fire behavior are improved the most.

As shown in Table 19, the primary fuel models present are fuel model 9 (timber with loosely compacted litter) for the Dry Forest and fuel model 10 (timber with heavy litter) in the Moist Forest. The amount of area with fuel model 9 increases by 6% from the no action alternative due to the prescribed burning of areas with older activity created slash. The area in fuel model 10 decreases by 9% and an increase of 7% in fuel model 5 (short shrub) which has a much lower spread rate and intensity. There is a 3% increase in fuel model 2 as a result of the under story removal treatments which leave large trees with a light under story more typical of conditions that existed prior to fire exclusion. The other stand treatments in the Dry Forest do not reduce tree stocking levels enough to result in fuel model 2. Fuel model 11 (activity slash) is temporarily increased to 14 % until prescribed burning reduces it to 3%. Fuel model 13, which represents the blow down of timber in Vincent Creek, is eliminated through treatment.

Like Alternative 2, Alternative 5 treats all sub watersheds, except for Granite Boulder, to reduce the crown fire hazard in large enough areas to help prevent crown fires and to allow crown fires from adjacent untreated areas to drop back to the ground. Crown fire hazard would be reduced by 26 percent and that is four percent more effective than Alternative 2. Otherwise, the effects are the same as described for Alternative 2.

Table 139—Percentage of Crown Fire Hazard by Forest Type

CROWN FIRE HAZARD	DRY FOREST	MOIST FOREST	LODGEPOLE FOREST	COLD FOREST
High Existing	66%	60%	98%	84%
High Alternative 5	40%	54%	2%	84%

Wildfire Risk at the Watershed Scale

The effects of Alternative 5 would be to a greater degree than Alternative 2 since it treats more acres. Similar projects are recommended , or are being implemented to improve forest sustainability and resiliency throughout the Middle Fork John Day Sub-Basin. If this alternative is selected, the effects will be much the same across the sub-basin, with the Southeast Galena area treated much more intensively. There will less chance of insects and disease activity that could spread outside the Southeast Galena project area. Initial attack on fires starting in the Southeast Galena area would be more likely to be successful and the fires would not be as likely to become large, uncharacteristically severe wildfires.

The reduction for high crown, fuel ladder and ground fuel hazards through mechanical treatment is about 10 percent of the watershed. If the Northwest Galena project does a proportionate level of treatment, high crown, ladder and ground fuel hazards would be reduced through mechanical treatment by a total of about 8 percent. Prescribed burning treatments outside mechanically treated units would be about 17 percent of the watershed which is about 1% less than Alternative 2 but would be more than made up by the increase of mechanical treated acres that are also to be prescribed burned. The cumulative effect of Southeast Galena and Northwest Galena fuel reduction projects would be a treatment of a total of about 34 percent of the watershed that would separate areas of high fuel hazards. In comparison with Alternative 2, Alternative 5 would have 4 percent less of the watershed, or about 5100 acres, with a high crown fire hazard so it is the most effective alternative for reducing the threat of large fires. The wildfires would be lighter in severity and safer to suppress over the treated areas. Prescribed burning at intervals within the natural cycle for the fire regimes will be needed to maintain treated areas within HRV. Prescribed burning at intervals within the natural cycle for the fire regimes will be needed to maintain treated areas within HRV. . This alternative will reduce the need to use mechanical treatment in the future for fuels reduction more than the other alternatives.

Public Safety and Property

Alternative 5 provides more hazard reduction than Alternative 2 does in the area south of the Middle Fork, reducing more of the high fire hazard adjacent to privately owned lands and structures in the Bates, Austin, and Austin Junction areas.

Alternative 5 provides the same degree of fire hazard reduction as Alternative 2 does in the upper Vinegar Creek area. This alternative would treat the high fire hazard area that was the result of the 1998 blow down area by salvaging the wind thrown timber. The high hazard of a catastrophic fire destroying the private property and structures in the vicinity of the town site of Greenhorn would be greatly reduced.

Air Quality

The effects are similar to Alternative 2, except the amount of area treated is approximately 16% more than that treated by Alternative 2. Therefore, the air quality benefit of Alternative 5 is expected to be 16% more than that provided by Alternative 2.

4.2.6 TREATMENT OBJECTIVES FOR DEGRADED WILDLIFE CONDITIONS

Terrestrial wildlife habitat is currently degraded or missing essential components because of past activities. See ***1.2.2.6 Desired Condition: Wildlife Habitat****, page 27;and* ***3.2.6 Wildlife Habitat****165.*

Table 140 HRV;

STATEMENT OF NEED	DESIRED RESTORATIVE OUTCOME OR OBJECTIVE
A need exists to enhance and improve certain wildlife habitat components within the project area in order to provide habitat needs for viable populations of TES, MIS, and SOI.	By implementing aquatic, vegetation and infrastructure projects, needed wildlife habitat components would exist across the project area in a resilient, dispersed, and diverse condition allowing for viable populations of many TES, MIS, and SOI.

4.2.6.1—TES SPECIES, MIS AND SOI

The following section discusses effects to Threatened, Endangered and Sensitive (TES) species, Management Indicator Species(MIS), and Species of Interest (SOI). See 3.2.6 Wildlife Habitat, page 165, for habitat conditions and needs for specific wildlife species. 3.2.6.4—Habitat Summary Tables, page 193 grouped species by Forest type and structural stage (e.g., Dry Forest OFMS). This analysis assumes that Forest type/structural stage equates to habitat types. This section will disclose effects by habitat type. For species-specific detail on TES species, see the Wildlife Biological Evaluation in Appendix B.

4.2.6.1.1—ALTERNATIVE 1

Dry Forests

The no action alternative would result in little change in the existing condition of Dry Forest habitats in the short-term (0-10 years). Although stand densities would continue to increase, stand structure would remain relatively similar to that displayed in Table 107 Relationship of Dry Forests to Wildlife Habitats and Existing Condition, page 194. In the short- and mid-term (0-25 years), dead wood habitats would likely increase. Stands currently classified as OFMS growth could change to YFMS if large diameter trees succumb to insects or diseases. Other structural stages would see little change even in the mid-term.

Approximately 57% of Dry Forest stands are identified as moderate to high risk for stocking induced mortality and/or related infestation of pests or diseases. Without vegetation management and the controlled re-introduction of fire, stands that are heavily overstocked and stressed would remain highly vulnerable to insect outbreaks and disease. Increased tree mortality would be expected. Species such as the pileated woodpecker and pine marten, would benefit from the increased stand density and dead wood habitat. Northern goshawk populations would be maintained. Populations of primary cavity excavators would increase with the increased availability of dead wood habitat. Species most likely to benefit include hairy, downy and black-backed woodpeckers. Higher stand densities would delay the development of large tree structure in YFMS, SEOC, SECC and UR stands. Blue grouse winter roost habitat would continue to improve as Douglas-fir dwarf mistletoe continues to spread. Connectivity/corridor habitat would continue to improve and expand, as multi-stratum structure condition increases across this Forest type.

Improvements to the above habitats would come at a risk. With the increased stand densities and resulting accumulations of dead and diseased trees and down logs, risk of high intensity stand replacement wildfire also increases. Stand replacement wildfires do not reflect the historic fire regime of these Forest types.

The large-scale loss of forested habitat could result from such a fire, impacting the species identified above. Populations would be displaced, forced to move to other areas.

The white-headed woodpecker is heavily dependant upon the presence of open-park like mature ponderosa pine habitat. Historically, 30 to 55% of the Dry Forest types were in stands of OFSS. Today, only 1% of these forest types are classified as OFSS. This alternative would not develop OFSS habitats. OFMS stands would not be entered and converted back to OFSS structure. YFMS, SEOC, SECC and UR stands would not be entered and managed towards OFSS. Fire is an important natural disturbance that historically helped develop and shape OFSS structure. Under the no action alternative, fire would not be reintroduced into the system. Fires caused by lightning would be suppressed. This deficiency in OFSS habitat is likely adversely affecting the populations and viability of white-headed woodpeckers within the project area. Other species, such as the Lewis's woodpecker, flammulated owl and some neotropical migrant birds dependent upon these open pine habitats, would be similarly impacted.

Cumulatively, across the Middle Fork John Day subbasin, development of OFSS stand structures would likely occur as timber sale and prescribed burning activities are implemented elsewhere (See Appendix C—Projects Considered for Cumulative Effects). Harvest and burning activities in the Dry Forests types would benefit species such as the white-headed woodpecker, and contribute to overall viability of the populations. Distribution of populations would remain poor, however, as much of Southeast Galena goes untreated.

Moist Forests

The no action alternative would result in little change in the existing condition of Moist Forest habitats in the short- to mid-term (0-25 years) or long-term (25+ years). Stand structure would remain relatively similar to that displayed in Table 108 Relationship of Moist Forests to Wildlife Habitats and Existing Condition, page 196. Dead wood habitat would likely remain at current levels.

High stand densities within the OFMS and YFMS stand structures would maintain high quality habitat for the pileated woodpecker, pine marten, Canada lynx, and Pacifc fisher. Insect and disease activity will continue to replace dead wood habitat over time, maintaining nesting, denning and/or foraging habitat for these species. In particular, the OFMS structure habitats would provide excellent habitat conditions with an abundance of large trees, providing a continued supply of the dead wood habitat favored by these species. Other primary cavity excavators would benefit as well to the presence and higher densities of dead wood habitats that would be created over time. Large snag and downed wood densities likely occur at levels that provide for 100% of the potential population levels of most primary excavator species. Northern goshawk nesting habitat would remain secondary to higher quality Dry Forest habitats, but with the presence of complex stand structure and a large tree component for nest sites, these areas would likely provide alternative nesting areas that would be used. Generally, the Moist Forest types with their higher tree densities, would continue to provide good connectivity habitat.

Blue grouse winter roost habitat would continue to improve as Douglas-fir dwarf mistletoe continues to spread.

One drawback to the no action alternative would be the delay in development of large tree structure within middle- and younger-aged stands (YFMS, SECC, UR). Reduced tree growth rates would delay the development of large diameter trees, i.e., those greater than 21" dbh, and consequently reduce the number of larger trees available for snag creation. This could potentially impact the density and distribution of primary cavity excavators and pine martens, 25 years and later. Nearly 60% of the Moist Forest types are in a condition that is deficient in a large tree component.

With the increased stand densities and accumulation of dead snags and downed logs, risk of large-scale, stand replacement wildfire would remain high. For several wildlife species, such as the black-backed and three-toed woodpeckers, such a fire would result in high quality habitat for 1 to 25 years following the disturbance, then very little habitat until large trees are reestablished. Such fires would create an excessive short term abundance of snags that would be used for nesting and foraging. Research indicates both

species respond favorably with increases in population densities following such fires (Knotts 1998). Other species such as pine marten, pileated woodpecker, northern goshawk, Canada lynx and Pacific fisher, however, would be adversely affected by such a disturbance. Stand replacement wildfire would remove much of the forest cover and stand structure required by these species. This is not necessarily a negative habitat condition when disturbances are within the Historic Range of Variability, however recent fires have been much larger and with a higher percentage of stand replacement fire. These species would be required to find habitats outside the burned areas. Distribution of populations would remain poor, however, as much of Southeast Galena goes untreated.

Cumulatively, effects across the Middle Fork John Day sub basin would be similar to those expected in the Southeast Galena project area. Most management activities on the Forest are focusing on Dry Forest and riparian habitat restoration, with only a low amount of activity taking place in the Moist Forest types (see Appendix C-Projects Considered for Cumulative Effects). Habitat conditions for species associated with the Moist Forest types would remain good.

Lodgepole Pine Forests

The lodgepole type, at 1,100 acres, is poorly represented in the Southeast Galena project area. Lodgepole types would continue to contribute habitat for species such as pine marten, three-toed woodpecker, black-backed woodpecker, Canada lynx, and Pacific fisher, but the majority of the habitat needs would be met in the Moist and Cold Forest types. Habitat is probably better provided in stand mixes where lodgepole is seral to other tree species or where there is a epidemic increase in bark beetle populations that result from fires or blowdown events.

The no action alternative would result in little change in existing condition of lodgepole pine forest habitats in the mid-term (5-25 years) or long-term (25+ years). Stand structure would remain relatively similar to that displayed in Table 109 — Relationship of Lodgepole Pine Forests to Wildlife Habitats and Existing Condition, page 197. Currently 180 acres (12%) of lodgepole pine habitat is in an OFMS condition. Over time, an even flow of structural stages should be maintained as YFMS, UR and SEOC habitats mature into OFMS and existing OFMS habitats deteriorate into UR and possibly SI structures as a result of insect and disease outbreaks and possible stand replacement fire events.

Cumulatively, effects across the Middle Fork John Day subbasin would be similar to those expected in the Southeast Galena project area. Most management activities on the Forest are focusing on Dry Forest and riparian habitat restoration, with only a low amount of activity taking place in the Lodgepole Forest types (see Appendix C-Projects Considered for Cumulative Effects). Habitat conditions for species associated with the Lodgepole Forest types would remain good.

Cold Forests

Stand structure would remain relatively similar to that displayed in Table 110 Relationship of Cold Forests to Wildlife Habitats and Existing Condition, page 199. Effects would be similar to those described for the Moist Forest types. Although there are differences between these two Forest types, they do provide habitat needs for many of the same wildlife species. Possibly, the northern goshawk may be the only species that would be rarely found in the Cold Forest types.

Riparian Hardwood Shrubs and Trees

Alternative 1 forgoes the option to plant and protect riparian hardwood shrubs and trees. The quantity and vigor shrubs would continue to decline as overstory shading and competition for water and nutrients increases. Natural or accidentally induced fires would likely be suppressed and in most instances held to a few acres. Historically frequent, low intensity fires recycled nutrients and invigorated many shrub species. The continued absence of these fires would continue to contribute to the decline in species' health and

vigor. Mature aspen trees would continue to decline and regeneration would be low or nonexistent. Several of the smaller, older and more decadent aspens sites could disappear from the watershed within 25 years. All aspen sites may be gone within 100 years. Red-naped sapsucker, Williamson's sapsucker, Lewis' woodpecker and downy woodpecker are several species likely to be adversely affected by the decline in hardwood vegetation.

Cumulatively, across the Middle Fork John Day subbasin, efforts are being taken to improve riparian habitat. Hardwood planting and protection is being implemented along many stream reaches (see Appendix C-Projects Considered for Cumulative Effects). Most wildlife species disproportionately utilize riparian areas more than any other type of habitat (Thomas 1979). Although management would be improving conditions in RHCAs across the subbasin, static or declining riparian conditions in Southeast Galena would have effects on species that depend upon these habitats.

TES Species—Alternatives 2 thru 5

Forest structure and species composition would change immediately following recommended timber harvest and prescribed burning activities. Habitat conditions would be modified accordingly. The majority or recommended treatments occur in the Dry Forest types (see Table 141), followed by the Moist Forest types. Effects to wildlife species that depend on these two Forest types are described below. No timber harvest or burning activities would be recommended in Cold Forest types or Lodgepole Forest types under any action alternative. Effects on wildlife that use these two Forest types would be as described for Alternative 1 – No action.

Table 141 Acres of harvest treatment by forest type and alternative. The table also displays % of total treatment acres in each forest type.

FOREST TYPE	TOTAL ACRES IN FOREST TYPE	# OF TREATMENT ACRES (% OF TOTAL TREATMENT ACRES)			
		ALT. 2	ALT. 3	ALT. 4	ALT. 5
Dry Forest	29,000	9,700 (91%)	7,470 (91%)	2,460 (90%)	11,120 (91%)
Moist Forest	11,500	940 (9%)	740 (9%)	270 (10%)	1,100 (9%)
Lodgepole Forest	1,100	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Cold Forest	2,000	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Total Acres	43,600	10,640 (100%)	8,210 (100%)	2,730 (100%)	12,220 (100%)

Dry Forests

Table 142 Percentage of Dry Forest type treated by silvicultural prescription by alternative.

TREATMENT	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Dry Forest (29,000 acres)				
Commercial. Thinning (HTH)	14.7%	10.9%		15.8%
Comm. Thin & Pre-commercial Thin (HTH/SPC)	4.6%	3.7%		6.5%
Comm. Thin in Connectivity Corridors (HTH-1)	1.8%	1.0%		0.5%
Comm. Thin & Pre-commercial. Thin in Connectivity Corridors. (HTH-1/SPC-1)	2.6%	2.1%		.1
Understory Removal (HUR)	3.0%	0.8%		4.0%
Shelterwood (HSH)	4.8%	3.3%		9.3%
Salvage (HSV)	0.2%	0.2%		0.2%
Pre-commercial Thinning (SPC)	2.0%	2.1%	6.2%	2.4%
Pre-commercial Thin in Connectivity Corridors (SPC-1)	0.3%	0.4%	2.1%	
Total Treatment	35.0%	24.5%	8.3%	40.0%
No Treatment (HNT)	65.0%	75.5%	91.7%	60.0%

Commercial and/or Pre-commercial Thinning Treatments (HTH, HTH1, SPC, SPC1, see pages 59, 59, and 64)

Stands are recommended for OFSS development. Treatment would be in stands classified as YFMS, UR, SEOC, and SECC structural stages. Ponderosa pine, Douglas-fir and western larch would be favored for retention over grand fir and lodgepole pine. Stand densities would be reduced to decrease fire, insect and disease risk. Tree growth would be increased to reduce the time it takes to grow large diameter trees.

In the short-term (0-5 years), the most substantial change to habitat would be a reduction in canopy closure and stand densities, simplifying stand structure. In many instances, treatment would push stands back to an earlier structural stage (e.g., YFMS would be converted to SEOC).

These changes could potentially affect species that rely on dense, multi-stratum stand conditions for nesting habitat. Many of the stands in YFMS structure condition are currently in cover conditions that would be useful as nesting habitat to woodpeckers, and to a much lesser degree, northern goshawks. With the recommended treatments, crown closures would be reduced 5 to 25%. Such reductions in cover would likely reduce the effectiveness of these stands for nesting habitat.

Forage habitat for these species would be less impacted. While the reduction in canopy closure and stand densities could potentially make feeding woodpeckers more vulnerable to predators, changes in feeding behavior and use of these harvested stands would likely be minimal and difficult to detect. Conversely, goshawk feeding habitat would likely improve. More open stand conditions would create foraging habitat that would permit this raptor to detect and acquire prey more efficiently.

Dead wood habitats would be maintained near existing stand conditions. Because of the existing structure and lack of large trees, dead wood habitat is generally smaller, averaging 8-15" dbh. These habitats, however, would continue to provide foraging habitat for primary cavity excavators. The intensity of the different alternatives varies, with alternative 5 having the greatest impact on YFMS habitats followed by alternatives 2, 3 and 4 in decreasing order of impact.

Pine martens using the higher density YFMS habitats, would be adversely impacted by these treatments. Pre-commercial thinning would result in impacts to the density of ground level vegetation and its effectiveness as cover for this species. Denser understory development is important to the security of the species from predation, as well as its ability to successfully hunt and find prey (Ruggiero et al. 1994). While dead wood habitats would remain relatively unchanged, and continue to provide habitat for the marten, the loss of vegetation cover may be enough to limit or prevent use of treated habitats. Denning and foraging habitat would be degraded or likely lost.

Potential impacts are likely limited to YFMS in the *warmer* Dry Forest types, i.e., those with a high grand fir component. Stands in the *hotter* Dry Forest types and those in the UR, SEOC, and SECC structural stages probably provide minimal habitat for pileated woodpeckers or pine martens. It is important to note that even in the YFMS grand fir types, overall quality of habitat varies, and none contain the higher densities of large tree live and dead wood habitats that are preferred by pileated woodpeckers or pine martens. These conditions result in less than ideal, and possibly less likely used, habitats. The amount of nesting and denning habitat would be reduced, and could potentially affect the number of breeding pairs and territories that the project area could support.

There is the potential to create some much needed, and currently absent, habitats for several species. The treatments recommended would lay the groundwork for restoring OFSS ponderosa pine and mixed conifer stands across the landscape. OFSS was a habitat condition that was historically present and abundant within the project area. The loss of habitat has likely affected the viability of the white-headed woodpecker, a MIS that is greatly dependent upon these open, mature ponderosa pine habitats. Likewise, the Lewis' woodpecker, flammulated owl, various neotropical migrant birds, and other open habitat dependent species have been adversely affected by the loss OFSS stands. Treated stands would not be immediately converted to OFSS due to the deficiency in large diameter trees. However, thinning would accelerate development of large diameter trees. Stands currently in YFMS structure would likely develop into OFSS in

25 years. Stands currently in UR, SEOC or SECC would likely take 50 or more years to develop into OFSS. An OFSS structural stage could be reached more rapidly than under a no treatment scenario.

Understory Removal (HUR, see page 62)

Stands are recommended for OFSS development. Treatment would be in stands classified as OFMS and YFMS that were historically classified as OFSS. Alternatives 2, 3, 4 and 5 respectively treat 435, 233, 20 and 457 acres of OFMS. Understory removal of smaller diameter trees, usually late seral species such as grand fir, which have grown in underneath large, early seral species trees such as ponderosa pine. The objective is to convert these stands from OFMS to OFSS or YFMS to SEOC and to create conditions where fire can be reintroduced as a natural ecosystem component.

In OFMS stands, treatment would degrade habitat for such species as pileated woodpecker and pine marten while improving it for species such as the white-headed woodpecker and flammulated owl. Again, these stands may be providing only secondary habitat for pileated woodpeckers and pine martens because of the deficiency in large snags and downed wood. Treatment may degrade or eliminate nesting habitat for pileated woodpeckers, but would still provide foraging habitat. Both denning and foraging habitat may be eliminated for pine marten. For northern goshawks, harvest would likely degrade nesting but improve foraging habitat. Without treatment these stands remain high risk to wildfire or insect outbreaks that could kill large, older trees and reduce canopy cover. White-headed woodpeckers would benefit greatly from this treatment. The large tree component is already intact, and stand structure would be restored to the open, park-like condition this species prefers. Following harvest treatment, prescribed fire could be used to replicate natural fire regimes and maintain these stands in OFSS condition.

YFMS stands are deficient in the number of large diameter trees required for old growth classification; rather then developing naturally, these stands were originally classified as OFSS and timber harvest removed a portion of the large diameter trees. Fire suppression permitted establishment of understory trees to create the multiple story structure. Conversion of these stands from YFMS to SEOC would accelerate the development of OFSS. OFSS would be expected to develop in approximately 25 years.

Shelterwood Harvest (HSH, see page 60)

Stands are recommended for regeneration and species conversion (i.e., ponderosa pine, western larch and Douglas-fir favored over grand fir). Shelterwood harvest would be applied in a mosaic within each stand. Where high proportions of grand fir exist, harvest would reduce tree stocking to 15 to 20 trees per acre and created openings would be planted with early seral species. Where high proportions of ponderosa pine exist, treatment would resemble a commercial thin and planting would be unnecessary. The objective is to convert these stands from a majority of late-seral species to a majority of early-seral species that are resilient to fire, and insect disturbances.

All stands recommended for treatment are in the SECC structural stage. Treatment would convert these stands to SEOC, UR or SI depending on the proportion of late seral versus early seral species, and the amount of planting required. If the majority of a stand is occupied by grand fir, the post-harvest structure would likely be SI. Because SECC stands are relatively young and even-aged, habitat for late and old growth-species is already fairly limited. Often the grand fir trees are of smaller diameter and highly damaged from insect, disease or suppression. Stands probably provide marginal foraging habitat for woodpecker species.

Harvest would substantially reduce canopy closure and stand density. With the woodpecker species, reduction of cover would result in reduced security from predation, primarily from raptors. Existing dead wood habitats would be maintained; however, with the reduced canopy cover and protection, overall use would decrease. Goshawks would continue to use these habitats for foraging needs, with the opening of canopies possibly benefiting this species. The more open canopy conditions may allow hunting goshawks to be more effective in finding and acquiring prey. Sufficient large diameter trees would be retained to provide a continuous supply of snags and downed wood over time. Stands would likely take 75 to 100 years to develop into OFSS.

Salvage Harvest (HSV see page 62)

Salvage harvest would remove trees blown down in a 1998 windstorm. Salvage would occur on about 60 acres. Recommended harvest units likely classified as OFMS or YFMS prior to the blowdown event; the storm converted these stands to SI. Overstory cover has been essentially eliminated. Nesting/denning habitat no longer exists for canopy dependent species like pileated woodpecker and pine marten. In portions of the blowdown area, the understory is still intact, and likely providing forage habitat. In general, the blowdown event increased foraging habitat for woodpeckers. Three-toed and black-backed woodpeckers, in particular, respond to the increased bark beetle populations associated with these kinds of disturbances. Alternatives 2, 3 and 5 implement salvage harvest; alternative 4 does not. In the salvage unit, untreated patches, 2 to 5 acres in size, would be retained to provide future denning habitat for lynx. Down log accumulations would still remain well above *Land and Resource Management Plan* standards. Salvage and planting would restore vegetation.

Prescribed fire (FBR see page70)—Underburning

Prescribed underburning can alter or remove vertical and horizontal stand structure including snags and down wood. Snags can be both lost and recruited during prescribed burning. The level of loss and replacement is dependent on fire intensity, time of year, local weather conditions, and fuel load. In Southeast Galena, effects to existing dead wood habitats would be expected to be minimal. Snag habitats are already extremely deficient/non-existent throughout most of the recommended burning areas. Past timber harvest, and to a lesser degree, firewood cutting has created this snag-deficient condition. Likewise, down wood habitats are also severely lacking.

Prescribed fires would be expected to burn relatively cool, move slowly, and burn in a mosaic of burned and unburned patches. There is a potential for existing snags to burn through and fall. For ground-based operations, mitigation would require that ignition be avoided within 100 feet of snags 15 inches to 20 inches dbh. Greater protection would be given to trees 21 inches dbh and greater. Helicopter ignitions do not allow such control; if used, sites would need to be monitored to ensure that *Land and Resource Management Plan* standards for snags are being met. Existing down wood would likely be charred. Fires will be kept at a low enough intensity to meet *Land and Resource Management Plan* Amendment 2 standards. Tree mortality directly from the implemented burns, and indirectly from subsequent insect attacks, will likely result in the creation of new snags. Fire would be expected to cause localized single or clumped tree mortality. Although burning prescriptions would permit killing as many as 10% of the dominant and co-dominant trees, recent prescribed burning on the District has not generated these mortality levels. Fire-induced mortality could help offset snags lost during harvest and post-harvest burning. This “snag exchange” may even increase local woodpecker viability if fire created snag recruitment exceeds losses.

Many species tend to have no adverse response to burning nor avoid burned areas (Smith 2000). Research found that prescribed fire does not affect the abundance of birds using the burn area, but burning did alter species composition. Some species, including black-backed, three-toed woodpeckers and Lewis’ woodpeckers may increase their use of the area after burning, depending on the intensity of the burn and the resultant mortality. Black-backed and three-toed woodpeckers, in particular, have been shown to respond favorably to these small pulses in snag creation (Knotts 1998). Hairy and downy woodpeckers also show a positive correlation with burning. The influx in woodpecker species is a response to increased forage and nesting opportunities created by fire-killed or stressed trees and changes in accumulations of ground litter and ladder fuels, senescent shrubs and dense regeneration.

Prescribed burning activities would likely change ground level and lower canopy vegetation structures. Such activities have the potential to affect security/hiding cover for big game species (see deer and elk discussion later in section), wide-ranging carnivores, and smaller mammals. Such change could also affect nesting habitat of ground or near-ground nesting birds, including neotropical migrant species, particularly if burning is conducted during the nesting season. Burning operations could destroy nests or prevent adults from caring for their young. Corridor or connectivity habitat could be affected with loss of security cover.

Understory tree mortality would vary considerably from 10% to 85%. In the southern half of the District, two large-scale prescribed fires (the Antelope and Spion prescribed burns) were conducted within the last five years; both burns appeared to kill less than 5% of the overstory and understory trees. The actual level of impact to security and nesting cover is unknown, although a considerable number of acres would be impacted by these treatments (10,640 to 17,230 acres, depending upon the alternative). Treatments would not all occur in one year; rather they would be implemented over a 10-year period, allowing ground vegetation to recover in some areas before other areas are even burned. Prescribed burning would occur only in Dry Forest types, in areas that historically had relatively low levels of ground and low-canopy structures.

Prescribed burning in combination with harvest treatments recommended for OFSS development would enhance habitat for species which prefer open park-like stands of large diameter trees, including white-headed woodpeckers, Lewis' woodpeckers, and various neotropical migrant birds. The combination of harvest and prescribed fire would help restore historic high frequency/low intensity fire regimes to these Dry Forest types. Prescribed fire was a key feature in creating and maintaining habitat for these species.

Prescribed Fire—Harvest Unit Treatment

In HUR, HTH, HTH1, SPC and SPC1 units, either prescribed underburning or hand pile burning would be used to treat activity fuels created by the recommended harvest treatments. In HSV units, hand pile burning would be used. In HSH units, sites may be prepared for planting via a combination of diseased and damaged tree removal and broadcast burning. Effects associated with underburning were described in the preceding paragraphs. Effects for hand pile burning and broadcast burning are described below.

For hand pile burning, potential effects relate to impacts to down wood densities and impacts to small mammals that may use hand piles for denning or other habitat uses. Materials treated by hand piling activities are generally smaller in diameter, usually smaller than 12" diameter (minimum diameters required for downed wood to be considered for wildlife habitat), and are usually composed of limbs and boughs of the felled trees. In and of themselves, their usefulness as wildlife habitat is minimal. Burning occurs primarily in the winter, when the piles are lit when snow is on the ground. This prevents spread of fire beyond the pile itself. As a result, the potential for impact upon the remaining larger pieces of down wood is minimal if non-existent. Forest rodents will regularly use piles for dens and nests during the year. These "habitats" often replace the deficiencies in down wood habitats that occur throughout project area. Mitigation can be implemented to prevent these impacts, such as burning the piles as soon as possible after piling operations are complete to minimize the number of piles that are inhabited by rodents. Overall impact of burning the piles would be limited to the individuals affected and would not impact species viability across the project area.

Broadcast burning for site preparation is a more intensive treatment. Prior to burning, all undesirable diseased and damage trees are felled. Small diameter grand fir trees are usually felled regardless of their condition. Recall that the objective of shelterwood treatments is to convert stands back to seral species such as ponderosa pine, western larch and Douglas-fir. Burns are controlled to meet *Land and Resource Management Plan* standards for large down logs including charring limits. Burning would reduce most of the downed wood less than 12" dbh. These treatments typically eliminate all thermal and hiding cover. Stands are converted to the UR or SI structural stage. Habitat would be provided for wildlife species which thrive under early seral or open forest conditions. Sites would be planted with ponderosa pine, western larch and Douglas-fir following site preparation activities.

Summary—Changes in Structural Stages

The easiest way to summarize alternative effects on wildlife habitat is to review changes in structural stage distribution. Table 143 displays percentage of each structural stage for each alternative. HRV is displayed to indicate desired distribution. Alternative 1 displays the existing structural stages.

Table 143 Dry Forest Structural Stage Distribution by Alternative

ALTERNATIVE	PERCENTAGE OF FOREST TYPE (TOTAL ACRES = 29,000)						
	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV Range	5-15%	5-25%	5-10%	5-10%	5-15%	30-55%	5-15%
1 – *Existing*	5%	42%	3%	7%	30%	1%	12%
2	5%	43%	2%	13%	24%	4%	9%
3	5%	42%	3%	11%	26%	2%	11%
4	5%	42%	3%	9%	28%	1%	12%
5	5%	43%	2%	17%	20%	5%	8%

YFMS is noticeably reduced, particularly in Alternatives 2 and 5. Treatment would convert most of these stands to SEOC and UR structural stages. Habitat would be degraded or lost for species that prefer high canopy cover and complex structure stands, e.g., pileated woodpecker and pine marten. There are three relatively large, contiguous blocks of YFMS that may be providing sufficient habitat to support reproducing pairs of these species. Two blocks in the Little Boulder/Deerhorn and Vinegar Creek Subwatersheds are each about 1,200 acres in size, although the block in Vinegar Creek is more fragmented. A third block of YFMS, 600 acres in size, is in the Butte Subwatershed. These YFMS blocks are not considered the highest quality habitat for these species. They are in Dry Forest types, are not OFMS, likely have reduced canopy closure, have had past harvest, and are likely deficient in dead wood habitat. The two larger blocks of habitat are on the high end of estimated range sizes for pileated woodpecker (900 acres) and pine marten (1,400 acres). Because of the reduced quality of these habitats, larger home ranges would likely be required to support reproducing pairs. Elsewhere, smaller existing YFMS blocks are found along the periphery of larger contiguous blocks of OFMS, and probably provide foraging habitat for reproducing pairs in the OFMS blocks.

Alternatives 2 and 5 essentially convert the entire Little Boulder and Butte blocks from YFMS to SEOC and UR structure, certainly making these blocks unsuitable for nesting or denning. These alternatives also convert about ½ of the Vinegar block to SEOC and UR structure. Consequently, implementation of alternatives 2 and 5 would potentially reduce the project area carrying capacity by one to three reproducing pairs each of pileated woodpeckers and pine martens. Alternative 3 and 4 would not treat vegetation as aggressively as alternatives 2 and 5. Alternative 3 converts ½ or less of each of these large blocks to SEOC and UR structure; implementation would potentially reduce the project carrying capacity by one to two reproducing pairs for each of these species. Alternative 4 fragments the Little Boulder and Vinegar blocks, but does not enter the Butte block; implementation would possibly reduce carrying capacity by one reproducing pair for each species. Although all action alternatives enter additional smaller blocks of YFMS structure, many of these habitat blocks are isolated or heavily fragmented. Where these smaller habitat blocks are adjacent to larger contiguous blocks of OFMS, they may provide additional foraging habitat for a reproducing pair, but treatment is unlikely to exclude animals from a viable home range. Estimates for reductions in reproducing pairs are simply that – an estimate. Accurate density estimates do not exist for these species, although all are known or suspected of occurring within the project area. Population viability for pileated woodpeckers and pine martens would be maintained via the old growth in the Cold and Moist Forest as well as the recommended system of Dedicated Old Growth, Replacement Old Growth, and Pileated Woodpecker Feeding Areas, as prescribed by the *Land and Resource Management Plan*.

Alternatives were specifically designed to create habitat for the white-headed woodpecker and other species that prefer open park-like stands of old growth, even at the expense of habitat for species like the pileated woodpecker and pine marten. In Table 143, conversion of OFMS to OFSS is reflected in the percentage changes in these two structural stages. Alternative 5 would convert the most acres from OFMS to OFSS – i.e., 457 acres. Most treatment blocks are smaller, although one 180+ acre block would be created. Alternatives 2 and 3 convert 435 and 233 acres, respectively. Alternative 4 converts only 20 acres, and consequently does little to enhance white-headed woodpecker habitat.

Following treatment, SEOC and UR stands would support relatively low trees stocking and canopy cover, but individual tree growth rates would be high. Harvest and under-burning would accelerate development of large diameter trees. Stands converted to the SEOC and UR stage would likely take 25 to 50 years to develop into OFSS. Habitat for the white-headed woodpecker and flammulated owl would be substantially increased.

Blue grouse winter roost habitat could potentially be affected by treatments recommended . Thinning in YFMS stands would have the greatest potential for impact, particularly in ponderosa pine/Douglas-fir mixes. Harvest would likely target many of the mistletoe-infected trees, reducing the overall availability of habitat within these stands. However all alternatives have mitigation that requires leaving clumps of mistletoe infected Douglas-fir near ridge tops, reducing the level of impact. Recommended activities will not affect the viability of this species within the project area.

Snags and downed wood would be essentially maintained at existing levels, providing habitat for primary cavity excavators.

Action alternatives, by shifting stand structure from OFMS and YFMS to simpler stand structures would reduce risk of uncharacteristically severe wildlife, insect or disease damage and restore natural disturbance regimes. The risk of losing large blocks of wildlife habitat would be reduced. Alternative 5 reduces the highest risk structural stages, i.e., OFMS, YFMS, and SECC, from 46% to 31%. Alternative 2, 3 and 4 reduces the high risk structural stages from 46% to 34%, 39% and 43%, respectively.

Moist Forests

Table 144 Percentage of Moist Forest type treated by silvicultural prescription and alternative.

TREATMENT	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Moist Forest (11,500 acres)				
Commercial. Thinning (HTH)	1.6%	.7%		1.7%
Comm. Thin & Precommercial Thin (HTH/SPC)	0.8%	0.3%		2.0%
Comm. Thin in Connectivity Corridors (HTH1)	0.3%			0.3%
Comm. Thin & Precommercial. Thin in Connectivity Corridors (HTH1/SPC1)	0.1%			
Understory Removal (HUR)				0.5%
Shelterwood (HSH)	2.7%	2.1%		2.7%
Salvage (HSV)	1.6%	1.6%		1.6%
Precommercial Thinning (SPC)	1.3%	1.3%	2.1%	1.3%
Precommercial Thin in Connectivity Corridors (SPC1)			0.1%	
Total Treatment	8.5%	6.0%	2.2%	10.1%
No Treatment (HNT)	91.5%	94.0%	97.8%	89.9%

Commercial and/or Pre-commercial Thinning Treatments (HTH, HTH1, SPC, SPC1 see pages 59, 59, and 64)

Commercial and pre-commercial thinning in Moist Forest types would have similar effects as described for the Dry Forest types. All treatments occur in YFMS, UR or SECC structured stands. Tree removal would substantially reduce canopy cover in treatment units. In YFMS stands, thinning would reduce the effectiveness of these stands as nesting habitat for pileated woodpeckers and goshawk and as denning habitat for pine marten. Snag and downed log levels would be maintained at existing levels. Treated stands would still provide foraging habitat for primary cavity excavators. Moist Forest types typically have higher dead wood habitats then Dry Forest types.

Shelterwood Harvest (HSH see page 60)

Shelterwood harvest and commercial thinning in Moist Forest types would have similar effects as described for the Dry Forest types.

All stands recommended for treatment are in the YFMS or UR structural stages. Timber harvest would convert these stands to UR or SI depending on the proportion of late seral versus early seral species. Harvest would substantially reduce canopy closure and stand density. Nesting habitat for pileated woodpeckers and goshawks would be eliminated. Because these stands are not in an OFMS condition, they were likely providing marginal nesting habitat at best. Denning habitat for pine martens would be eliminated. With the woodpecker species, reduction of cover would result in reduced security from predation, primarily from raptors. Existing dead wood habitats would be maintained; however, with the reduced canopy cover and protection, overall use would decrease. Goshawks would continue to use these habitats for foraging needs, with the opening of canopies possibly benefiting this species. The more open canopy conditions may allow hunting goshawks to be more affective in finding and acquiring prey. Sufficient large diameter trees would be retained to provide a continuous supply of snags and downed wood over time. Sufficient large diameter trees would be retained to provide a continuous supply of snags and downed wood over time. Stands would likely take 75 to 100 years to develop into OFMS or OFSS.

Understory Removal (HUR see page 62)

One stand in the Moist Forest type is recommended for conversion from OFMS to OFSS, and only in Alternative 5. The stand is 53 acres. Effects would be as discussed for HUR treatments under Dry Forests. Treatment would degrade habitat for such species as pileated woodpecker and pine marten while improving it for species such as the white-headed woodpecker and flammulated owl. Treatment may degrade or eliminate nesting habitat for pileated woodpeckers, but would still provide foraging habitat. Both denning and foraging habitat may be eliminated for pine marten. For northern goshawks, harvest would likely degrade nesting but improve foraging habitat. Without treatment this stand remains high risk to wildfire or insect outbreaks that could kill large, older trees and reduce canopy cover. White-headed woodpeckers would benefit from this treatment. The large tree component is already intact, and stand structure would be restored to the open, park-like condition this species prefers.

Salvage Harvest (HSV see page 62)

Salvage harvest would remove trees blown down in a 1998 windstorm. Salvage would occur on about 180 acres. Recommended harvest units likely classified as OFMS or YFMS prior to the blowdown event; the storm converted these stands to SI. Overstory cover has been essentially eliminated. Nesting and denning habitat no longer exists for canopy dependent species like pileated woodpecker and pine marten. In portions of the blowdown area, the understory is still intact, and likely providing forage habitat for species such as lynx. The blowdown event increased foraging habitat for woodpeckers. Three-toed and black-backed woodpeckers, in particular, respond to the increased bark beetle populations associated with these kinds of disturbances. Alternatives 2, 3 and 5 implement salvage harvest; alternative 4 does not. In the salvage units, untreated patches, 2 to 5 acres in size, would be retained to provide denning habitat for lynx. In Alternatives 2 and 5, additional blowdown would be removed from the outer ½ of RHCAs (72 acres); 50%-80% of the downed logs would be removed from these acres. In both instances, down log accumulations would still remain well above *Land and Resource Management Plan* standards. Salvage and planting would restore vegetation.

Prescribed Fire (FBR see page70) – Underburning

Prescribed underburning would be limited to treating activity fuels created by timber harvest and precommercial thinning (see below). No underburning would be conducted outside harvest units.

Prescribed Fire—Harvest Unit Treatment

Prescribed fire treatments would include underburning, hand pile burning and broadcast burning. Effects would be as described for prescribed burning in Dry Forests.

Summary—Changes in Structural Stages

The easiest way to summarize alternative effects on wildlife habitat is to review changes in structural stage distribution. Table 145 displays percentage of each structural stage for each alternative. Historical Range of Variability (HRV) is displayed to indicate desired distribution. Alternative 1 displays the existing structural stages.

Table 145 Moist Forest Structural Stage Distribution by Alternative

ALTERNATIVE	PERCENTAGE OF FOREST TYPE (TOTAL ACRES = 11,500)						
	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV Range	10-30%	5-10%	10-20%	10-20%	10-20%	5-15%	15-40%
1 – Existing	6%	6%	4%	6%	39%	5%	34%
2	6%	6%	4%	10%	35%	5%	34%
3	6%	6%	4%	9%	36%	5%	34%
4	6%	6%	4%	7%	38%	5%	34%
5	6%	6%	4%	11%	34%	6%	33%

None of the action alternatives have significant effects on Moist Forest types. Even the most aggressive alternative, i.e., alternative 5, treats only 10% of this forest type. The most noticeable effect of the action alternatives would be the conversion of YFMS stands to UR stands. Habitat would be degraded or lost for species that prefer high canopy cover and complex structure stands, e.g., pileated woodpecker and pine marten, but only on those acres where treatment would occur. Harvest treatment does not fragment any large blocks of OFMS habitat, so the highest quality habitat for pileated woodpeckers and pine martens would be maintained. Alternative 5 would convert one 53-acre stand from OFMS to OFSS, a relatively negligible amount given the size of the project area. Alternatives 2, 3 and 4 would not convert any OFMS to OFSS. The Moist Forest types historically contributed a small amount of habitat for species such as the white-headed woodpecker and flammulated owl. It is estimated that 5 to 15% of this Forest type was historically in OFSS; currently, OFSS is within HRV at 5%, but certainly at the low end of the range.

Stand density and canopy cover in SE and UR stands would be relatively low following stand treatments, but individual tree growth rates would be high. Harvest would accelerate development of large diameter trees. It would likely take 25 to 50 years to restore old growth conditions. SI stands would take 75 to 100 years to develop back into old growth.

A continued supply of dead wood habitat would provide habitat for primary cavity excavators.

Effects to blue grouse would be similar to those described in the Dry Forest types. Because only 10% of the Moist Forests are being treated, magnitude of effects would be much lower.

Overall, the existing distribution of structural stages reflects HRV relatively well. There is an excess of YFMS structural stands and a deficiency in younger structural stages, i.e., the SI, UR, and SECC stages. In the future, it may be desirable to convert some of the YFMS stands into the younger structural stages to provide the historic range of habitats. The best approach would be to mimic the natural fire regime for the Moist Forest type, which tended to convert large blocks of habitat, 200 to 2000 acres in size, into the SI stage in a single event.

Population viability for pileated woodpeckers and pine martens would be maintained via old growth in the Cold and Moist Forest types as well as the recommended system of Dedicated Old Growth, Replacement Old Growth, and Pileated Woodpecker Feeding Areas as prescribed by the *Land and Resource Management Plan*.

Prescribed burning would not be used in the Moist Forest types except in harvest units to reduce activity fuels. Stands would remain at risk for stand replacement wildfires; as this type of fire would remove much of the forest cover and stand structure required by species such as the pileated woodpecker and pine marten. This is not necessarily a negative habitat condition when disturbances are within the Historic Range of Variability. These species would be required to find habitats outside the burned areas. Given the

low level of activity within the Moist Forest types, particularly in Alternative 4, effects would be low and somewhat similar to those described in the no action alternative.

Riparian Hardwood Trees and Shrubs

All of the action alternatives place emphasis on restoring riparian habitat. Hardwoods and shrubs would be planted and/or protected from browsing. Removing encroaching conifers and fencing aspen suckers would enhance existing aspen stands, increasing their chances for survival and ability to return to their historical coverage. Red-napped sapsucker, Williamson's sapsucker, Lewis' woodpecker, and downy woodpecker are several species likely to benefit. Population viability would increase because riparian restoration is being conducted in RHCAs across much of the Middle Fork John Day Basin.

Cumulative Effects to Wildlife—Common to All Action Alternatives

Similar activities - timber harvest, prescribed burning, and hardwood planting and protection - will be going on concurrently within the Middle Fork John Day Subbasin (see Appendix C-Projects Considered for Cumulative Effects). This combination of activities has the potential to cumulatively affect various wildlife species.

The majority of the timber harvest and prescribed fire activities are being conducted in the Dry Forest types where much of the vegetation is outside HRV. Cumulatively, effects would be similar to those described in the previous sections, except they would be applied over a larger area. Treatments will convert OFMS to OFSS structure stands, where appropriate. Younger stands will be managed to develop OFSS over the next 25 to 50 years. Development of large blocks of OFSS structure stands will increase the density and distribution of the white-headed woodpecker, Lewis' woodpecker, flammulated owl, and various neotropical migrant birds dependant on this structure. Population viability for these species would be significantly improved.

Treatments will reduce canopy closures and stand densities. Species, such as the pileated woodpeckers, pine marten, and northern goshawk could be affected by these activities. However, Dry Forests, even in the YFMS condition, are not particularly productive habitats for these species. Large diameter trees and dead wood habitats are notably lacking. Canopy closures are generally lower. Stands are dominated by ponderosa pine and Douglas-fir with a smaller component of grand fir. While structural stages will change from ones that are more suitable for theses species to ones that are less suitable, the overall impact will be much less because of the poorer quality of habitat as it currently exists. Impacts will be primarily to habitats used more for foraging than nesting or denning purposes. Population viability for pileated woodpecker and pine martin would be maintained via old growth in the Moist and Cold Forest types as well as a system of Dedicated Old Growth (DOG), Replacement Old Growth (ROG), and Pileated Woodpecker Feeding Areas (PWFAs).

In the long-term, restoration of Dry Forests, i.e., restoring natural vegetation conditions and fire regimes, will make these habitats far more self-sustaining for associated wildlife species. Treatments will increase, not reduce, wildlife species diversity.

Cumulative impacts to higher quality Moist and Cold Forest habitats are low.

Cumulatively, restoration of riparian habitats across the subbasin will improve overall habitat for species such as the red-naped sapsucker, Williamson's sapsucker, Lewis' woodpecker, downy woodpecker, hermit thrush, red-eyed vireo, and olive-sided flycatcher.

4.2.6.2—Old Growth Habitat and Connectivity

4.2.6.2.1 Modifying DOG/ROG/PWFA Boundaries

4.2.6.2.1.1—Alternative 1

Alternative 1 would maintain the existing condition (see Table 146). Existing Dedicated Old Growth (DOG), Replacement Old Growth (ROG), and Pileated Woodpecker Feeding Area (PWFA) boundaries would not be adjusted. No new DOGs, ROGs or PWFAs would be designated to meet MA-13 standards. Although no new management activities would occur under this project, areas adjacent to existing DOGs/ROGs/PWFAs could be managed under other management area (MA) standards and guidelines. In MA-1 General Forest, timber harvest could still be used aggressively. The ability to manage for an adequate system of DOGs/ROGs/PWFAs could be at risk.

In the short-term (1-25 years), existing DOGs and ROGs would continue to provide habitat for old-growth dependent species. DOGs 129, 248, 33, 433, and 533 are predominantly in the Dry Forest types and are outside HRV, making them high risk for insect, disease or wildfire damage. These DOGs, in their current condition may not be sustainable in the long-term (25+) years.

DOGs 242, 243, 245, 249, 250, 252, 330, and 332 are in the Moist or Cold Forest types, representing the highest quality habitat. Vegetation in these DOGs is considered to be within or near HRV.

Without designation of ROGs and PWFAs, most DOGs provide smaller home ranges than are recommended for pileated woodpeckers and pine martens. However, adjacent habitat is suitable to support species.

Existing LRMP2 corridors would be maintained.

Old Growth Habitat and Connectivity—Alternatives 2, 3, 4 and 5

Alternatives 2, 3, 4 and 5 would result in changes and additions to pileated woodpecker DOGs, ROGs and PWFAs to meet MA-13 standards; i.e., 600 acres for pileated woodpeckers (see Table 146). Designation of suitable MA-13 old growth areas across the project area would improve the Agency's ability to manage for MIS pileated woodpecker and pine marten. As described under Alternative 1, several DOGs/ROGS are located in the Dry Forest types. Vegetation is considered outside HRV, and may be only sustainable in the short- to mid-term (1-25 years.)

Existing LRMP2 corridors would be maintained.

Table 146 Dedicated Old Growth (DOGs) and Replacement Old Growth (ROGs) Units

DOG #	HABITAT REQUIREMENTS FOR INDICATOR SPECIES	MIN. ACRES[1]	EXIST. DOG ACRES	PROP. DOG ACRES	EXIST. ROG ACRES	PROP. ROG ACRES[2]	ADD. FEEDING ACRES[2]	TOTAL PROP. ACRES
DOG 129	Pileated Woodpecker	600	397	443[4]	0	193 (46)[3]	137	773 (46)[3]
DOG 242	Pine Marten	240	249	268	47	142 (10)[3]	---	410 (10)[3]
DOG 243	Pine Marten	240	204	208 (22)[3]	0	109 (5)[3]	---	317 (27)[3]
DOG 245	Pine Marten	240	214	235	0	132	---	367
DOG 248	Pine Marten	240	149	161	0	124	---	285
DOG 249	Pine Marten	240	168	191	0	87	---	278
DOG 250	Pine Marten	240	169	170	0	97	---	267
DOG 252	Pine Marten	240	153	152	0	89	---	241
DOG 330	Woodpecker/Marten	600	340	337	0	160	173	670
DOG 332	Woodpecker/Marten	600	302	298 (6)[3]	0	171	140	609 (6)[3]
DOG 333	Woodpecker/Marten	600	366	332 (14)[3]	134	193 (8)[3]	137 (7)[3]	662 (29)[3]
DOG 433	Pileated Woodpecker	600	171	168[4]	0	146	160	474
DOG 533	Pine Marten	240	217	251	0	130 (8)[3]	---	381 (8)[3]
TOTALS		4,920	3,099	3,214 (42)[3]	181	1,773 (77)[3]	747 (7)[3]	5,734 (126)[3]

NOTES: MIN. = Minimum **EXIST. =** Existing **PROP. =** Recommended **ADD. =** Additional

1 Old-growth Management Area (MA-13) Minimum Management Requirements:

Pileated Woodpecker Areas = 300-acre DOG + 300-acre feeding area = 600 acres. ROGs = 150-acres and overlap with feeding areas.

Pine Marten = 160-acre DOG + 80-acre ROG = 240 acres

2 ROG acres also contribute towards pileated woodpecker feeding acres. "Recommended ROG Acres" and "Additional Pileated Feeding Acres" fields should total at least 300 acres for each DOG.

3 Non-forested or unsuitable inclusions (acres) are displayed in parentheses.

4 Recommended DOG 433 at 168 acres falls short of minimum size requirements for a pileated woodpecker DOG (300 acres); however DOG 129 is immediately adjacent to DOG 433 and includes 143 surplus acres. Combined, the two DOGS contain 611 acres, a sufficient number of acres to meet requirements (600 acres).

4.2.6.2.1.3—Alternative 3 only

Alternative 3 would expand DOG/ROG/PWFA areas for pileated woodpeckers to meet 900-acre home ranges recommended by Bull and Holthausen (1993) as displayed in Table 147, DOGs 129, 330, 332, 333, and 433 would be expanded. The additional 300+ acres would not be officially added to DOGs or ROGs, but rather, these acres would be mapped and harvest treatment would be deferred until the next round of Forest planning determines appropriate management strategies. The 900-acre areas would include acres designated as DOG, ROG, and feeding areas plus the additional 300 treatment-deferred acres. CONCERN 1: MODIFYING MA-13 DOGS/ROGS/PWFAS discusses the effects of increasing DOG/ROG/PWFA areas in detail. Pine marten areas would remain as described in Table 146. Existing LRMP2 corridors would be maintained.

Table 147 Expanded Pileated Woodpecker Areas

DOG #	DESIRED HOME RANGE ACRES[1]	PROP. DOG ACRES	PROP. ROG ACRES[2]	ADD. PILEATED FEEDING ACRES[2]	TOTAL PROP. ACRES – CURRENT FOREST PLAN DIRECTION	HOME RANGE ADDITIONS	NEW TOTAL ACRES
DOG 129	900	443[4]	193 (46)[3]	137	773 (46)[3]	302	1,075 (46)[3]
DOG 330	900	337	160	173	670	285	955 (6)[3]
DOG 332	900	298 (6)[3]	171	140	609 (6)[3]	303	912
DOG 333	900	332 (14)[3]	193 (8)[3]	137 (7)[3]	662 (29)[3]	306	968 (29)[3]
DOG 433	900	168[4]	146	160	474	309	783
TOTALS	4,500	1,578 (20)[3]	863 (54)[3]	747 (7)[3]	3,188 (81)[3]	1,505	4,693 (81)[3]

1 Home range size recommended by Bull and Holthausen (1993):

2 ROG acres also contribute towards pileated woodpecker feeding acres. "Recommended ROG Acres" and "Additional Pileated Feeding Acres" fields should total at least 300 acres for each DOG.

3 Non-forested or unsuitable inclusions (acres) are displayed in parentheses.

4 Recommended DOG 433 at 168 acres falls short of minimum size requirements for a pileated woodpecker DOG (300 acres); however DOG 129 is immediately adjacent to DOG 433 and includes 143 surplus acres. Combined, the two DOGS contain 611 acres, a sufficient number of acres to meet requirements (600 acres).

4.2.6.2.2 Timber Harvest/Prescribed Fire within Old Growth Habitat and Connectivity Corridors

Timber harvest and prescribed fire can be used to help restore historic stand structure and fire regimes, in particular, on Dry Forest types. *Land and Resource Management Plan* Amendment 2 and the *Galena Watershed Analysis* recommended conversion of OFMS stands back to historic conditions of OFSS, where appropriate. *Land and Resource Management Plan*, Amendment 2 directs that younger stands should be managed towards OFMS or OFSS. Action alternatives incorporate these strategies at varying levels (see Table 148). In the DOGs, timber harvest and prescribed fire would not occur in any of the alternatives. In the ROGs, PWFAs, and LRMP2 corridors action alternatives would use timber harvest and prescribed fire to varying degrees, as described below. Treatments are prescribed where current vegetation conditions do not meet historic conditions, and stands are considered at risk. All recommended management actions are consistent with *Land and Resource Management Plan* standards for maintaining DOG and ROG habitat. Mitigation measures for large diameter trees, wildlife snags, down woody debris, LRMP2 corridors, and prescribed burning are described in **2.5.6 Mitigation**, page 90.

Table 148 Summarizes treatment acres and (percentages) within old growth habitat and LRMP2 corridors by alternative.

Alternative	Harvest Acres in DOGs	Harvest Acres in ROGs	Harvest Acres in PWFAs	Harvest Acres in 300-acre Additions[1]	Harvest Acres in Old Growth Outside DOGs/ROGs	Harvest Acres in LRMP, Amendment 2 Corridors
Alternative 1	0	0	0	0	0	0
Alternative 2	0	131 (4%)	195 (7.7%)	257 (17%)	313 (4%)	171 (2%)
Alternative 3	0	0	0	0	223 (3%)	0
Alternative 4	0	0	0	0	20 (<1%)	38 (<1%)
Alternative 5	0	192 (4%)	195 (7.7%)	257 (17%)	313 (4%)	220 (3%)

1Only Alternative 3 expands pileated management areas by 300 acres. Harvest activities are deferred. Alternatives 2 and 5 treat these areas as General Forest MA-1.

4.2.6.2.2.1—Alternative 1

Management activities are limited to ongoing activities. Alternative 1 would not conduct any additional timber harvest or prescribed burning activities in old growth habitat or LRMP2 corridors. In the short term (0-25 years), cover and stand structure would improve, providing better movement and dispersal habitat. In the long term (over 25 years), connectivity habitat would be at greater risk for wildfire or insect damage.

Action Alternatives (4.2.6.2.2.)

The number of acres recommended for harvest treatment is relatively low, given the size of the Southeast Galena project area. Table 149 displays the number of acres recommended for treatment as well as the percentage treated. The following discussion describes effects only on those acres prescribed for treatment. Section 4.2.6.2.1 incorporates effects at the project level scale.

In the short- to mid-term (1-25 years), treatments may have effects to old-growth species dependent on high canopy cover and structure, such as pileated woodpecker and pine marten. For pileated woodpeckers, habitat changes would make treatment areas less suitable for nesting, but still suitable for foraging. For pine martens, denning and foraging habitat may be lost in the short- to mid-term, but only on the acres treated. Treatment would only be conducted within the ROGs and PWFAs as directed by the *Land and Resource Management Plan*; core habitat for nesting/denning would be maintained in the DOGs. Treatments are considered beneficial to related old growth dependent species in the long-term (25+ years).

OFMS would be converted back to OFSS stands. Tree species and stand structure would better mimic historic, more sustainable conditions. Younger structural stage stands (YFMS, SECC, and UR) would be thinned to accelerate development of large diameter trees and restoration of old forest structure. Specific actions and effects are described below by alternative. 4.3.11—, page 413 provides additional detail on the effects of treatments in LRMP2 corridors.

4.2.6.2.2.2—Alternative 2

Alternative 2 would not harvest within any DOG. Timber would be harvested on 131 acres within recommended ROG 433. On 122 of the 131 acres, understory removal (HUR) would be used to thin smaller, understory trees from beneath larger, overstory trees. Stand structure would be converted from OFMS to OFSS. Treatment units are 704, 706, and 710. On the remaining 9 acres, commercial thinning (HTH) would reduce tree stocking in a SECC stand to increase growth on the residual trees. Tops of trees would be yarded attached to remove fuels from site. Thinning would accelerate development of large diameter trees and restoration of old forest structure. Treatment unit is 708. All units would be prescribe burned to reduce slash and other ground fuels.

Alternative 2 would harvest timber on 195 acres within PWFAs associated with DOGs 129 and 433. Treatment units are 702, 728 and 666; units classify as YFMS or SEOC. Commercial thinning (HTH) and/or pre-commercial thinning (SPC) would reduce tree stocking, increase growth rates on the residual trees, and accelerate the development of old forest structure. In units 702 and 666, tops of trees would be yarded attached and then the units prescribe burned. In unit 728, slash would be hand piled and burned.

Alternative 2 would harvest timber on 313 acres of OFMS located outside existing and recommended DOGs/ROGs. Treatment units are 17, 18, 152, 154, 178, 180, 186, 188, 346, 348, 642, 715, 838 and 840. Understory removal (HUR) would thin smaller, understory trees from beneath larger, overstory trees. Stand structure would be converted from OFMS to OFSS. All units would be prescribe burned, except for unit 642 where slash would be hand piled and burned.

Alternative 2 would harvest timber on 171 acres within LRMP2 corridors. Treatment units are 47, 48, 49, 64, 600, 602, 603, 606, and 608. A modified commercial thinning (HTH1) would reduce stocking, increase growth rates on the residual trees, and accelerate development of old forest structure, while maintaining connectivity. Tops of trees would be yarded. Where understory stocking is high, a modified precommercial thinning (SPC1) would also be used to reduce stocking. Clumps of small trees would be retained to provide connectivity and horizontal diversity. In units 64 and 606, slash would be hand piled and burned.

Outside of harvest units, prescribed fire could be used in Dry Forest types located in ROGs, PWFAs, or LRMP2 corridors. Mitigation would ensure that minimum canopy closure and tree stocking requirements would be met (see Chapter 2, Section 2.5.6). Prescribed fire effects would be as described in Prescribed Fire (FBR) – Underburning.

4.2.6.2.2.3—Alternative 3

Alternative 3 would emphasize short-term habitat needs for pileated woodpecker and pine marten over long-term needs. This alternative does not harvest within any existing or recommended DOG, ROG or PWFA. Harvest would also be avoided within 300-acre additions to pileated woodpecker management areas. Existing canopy cover and structural complexity would be maintained.

Alternative 3 would harvest timber within 233 acres of old growth habitat located outside existing and recommended DOGs/ROGs. Treatment units are Units 17, 18, 152, 154, 178, 180, 186, 188, 346, 348, 838 and 840. Understory removal (HUR) would thin smaller understory trees from beneath larger, overstory trees. Stand structure would be converted from OFMS to OFSS. All units would be prescribed for burning.

Alternative 3 would not harvest timber within LRMP2 corridors; prescribed fire effects would be as described for Alternative 2.

4.2.6.2.2.4—Alternative 4

Alternative 4 would not harvest within any existing or recommended DOG or ROG.

Alternative 4 would treat timber on 67 acres within the PWFA associated with DOG 129. The treatment unit is 728 would reduce tree stocking,increase growth rates on risidual trees, and accelerate the development of old forest structure. Slash would be hand piled and burned.

Alternative 4 would treat timber on 20 acres of OFMS located outside existing and recommended DOGs/ROGs. The treatment unit is Unit 642. Pre-commercial thinning (SPC) would thin smaller, understory trees from beneath larger, overstory trees. Stand structure would be converted from OFMS to OFSS.

Alternative 4 would pre-commercial thin (SPC1) small, understory trees on 38 acres within LRMP2 corridors. Treatment units are 602 and 603. Clumps of small trees would be retained to provide connectivity and horizontal diversity. Prescribed fire effects would be as described for Alternative 2

4.2.6.2.2.5—Alternative 5

Alternative 5 would not harvest within any DOG. Timber would be harvested on 192 acres within recommended ROGs 248, 249 and 433. On 184 of the 192 acres, understory removal (HUR) would be used to thin smaller, understory trees from beneath larger, overstory trees. Stand structure would be converted from OFMS to OFSS. Treatment units are 140, 637, 704, 706, and 710. On the remaining 9 acres, commercial thinning (HTH) would reduce tree stocking to increase growth on the residual trees. Tops of trees would be yarded attached to remove fuels from site. Thinning would accelerate development of large diameter trees and restoration of old forest structure. Treatment unit is 708. In unit 637, slash would be hand piled and burned. The remaining units would be prescribe burned to reduce slash and other ground fuels.

Alternative 5 harvests timber on 195 acres within PWFAs associated with DOGs 129 and 433. Commercial thinning (HTH) and/or small tree thinning (SPC) would reduce tree stocking, increase growth rates on the residual trees, and accelerate the development of OFMS structure. Treatment units are 702, 728 and 666.

Alternative 5 would harvest timber on 326 acres of old growth habitat located outside existing and recommended DOGs/ROGs. Treatment units are Units 17, 18, 152, 154, 178, 180, 186, 188, 190, 346, 348, 642, 715, 838 and 840. Understory removal (HUR) would thin smaller, understory trees from beneath larger, overstory trees. Stand structure would be converted from OFMS to OFSS. All units would be prescribe burned, except for unit 642 where slash would be handpiled and burned. .

Alternative 5 would harvest timber on 220 acres within LRMP2 corridors. Treatment units are 43, 47, 48, 49, 64, 600, 602, 603, 606, and 608. A modified commercial thinning (HTH1) would reduce stocking, increase growth rates on the residual trees, and accelerate development of old forest structure, while maintaining connectivity. Where understory stocking is high, a modified pre-commercial thinning (SPC1) would also be used to reduce stocking. Clumps of small trees would be retained to provide connectivity and horizontal diversity. In units 64 and 606, slash would be hand piled and burned. Treatments would maintain canopy closure within the top 1/3 of site potential, but may not retain the same 180 trees per acre stocking levels prescribed in LRMP2 corridors under the other alternatives. Cover near the ground would be reduced. Although these units would still maintain *Land and Resource Management Plan* standards for connectivity but the quality of habitat for dispersal and movement would be somewhat reduced.

4.2.6.3—Big Game

The following discussion discloses the effects of alternatives to big game. Discussion also addresses how well alternatives meet the following objectives brought forward from the Galena Watershed Analysis:

- Improve forage habitat
- Provide cover that is well distributed
- Reduce potential disturbance from road traffic
- Reduce the risk of catastrophic losses of habitat

4.2.6.3.1—Alternative 1

Alternative 1 would not meet the purpose and need to improve big game habitat, specifically to improve forage habitat, reduce potential disturbance from road traffic, and reduce the risk of catastrophic disturbances that might destroy large areas of habitat.

In the short-term (within 10 years), deer and elk numbers would remain high and the species relatively well distributed, animals possibly only avoiding the large, open expanses of the Summit and Reed Fire areas, and high road density areas in the Tincup/Little Butte and Granite Boulder Subwatersheds.

HEI, cover percentages and open road densities, which are all used to evaluate the habitat effectiveness of elk, would remain in their current condition (see Table 102, Table 103, Table 104, and Table 105 beginning on page 187).

Total percent cover would remain above *Land and Resource Management Plan* standards in all subwatersheds. One exception is the Dixie Butte Wildlife Emphasis Area where the Davis/Placer subwatershed is below standards; however, this is probably at full potential given site conditions (see 3.2.6.2.3—MIS—Rocky Mountain Elk , page 183). Otherwise, cover would remain well distributed except in Summit and Reed Fire areas.

Cover quality is skewed towards marginal cover. In summer range, satisfactory cover would remain at 3% or less in the Vinegar and Vincent subwatersheds, well below the *Land and Resource Management Plan* standard of 12%. In winter range, satisfactory cover would remain at 5% in the Little Boulder/Deerhorn and Tincup/Little Butte Subwatersheds, below the *Land and Resource Management Plan* standard of 10%. In the Wildlife Emphasis Area, satisfactory cover would remain at 2% in the Davis/Placer Subwatershed, below the *Land and Resource Management Plan* standard of 40%. It is probably unrealistic to expect greater levels of satisfactory cover, particularly in winter range, where high canopy cover is not particularly sustainable, much less attainable, in Dry Forest types. The Dixie Wildlife Emphasis Area remains deficient in satisfactory cover due to the extent of low canopy, subalpine habitats rather than past management activities. Deficiencies in satisfactory cover may not be severely limiting given the abundance of total cover.

Elk and deer numbers would remain out of balance with forage, particularly in the amount of browse species. Forage would continue to exist in meadows, past harvest units and forested areas where canopy closure is low (<40%). In the Summit and Reed Fires, ground vegetation, both grasses and shrubs, would likely be well established in many areas by the end of the 10-year period. Grasses are recovering quickly, and shrub species such as ceanothus and upland willow are emerging in many areas. The burns may not be fully utilized, however, due to the long distance to cover in many areas. Alternative 1 forgoes the option to plant and protect hardwood shrubs and trees, which are favored browse species of big game.

Open roads would continue to have an adverse effect on big game, especially in locally cover deficient areas as well as riparian areas that may be used for calving and fawning. In winter range, open road densities would remain in excess of the Forest Plan standard of 2.2 miles per square mile in the Tincup/Little Butte (3.92 miles/square mile) and Granite Boulder (7 miles per square mile) subwatersheds. Deer, and particularly elk, would likely avoid such heavily roaded areas, concentrating animals over smaller

areas. Elsewhere, minimum standards for road densities would be met but would not always be at target levels recommended in the *Land and Resource Management Plan* Record of Decision, i.e., 1.5 miles of open road per square mile in summer range and 1.0 miles of open road per square mile in winter range. A few roads may close naturally as a result of encroaching vegetation and very little use, but minimal change in open road densities would be expected. Open roads would continue to affect the distribution and movement of elk and deer, but would likely be highly limiting only in the winter range portion of the Tincup/Little Butte and Granite Boulder Subwatersheds.

Risks of uncharacteristically severe wildfire would remain high on much of the project area. Another wildfire on scale with the Summit Fire could dramatically reduce cover and forage habitat. Deer and elk could be forced into smaller usable areas or into adjacent watersheds.

Over the next 25 years, in the absence of disturbance, canopy cover would gradually increase, both within stands currently classified as satisfactory or marginal cover, and within stands currently classified as forage habitat. Harvest units thinned in the 1980's and 1990's would begin to transition from foraging habitat to marginal cover. Harvest units regenerated in the 1980's and 1990's, including large portions of the Summit and Reed Fires, would begin to transition from forage habitat to hiding cover.

Forage would become more limiting. The quantity and vigor of grasses and shrubs would continue to decline as overstory shading and competition for water and nutrients increases. Natural or accidentally induced fires would likely be suppressed and in most instances held to a few acres. Historically frequent, low intensity fires recycled nutrients and invigorated many grasses and shrub species. The continued absence of these fires would continue to contribute to the decline in species' health and vigor. The decline in forage quantity and quality would likely be most impacting in winter range. Aspen is a favored browse species. Mature aspen trees would continue to decline and regeneration would be low or nonexistent. Several of the smaller, older and more decadent aspens sites could disappear from the watershed within 25 years. All aspen sites may be gone within 100 years.

In the long-term, and in the absence of some major natural disturbance, habitat effectiveness would gradually decline as cover increases and both forage quantity and quality become more limiting.

As forested stands become more crowded, the likelihood and potential severity of a catastrophic disturbance event such as wildfire or insect epidemic would also increase. A large, catastrophic event could eliminate large blocks of cover and/or forage in a short period of time, making large areas of the watershed unsuitable as habitat. HEI values could easily fall below standards. Under such circumstances the decline in habitat effectiveness would be dramatic rather than gradual.

Big Game—Alternatives 2, 3, 4 and 5

The general effects of management activities to big game are described first. Secondly, discussion will address specific changes in HEI, cover and open road density by alternative.

General Direct and Indirect Effects of Action Alternatives

Overall, alternatives 2, 3, and 4 would meet the purpose and need to improve big game habitat, although to varying degrees. Specifically, these alternatives would improve forage habitat, provide well-distributed cover, reduce potential disturbance from road traffic, and reduce the risk of catastrophic disturbances that could destroy large areas of habitat. In localized areas, management has the potential to both positively and negatively impact habitat. Timber harvest and pre-commercial thinning, prescribed fire, road closures, and hardwood planting and protection would have the most pronounced effects.

In Alternative 5, high priority is given to restoring historic vegetation conditions, in some subwatersheds, at the expense of meeting *Land and Resource Management Plan* standards for thermal cover. High priority is also given to increasing road access, at the expense of meeting *Land and Resource Management Plan* standards for open road density. Management tools are identical to those used in Alternatives 2, 3 and 4 – i.e., timber harvest and pre-commercial thinning, prescribed fire, road closures, and hardwood planting and protection – however, in many subwatersheds, they are used more intensively.

Timber Harvest and Pre-commercial Thinning

Under all action alternatives, timber harvest would reduce satisfactory, marginal and hiding cover. Analysis assumed that all recommended harvest treatments in cover - shelterwood harvest (HSH), understory removal (HUR), commercial thin (HTH or HTH1) and pre-commercial thin (SPC or SPC1) - would essentially eliminate thermal cover, i.e., cover will be reduced below the 40% canopy cover needed to classify as marginal cover. This assumption may be conservative. Where only small diameter trees are removed, as in the HUR or SPC treatments, canopy cover may be reduced, but not necessarily fall below the 40% threshold.

Most of the timber harvest in cover would occur in ponderosa pine stands on Dry Forest types. These stands are considered outside HRV; i.e., overstocked and likely unsustainable given the high risk of uncharacteristically severe wildfire or insect epidemics. Many of these stands would likely fall out of cover within the next 25 years if not treated. Harvest would help move theses stands back towards their historical condition. Treatment would reduce the risk that a large-scale disturbance similar to the Summit Fire would reduce large areas of cover and forage.

Pre-commercial thinning of small trees – small pole-, sapling- and seedling-sized trees – would have the greater impact on hiding cover. Road closures would be used to mitigate these losses. In addition, silvicultural prescriptions would be modified to retain cover patches and provide structural diversity as follows:

- In commercial thinning (HTH) units, harvest would be designed to vary tree density by up to 50% to retain patches of cover. Patches would be 0.25 acre to 1 acre in size. High tree density areas would provide higher levels of cover in the short-term. Lower density areas will open up forest stands dramatically, permitting natural regeneration to occur, which in turn should provide patches of hiding cover in about 20 years (see **2.5.6.2.2—Mitigation for Harvest Operations**, Wildlife, page 96)
- In understory removal (HUR) and pre-commercial thinning (SPC) units, a minimum 15% of each unit would be retained in untreated patches scattered throughout the unit. Patches would be 0.25 acre to 1 acre in size. Priority would be given to locating untreated patches adjacent to open roads, meadows, and other natural openings years (see **2.5.6.2.2—Mitigation for Harvest Operations**, Wildlife, page 96)
- In LRMP2 wildlife corridors and KLAs, each HTH1 and SPC1 unit would be marked to manage canopy cover at the upper 1/3 of site potential. Trees 8 feet in height or greater would be retained at a minimum of 180 trees per acre. Tree retention guidelines would apply to commercial harvest , pre-commercial harvest and burning operations. Pre-commercial thinning size material (i.e., 7 inches dbh or less) would be retained in untreated patches, .025 to 1 acre in size, scattered across the unit (see **Commercial Thinning in Connectivity Corridors—HTH1**, page 59 and **Pre-commercial Thin in Connectivity Stands—SPC1** page 64).

Untreated patches would remain at high risk to bark beetle attack, and would likely fall out of cover if tree mortality is high. These patches would be gradually lost over the next 25 years.

Timber harvest, while reducing cover, at the same time has the potential to increase forage. Where canopy cover is reduced, understory vegetation is likely to increase due to less competition for light, water and nutrients.

Where cover/forage ratios are skewed towards cover, timber harvest that removes cover and increases forage will potentially improve big game habitat (Thomas et al., 1979). Where the cover/forage ratio is skewed in favor of forage, cover removal by timber harvest can create areas avoided by deer and elk, most notably if roads provide human access into forage areas. In Southeast Galena, all subwatersheds have total cover in excess of minimum standards, and forage and browse is likely to be the more limiting habitat component.

In La Grande, Oregon, the Pacific Northwest Research Station has been studying ungulates under the 40 square mile Starkey Project. Research has raised the concern that resource managers may be overstating the importance of thermal cover on elk condition (PNW Research Station 2000). The energetic benefits of thermal cover may be inconsequential, and it is forage or nutritional effects that may have the greater impact on individual animal performance. This research compliments Southeast Galena objectives to restore HRV and increase forage at the expense of cover.

Timber harvest and pre-commercial thinning are forgone in most riparian habitat conservation areas (RHCAs), reducing potential disturbance to or losses in calving and fawning habitat. Exceptions exist. Twenty-five aspen groves are located within or near RHCAs. Encroaching conifers would be removed and the groves fenced. Aspen groves make up an incremental portion of the riparian system, and effects to calving and fawning habitat would be essentially inconsequential. In the Vincent and Vinegar Subwatersheds, RHCAs in the 1,400-acre blowdown area would be entered. In the outer ½ of the RHCAs, approximately 50 to 80% of the wind thrown trees would be removed (salvaged) by helicopter. Removal of downed material can have both positive and negative effects. Salvage of downed trees would possibly degrade calving and fawning habitat, even though some of the downed materials would be left in place. On the other hand, large concentrations of down logs can also create barriers to big game movement. Thomas et al., (1979) noted that dead and down material and logging slash greater than two feet in depth can affect the way deer and elk use an area. Although elk are not excluded from areas with large amounts of down timber, they apparently tend to avoid such situations.

During periods of activity, timber harvest and pre-commercial thinning would impose an immediate disturbance to deer an elk. These activities would be conducted over a period of approximately 10 years. At any one time, management activities would be localized in portions of the watershed, and deer and elk are likely to shift use areas as activities progress across the watershed. In big game winter range (MA-4a), timber management activities would be restricted from December 1 to April 1 to minimize disturbance to wintering deer and elk.

Table 149 displays acres of satisfactory and marginal cover harvested in summer range and winter range. Values are displayed for all action alternatives. No timber harvest activities would be conducted in the Dixie Butte Wildlife Emphasis Area, so values are not displayed. Analysis assumes that the greater the reduction in cover, the greater the increase in forage. Juxtaposition of cover and forage patches is also important, since big game use in openings decrease with increased distance from cover. Lekenby (1984) verified that elk use of habitat in the Blue Mountains is influenced by distances from cover/forage edge areas as well as size and spacing of cover and forage patches. Consequently, values in table below need to be considered in conjunction with HEI and cover percentages displayed in Table 152, Table 153and Table 154, beginning on page 311.

Table 149 Acres of satisfactory and marginal cover harvested in summer and winter range. Percentage reduction in cover is also shown. Values are displayed for all action alternatives.

ALTERNATIVE	SUMMER RANGE				WINTER RANGE			
	SATISFACTORY COVER		MARGINAL COVER		SATISFACTORY COVER		MARGINAL COVER	
	Acres	%	Acres	%	Acres	%	Acres	%
1	0	0	0	0	0	0	0	0
2	687	12%	4,315	28%	57	10%	218	11%
3	277	5%	2,750	18%	57	10%	186	9%
4	111	2%	1,249	8%	0	0%	50	3%
5	1,072	19%	5,301	34%	69	12%	313	16%

Regenerated stands (HSH) would be expected to develop into marginal cover within 25 years if pre-commercial thinning is forgone; it may take 30 to 50 years if pre-commercial thinning is conducted.

Thinned stands (HTH or HTH1) would be expected to transition back into marginal cover in approximately 25 to 50 years depending on stand density following harvest. HTH1 stands would be thinned to approximately 80 square feet basal area and HTH stands to 60 square feet; consequently HTH1 stands would transition back into marginal cover more rapidly.

Prescribed fire

Prescribed fires are expected to burn relatively cool, move slowly, and burn in a mosaic of burned and unburned patches. Large, highly mobile animals like deer and elk tend to move calmly in response to fire, tending towards the periphery of the fire (USDA, 2000 Wildland Fire In Ecosystems). Small crews of about 5 to 10 people would manage the fire. If ATVs with drip torches are used to traverse the area, deer and elk may move further out from the fire perimeter. Disturbance would be short-term, unlikely lasting more than 2 or 3 days on the larger burning operations. Elk and deer could return to burn areas as soon as the ground cools.

Direct fire-caused mortality would be unlikely; mortality typically occurs only in uncontrolled wildfire situations where fire fronts are wide and fast moving, fires are actively crowning, and thick smoke occurs. Young calves/fawns could be trapped and killed by fire, although losses would probably not be significant. To help mitigate effects to calves and fawning habitat, fires in RHCAs would be conducted under conditions that promote low intensity fire. Fire ignition would not occur directly in RHCAs, although they would be permitted to creep in from adjacent areas. Prescribed fire would only be permitted in identified calving and fawning areas from July 1 to April 30 when newborns would not be present. In areas not specifically identified as calving or fawning areas crews are to watch for lone elk or deer. If crews see lone animals, they will search the immediate area for calves or fawns and avoid lighting where newborns are found.

Low intensity prescribed fire usually has little effect on thermal cover. Burning does little to reduce overstory canopy that contributes the most to thermal properties. Mortality in dominant and co-dominant trees would not exceed 10%.

Prescribed fire can however reduce hiding cover when allowed to burn at moderate or high intensity in thickets of young understory. In Southeast Galena, burning would be primarily conducted in Dry Forest vegetation types that were historically dominated by open park-like stands of large diameter trees. Fires would burn in a mosaic of burned and unburned patches. Understory tree mortality would vary considerably from 10% to 85%. In HUR and SPC units, mitigation requires that a minimum of 15% of understory trees be retained in patches of .25 to 1 acre, but rarely would burning reduce stocking of understory trees to this level. In the southern half of the District, two large-scale prescribed fires – the Antelope and Spion prescribed burns – were conducted within the last five years; both burns appeared to kill less than 5% of the overstory and understory trees. The negative impact of thicket removal is compounded near roads where sight distance is increased, thereby raising the potential for poaching and harvest vulnerability of deer and elk. Burning might increase the possibility for insect activity, particularly bark beetle activity. If beetle activity intensifies, there would be some risk of additional losses of hiding cover and possibly thermal cover.

In harvest units, prescribed fire could be used in concert with timber harvest and pre-commercial thinning to reduce logging slash and other ground fuels. Pre-commercial thinning would reduce most of the hiding cover; prescribed fire would have minimal additional effects. Regeneration units may be the only exception, where prescribed fires of higher intensity may be used to remove undesirable trees and slash and prepare the sites for planting.

Because prescribed fire would be expected to burn in a mosaic, ground vegetation would be reduced but not entirely eliminated. Temporarily, forage opportunities still may be better elsewhere, at least, until ground vegetation is reestablished. Most native grasses and forbs and many shrubs respond positively to fire. Plants tend to sprout vigorously from their roots if the above ground portions are killed by fire, although it might take 2 to 3 years for species to return to their pre-fire abundance and volume. Fire can also increase nutrient content and palatability of forage, although the increased quantity of forage after a fire

may be more significant than the increased quality of that forage (USDA 2000). Species that respond favorably to fire include pinegrass, elk sedge, rose, snowberry, ceanothus, serviceberry, chokecherry and currant. Species that are adversely impacted by burning include mountain mahogany and bitterbrush. Overbrowsing has been detrimental to existing shrubs and fire might increase abundance and vigor of many species, thus reducing the level of browsing on any individual species or plant. Ideally, landscapes would be underburned every 10 to 15 years to enhance forage quality and quantity.

Little impact to calving and fawning habitat would be expected. As stated previously, fires would be only allowed to creep into RHCAs and would be of low intensity. Based on District experience, it is unlikely that the fires would be of sufficient intensity to kill large amounts of riparian shrubs. Where fire does kill shrubs, forbs and grasses, vigorous sprouting of vegetation would be expected, and plants would regain their pre-fire abundance and size within 2 to 3 years.

Table 150 displays acres of fire treatment by alternative. The table displays acres to be treated both inside and outside timber harvest/pre-commercial thinning units. Fire treatment acres are totaled and displayed as a percentage of the Southeast Galena Restoration Project Area.

Table 150 Acres of fire treatment by alternative. Table displays acres inside and outside harvest units. Treatment acres are totaled and displayed as a % of Southeast Galena Project Area

Alternatives	Prescribed Burn Associated With Timber Sale (Acres)	Hand Pile And Burn Associated With Timber Sale (Acres)	Prescribed Fire (Acres)	Total Fire Treatment	
				Acres	Percent of SE Galena
1	0	0	0	0	0%
2	1,450	2,390	21,780	25,620	54%
3	910	1,430	18,490	20,830	44%
4	0	0	18,490	18,490	39%
5	2,150	2,360	21,780	26,290	55%

Treatment of vegetation, whether through tree cutting or prescribed burning, reduces wildfire risks, and consequently also reduces the potential for loss of wildlife habitat from an uncharacteristically severe wildfire. The greater the number of acres treated, the lower the wildfire risk. Under the no action alternative, risks of uncharacteristically severe fire would remain high to moderate on 72% of the project area. Alternative 2, 3, 4 and 5 would reduce this fire risk to 53%, 58%, 70%, and 48% of the project area respectively. Note that there is actually a temporary increase in fire risk immediately following timber-cutting activities, until cutting slash can be treated. Alternative 5 reduces wildfire risk the most; Alternative 4 reduces wildfire risk the least.

Open Road Densities

Within the first 10 years, new road construction would increase open road densities. When timber sales are active, log haul activities would temporarily increase local traffic levels. Disturbance to big game would be expected to increase over the current condition. Deer and elk are likely to shift use areas as activities progress across the watershed. As timber sales are completed, specified haul roads would be closed. Within the first 5 years, road closures to be completed with harvest activities would be about 20% complete, and road closures not associated with harvest activities would be about 50% complete. By year 10, all roads scheduled for closing, would be about 100% complete. As road closures are completed, disturbance to deer and elk from vehicular traffic and mortality from hunting would be expected to decrease from current levels. Closures would in part mitigate losses in hiding cover that occur due to timber harvest and prescribed fire. In RHCAs, approximately 22 miles of road would be decommissioned or relocated outside RHCAs under all action alternatives. Although road relocation is being conducted primarily to reduce

hydrology and fisheries concerns, moving roads out of RHCAs would improve potential calving and fawning habitat as well. Road closures within RHCAs would also improve calving and fawning habitat.

Alternatives 2, 3, and 4 implement the same "Access and Travel Management Plan." These alternatives would meet standards for open road density in all subwatersheds and management areas. Alternative 5 implements an alternative "Access and Travel Management Plan" and was purposely designed to increase public access, even at the expense of big game habitat effectiveness. Standards for open road density are met only some of the time (see Appendix E, Map 29 Access Travel Management Plan Alternatives 2,3, and 4).

Hardwood Planting and Protection

Many hardwood trees and shrubs are important browse species for deer and elk. The action alternatives would increase the distribution and density of these species. Hardwood trees and shrubs would be planted along 21 miles of streams; seedlings would be fenced to protect them from browsing. An additional 4 miles of existing shrubs would also be fenced. In 25 aspen groves, encroaching conifers would be removed and the sites expanded and fenced. In the first 10 years, many of these trees and shrubs would be essentially off limits to deer and elk, but as new regeneration become established and protective fences deteriorate or are removed, available browse should increase. Calving and fawning habitat would also increase. Aspen groves would be larger, and healthier and more likely to remain a viable component of the landscape. Table 151 summarizes hardwood restoration treatments.

Table 151 Displays miles of hardwood planting and protection, and number of sites and acres of aspen restoration by alternative

Alternatives	Streamside/Riparian Hardwood Planting And Protection (Miles)	Streamside/Riparian Existing Hardwood Protection (Miles)	Aspen Restoration (# Sites/Acres)
1	0	0	0
2	21	4	25/30
3	21	4	25/30
4	21	4	25/30
5	21	4	25/30

Habitat Effectiveness

Habitat Effectiveness Index (HEI), cover percentages and open road densities were calculated by subwatershed for each alternative. Values are displayed in Table 152, Table 153, and Table 154, beginning on page 311, for summer range, winter range and the Dixie Butte Wildlife Emphasis Area, respectively. The previous discussion highlighted the general impacts of timber harvest, pre-commercial thinning, prescribed fire, road management, and hardwood planting and protection on big game habitat. Cover would be reduced and forage would be increased. Open road density would be reduced in all alternatives except Alternative 5. Although management activities would provide both positive and negative impacts to big game habitat, the overall trend is one of habitat improvement. In most instances, the values presented in Table 152, Table 153, and Table 154 confirm these trends with Forest Plan standards being met or exceeded. There are localized instances, however, where management activities would not meet *Land and Resource Management Plan* standards or are causing a downward trend in habitat effectiveness. Discussion following the tables highlights these adverse effects. The "Total HEI" column in each table also rates each alternative relative to the other alternatives. The highest HEI values are rated 1, the second highest rated 2, etc. Alternatives 2 and 3 often generate the highest HEI ratings. Alternative 5 often generates the lowest HEI rating.

There is to some degree a range of weakness in the HEI model which should be noted:

- The HEI model is not highly sensitive to changes in cover habitat. This becomes more of a concern when overall cover levels are low. The HEc standard may be met even though the cover percentage standards (i.e., % satisfactory and % marginal cover) may not. For example, see Table 153, Winter Range, Tincup/Little Butte Subwatershed. Alternative 5 easily meets the

standard for HEc (0.60), but not the total cover percentage standard (21%). Although the *Land and Resource Management Plan* requires that habitat effectiveness be analyzed using both measures, this effects discussion will give more weight to the cover percentages.

- The cover variable (HEc) addresses the quality of cover based on the ratio of satisfactory cover to marginal cover, while the spacing variable (HEs) addresses the amount and distribution of cover. Based on observed differences in elk preference (USDA 1988), satisfactory cover is given a weight of 1.0 and marginal cover is given a weight of 0.5. Consequently, in situations where the amount of satisfactory cover is less than the amount of marginal cover, as is the situation in much of Southeast Galena, a reduction in marginal cover can actually improve the satisfactory/marginal cover ratio and increase the HEc variable. For example, see Table 152, Summer Range, Vinegar Subwatershed. Alternative 2 harvests 737 acres of marginal cover and 0 acres of satisfactory cover, increasing the HEc variable from .53 to .54.
- HEf is a measure of forage quality and quantity. In the absence of forage surveys, changes in the HEf variable are difficult or impossible to quantify. In this analysis, HEf values for all action alternatives are kept at 0.50 (the midpoint between a possible low value of 0.0 and a high value of 1.0) even though forage quantity and quality is expected to increase due to timber harvest, prescribed fire, and hardwood planting and protection. Under the no action alternative, HEf would be expected to decline.

Table 152 Summer Range—HEI values, cover percentages, and open road density

SUBWATERSHED	HEc♥	HEs♥	HEr♥	Total HEI♣ (Rating)♠	%S♦	%M♦	Total Cover %♦	Open Road Density (miles per square mile)
LRMP STANDARD Summer Range	.30	.30	.40	.40	12%	5%	20%	3.2 (1.5) ▲
Davis/Placer								
Alternative 1	.67	.47	.48	.52 *(2)*	17	34	51	2.05
Alternative 2	.68	.47	.53	. 54 *(1)*	15	28	43	1.60
Alternative 3	.67	.47	.53	. 54 *(1)*	16	31	47	1.60
Alternative 4	.67	.47	.53	. 54 *(1)*	17	34	51	1.60
Alternative 5	.69	.48	.42	.51 *(3)*	15	26	41	2.72
Vinegar								
Alternative 1	.53	.64	.50	.54 *(2)*	2	40	42	1.84
Alternative 2	.54	.68	.51	. 55 *(1)*	2	30	32	1.72
Alternative 3	.54	.68	.51	. 55 *(1)*	2	30	32	1.72
Alternative 4	.53	.67	.51	.55 *(1)*	2	34	36	1.72
Alternative 5	.52	.65	.44	.52 *(3)*	1	24	25	2.43
Vincent								
Alternative 1	.53	.63	.52	. 54 *(1)*	3	38	41	1.64
Alternative 2	.56	.59	.51	. 54 *(1)*	3	18	21	1.73
Alternative 3	.55	.62	.51	. 54 *(1)*	3	22	25	1.73
Alternative 4	.53	.61	.51	.54 *(1)*	3	35	38	1.73
Alternative 5	.50	.50	.33	.45 *(2)*	0	16	16	3.66
L. Boulder/Deerhorn								
Alternative 1	.59	.42	.57	.52 *(4)*	12	52	64	1.21
Alternative 2	.61	.58	.62	.58 *(1)*	10	36	46	0.91
Alternative 3	.61	.51	.62	.56 *(2)*	12	41	53	0.91
Alternative 4	.59	.52	.62	.56 *(2)*	10	45	55	0.91
Alternative 5	.61	.58	.54	.55 *(3)*	9	33	42	1.51
Tincup/Little Butte								
Alternative 1	.70	.43	.55	.54 *(4)*	29	42	71	1.42
Alternative 2	.73	.63	.57	.60 *(1)*	22	26	48	1.21
Alternative 3	.70	.44	.57	.54 *(4)*	26	40	66	1.21
Alternative 4	.71	.45	.57	.55 *(3)*	26	40	66	1.21
Alternative 5	.73	.63	.49	.58 *(2)*	20	25	45	1.96
Butte								
Alternative 1	.76	.59	.55	.59 *(3)*	23	21	44	1.38
Alternative 2	.76	.59	.58	.60 *(2)*	19	17	36	1.10
Alternative 3	.75	.65	.58	.61 *(1)*	18	18	36	1.10
Alternative 4	.76	.58	.58	.60 *(2)*	23	21	44	1.10
Alternative 5	.74	.60	.44	.56 *(4)*	16	17	33	2.47
Granite Boulder								
Alternative 1	.73	.53	.55	.57 *(2)*	23	27	50	1.34
Alternative 2	.73	.53	.57	.58 *(1)*	23	27	50	1.19
Alternative 3	.73	.53	.57	.58 *(1)*	23	27	50	1.19
Alternative 4	.73	.53	.57	.58 *(1)*	23	27	50	1.19
Alternative 5	.73	.53	.57	.58 *(1)*	23	27	50	1.21

♠The HEI column displays HEI rating relative to other alternatives (i.e.1=best)

♣HEI = Habitat Effectiveness Index HEI = Hcsr = (HEc x HEs x HEr)1/3

♥HEc = habitat effectiveness derived from quality of cover HEs = derived from size and spacing of cover HEr = derived from density of roads open to vehicular traffic HEf = derived from quantity and quality of forage.

♦%S = Satisfactory Cover %M = Marginal Cover % Total Cover = %S + %M

▲The LRMP standard for open road density in summer range is 3.2 miles/mile$_2$; but strives for 1.5 miles/mile$_2$.

Table 153 Winter Range—HEI values, cover percentages and open road density(see key at bottom of table for definitions in heading).

SUBWATERS HED	HEc♥	HEs♥	HEr♥	HEf♥	Total HEI♣ (rating) ♠	%S♦	%M♦	Total Cover %♦	Open Road Density (miles per square mile)
LRMP STANDARDWinter Range	.40	.30	.50	.40	.50	10%	10%	25%	2.2 (1.0) ▲
Davis/Placer									
Vinegar									
Vincent-									
L. Boulder/Deerhorn									
Alternative 1	.56	.75	.68	.50	.62 (1)	5	34	39	0.72
Alternative 2	.56	.75	.68	.50	.62 (1)	5	34	39	0.72
Alternative 3	.56	.75	.68	.50	.62 (1	5	34	39	0.72
Alternative 4	.56	.75	.68	.50	.62 (1)	5	34	39	0.72
Alternative 5	.56	.75	.42	.50	.55 (2)	5	34	39	2.70
Tincup/Little Butte									
Alternative 1	.58	.63	.30	.50	.48 (3)	5	26	31	3.92
Alternative 2	.59	.60	.54	.50	.60 (1)	5	21	26	0.62
Alternative 3	.59	.60	.54	.50	.60 (1)	5	21	26	0.62
Alternative 4	.58	.63	.54	.50	.60 (1)	5	26	31	0.62
Alternative 5	.60	.60	.48	.50	.54 (2)	4	17	21	2.10
Butte									
Alternative 1	.71	.76	.63	.50	.64 (1)	19	26	45	0.90
Alternative 2	.72	.78	.57	.50	.63 (2)	15	19	34	1.15
Alternative 3	.72	.78	.57	.50	.63 (2)	15	23	38	1.15
Alternative 4	.73	.75	.57	.50	.63 (2)	19	23	42	1.15
Alternative 5	.72	.78	.37	.50	.57 (3)	15	19	34	3.21
Granite Boulder									
Alternative 1	.60	.55	.10	.50	.36 (3)	12	44	56	7.00
Alternative 2	.60	.55	.47	.50	.53 (1)	12	44	56	2.16
Alternative 3	.60	.55	.47	.50	.53 (1)	12	44	56	2.16
Alternative 4	.60	.55	.47	.50	.53 (1)	12	44	56	2.16
.Alternative 5	.60	.55	.30	.50	.47 (2)	12	44	56	3.95

Key

♠The HEI column displays HEI rating relative to other alternatives (i.e.1=best)

♣HEI = Habitat Effectiveness Index HEI = Hcsrf = (HEc x HEs x HEr x HEf)1/4

♥HEc = habitat effectiveness derived from the quality of cover HEs = habitat effectiveness derived from the size and spacing of cover HEr = habitat effectiveness derived from the density of roads open to vehicular traffic HEf = habitat effectiveness derived from the quantity and quality of forage.

♦%S = Satisfactory Cover %M = Marginal Cover % Total Cover = %S + %M

▲The LRMP standard for open road density in summer range is 2.2 miles per square mile; however, the LRMP Record of Decision directs that managers will strive for an open road density of 1.0 mile per square mile.

Table 154 Wildlife Emphasis - HEI values, cover percentages and open road density by subwatershed(see key at bottom of table for definitions in heading).

SUBWATERSHED	HEc♥	HEs♥	HEr♥	HEf♥	Total HEI♣ (rating) ♠	%S♦	%M♦	Total Cover %♦	Open Road Density (miles per square mile)
LRMP STANDARD Wildlife Emphasis	.50	.60	.60	.50	.70	20%	20%	40%	1.5
Davis/Placer									
Alternative 1	.53	.55	1.0	.50	.62 (1)	2	24	26	0.0
Alternative 2	.53	.55	1.0	.50	.62 (1)	2	24	26	0.0
Alternative 3	.53	.55	1.0	.50	.62 (1)	2	24	26	0.0
Alternative 4	.53	.55	1.0	.50	.62 (1)	2	24	26	0.0
Alternative 5	.53	.55	1.0	.50	.62 (1)	2	24	26	0.0
Vinegar									
Vincent									
L.Boulder/Deerhorn									
Alternative 1	.79	.46	1.0	.50	.65 (1)	43	30	73	0.0
Alternative 2	.79	.46	1.0	.50	.65 (1)	43	30	73	0.0
Alternative 3	.79	.46	1.0	.50	.65 (1)	43	30	73	0.0
Alternative 4	.79	.46	1.0	.50	.65 (1)	43	30	73	0.0
Alternative 5	.79	.46	1.0	.50	.65 (1)	43	30	73	0.0
Tincup/Little Butte									
Alternative 1	.96	.26	1.0	.50	.59 (1)	85	8	93	0.0
Alternative 2	.96	.26	1.0	.50	.59 (1)	85	8	93	0.0
Alternative 3	.96	.26	1.0	.50	.59 (1)	85	8	93	0.0
Alternative 4	.96	.26	1.0	.50	.59 (1)	85	8	93	0.0
Alternative 5	.96	.26	1.0	.50	.59 (1)	85	8	93	0.0
Butte									
Alternative 1	.74	.44	.64	.50	.57 (2)	38	43	81	0.84
Alternative 2	.74	.44	.68	.50	.58 (1)	38	43	81	0.70
Alternative 3	.74	.44	.68	.50	.58 (1)	38	43	81	0.70
Alternative 4	.74	.44	.68	.50	.58 (1)	38	43	81	0.70
Alternative 5	.74	.44	.65	.50	.57 (2)	38	43	81	0.84
Granite Boulder									
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Key

♠The HEI column displays HEI rating relative to other alternatives (i.e.1=best)

♣HEI = Habitat Effectiveness Index HEI = Hcsrf = (HEc x HEs x HEr x HEf)1/4

♥HEc = habitat effectiveness derived from the quality of cover HEs = habitat effectiveness derived from the size and spacing of cover HEr = habitat effectiveness derived from the density of roads open to vehicular traffic HEf = habitat effectiveness derived from the quantity and quality of forage.

♦%S = Satisfactory Cover %M = Marginal Cover % Total Cover = %S + %M

4.2.6.3.2—Alternative 2 (HEI)

Summer Range

In Alternative 2, timber harvest would reduce total cover in all subwatersheds except Granite Boulder. *Land and Resource Management Plan* standards for ***total cover*** would be met in all subwatersheds.

In the Vincent and Vinegar subwatersheds, satisfactory cover is already deficient and no additional satisfactory cover would be harvested. In the Little Boulder/Deerhorn subwatershed, 195 acres of satisfactory cover would be entered, reducing the cover percentage from 12% to 10%, below the *Land and*

Resource Management Plan standard of 12%. Harvest units 636, 643, 644 and 646 would be commercially thinned (HTH) and/or pre-commercially thinned (HTH/SPC). All four units occur in mixed conifer stands on Dry Forest types. These stands are considered outside HRV; i.e., overstocked and likely unsustainable given the high risk of uncharacteristically severe wildfire or insect epidemics. Harvest would help move them back towards their historical condition. Hiding cover mitigation and road closures would help offset deficiencies in cover. A non-significant amendment to the *Land and Resource Management Plan* would be required to reduce cover below standard.

Road closures would reduce open road densities in all subwatersheds except theVinegar subwatershed. Open road density in Vinegar would increase slightly to provide access to both an active popular dispersed recreation site and a mine. All subwatersheds would meet the *Land and Resource Management Plan* standard for open road density of 3.2 open road miles per square mile. Four of seven subwatersheds would meet the *Land and Resource Management Plan* objective of 1.5 open road miles per square.

Total HEI improves or remains the same in all subwatersheds. Losses in satisfactory cover in the Little Boulder/Deerhorn Subwatershed would have minimal impact given the high percentage of total cover still remaining. Forage would improve. Open road densities would decrease as timber sales and associated activities are completed; disturbance to big game would be expected to decrease accordingly. Population numbers would likely remain about the same; herd distribution would improve. Total HEI ranks 1st in five subwatersheds and 2nd in one subwatershed.

Winter Range

Timber harvest would remove cover only in the Tincup/Little Butte and Butte Subwatersheds. *Land and Resource Management Plan* standards for total cover would be met in all subwatersheds. In the Little Boulder/Deerhorn and Tincup/Little Butte Subwatersheds, satisfactory cover is already deficient and no additional satisfactory cover would be harvested. Hiding cover mitigation and road closures would help offset deficiencies in cover.

Road closures in the Granite Boulder and Tincup/Little Butte subwatersheds would dramatically reduce open road densities. These subwatersheds would meet *Land and Resource Management Plan* standards for open road densities for the first time. HEr values would also decrease; the HEr value for Granite Boulder would remain slightly below standard; however, this is simply a reflection of an inconsistency between the HEI model and the open road density standard. In the Butte subwatershed, open road density would increase slightly to provide better access to trailhead facilities. The Little Boulder/Deerhorn subwatershed would meet the *Land and Resource Management Plan* objective of 1.0 miles of open road per square mile; the other subwatersheds would move towards, but not meet, this target.

Total HEI improves with substantial increases in the Tincup/Little Butte and Granite Boulder Subwatersheds. Large changes in HEr values have a pronounced effect on overall HEI values. Open road densities would decrease as timber sales and associated activities are completed; disturbance to big game would be expected to decrease accordingly. Winter forage would improve. Population numbers would likely remain about the same; herd distribution would improve. Total HEI ranks 1st in three subwatersheds and 2nd in one subwatershed.

Wildlife Emphasis Area

Recommended management is identical for Alternatives 2, 3 and 4. No timber harvest or prescribed fire would occur in the Dixie Butte Wildlife Emphasis Area. Only the Butte Subwatershed is roaded. Open road density is already low. Open road density would be reduced incrementally from 0.8 miles to 0.7 miles of open road per square mile.

Overall, HEI would remain the same as the existing condition in three of four subwatersheds. In the Butte Subwatershed, HEI would improve incrementally due to road closures. The difference between the action alternatives and the no action alternative is considered negligible. Effects would be as discussed for Alternative 1 – No Action. No impacts to population numbers or herd distribution would be expected. Deer and elk would continue to use the Dixie Butte Wildlife Emphasis Area during the summer due to cooler

temperatures and higher stand densities that afford decreased human access and increased big game security. Total HEI ranks 1st in all four subwatersheds.

Cumulative Effects (HEI)

Elsewhere in the Middle Fork John Day Drainage, similar projects – timber harvest, prescribed burning, road closures, and/or hardwood planting and protection – are being implemented or are recommended for implementation (see Appendix C-Projects Considered for Cumulative Effects). All projects are expected to improve big game habitat in the long-term. Timber harvest, prescribed fire, and hardwood planting and protection are expected to improve forage quantity and quality. Road closures are expected to reduce disturbance to big game. Restoration of HRV in the Dry Forest types is expected to reduce the risk of catastrophic disturbances such as uncharacteristically severe wildfire and insect epidemics that could destroy large expanses of cover and forage habitat.

4.2.6.3.3—Alternative 3(HEI)

Summer Range

Overall, Alternatives 2 and 3 are similar. Alternative 3 does retain somewhat higher levels of cover habitat than Alternative 2 as can be seen by comparing cover percentages. The most important difference between these two alternatives is that Alternative 3 would not reduce satisfactory cover below *Land and Resource Management Plan* standard in the Little Boulder/Deerhorn subwatershed. This subwatershed would provide 195 acres of additional satisfactory cover, although cover conditions may not be sustainable given the bark beetle risk.

Total HEI improves or remains the same in all subwatersheds. Forage would improve, although not on the same number of acres as Alternative 2. Open road densities would decrease as timber sales and associated activities are completed; disturbance to big game would be expected to decrease accordingly. Population numbers would likely remain about the same; herd distribution would improve. Total HEI ranks 1st in five subwatersheds. HEI ranking drops in the Tincup/Little Butte and Butte subwatersheds as compared to Alternative 2.

Winter Range

In winter range, Alternatives 2 and 3 are identical. Effects would be as described for Alternative 2. Total HEI would improve or remain the same in all subwatersheds. In the Tincup/Little Butte and Granite Boulder Subwatersheds, HEI would improve significantly upon completion of road closures. Open road densities would decrease as timber sales and associated activities are completed; disturbance to big game would be expected to decrease accordingly. Winter forage would improve. Population numbers would likely remain about the same; herd distribution would improve. Total HEI ranks 1st in three subwatersheds and 2nd in one subwatershed.

Wildlife Emphasis Area

In the Dixie Butte Wildlife Emphasis Area, Alternatives 2, 3 and 4 are identical. Effects would be as described for Alternative 2. Total HEI would remain the same as the existing condition in three of four subwatersheds. In the Butte Subwatershed, HEI would improve incrementally due to road closures. The difference between these alternatives and the no action alternative is considered negligible. No impacts to population numbers or herd distribution would be expected. Deer and elk would continue to use the Dixie Butte Wildlife Emphasis Area during the summer due to cooler temperatures and higher stand densities that afford decreased human access and increased big game security. Total HEI ranks 1st in all four subwatersheds.

Cumulative Effects (HEI)

Cumulative effects would be the same as described for Alternative 2. For Alternative 3, fewer cover acres would be treated under this project, however overall trends would be similar.

4.2.6.3.4—Alternative 4(HEI)

No commercial harvest would occur, only pre-commercial thinning of small diameter trees. This effects analysis assumes pre-commercial thinning would reduce canopy cover below the 40% threshold needed to classify as marginal cover. In reality, cover may be degraded rather than eliminated.

Summer Range

Although Alternative 4 reduces cover habitat within the project area, it does so to a much lesser degree than Alternatives 2 and 3, comparing cover percentages. Cover habitat would be retained on more acres, reducing opportunities to increase/improve forage habitat. Even in treatment units, limiting tree removal to small, understory trees, may only marginally open up canopy cover.

As in Alternative 2, loss of cover may be of concern only in the Little Boulder/Deerhorn Subwatershed. Alternative 2 harvests 196 acres of satisfactory cover in this subwatershed; Alternative 4 harvest 110 acres. The satisfactory cover percentage falls from 12% to 10%, below the *Land and Resource Management Plan* standard of 12%. Harvest units 643, 644 and 646 would be pre-commercially thinned (SPC). All three units occur in mixed conifer stands on Dry Forest types. As described under Alternative 2, these stands are considered outside HRV; harvest would help move them back towards their historical condition. Hiding cover mitigation and road closures would help offset deficiencies in cover. A non-significant amendment to the *Land and Resource Management Plan* would be required to reduce cover below standard.

Total HEI improves or remains the same in all subwatersheds. Forage would improve, although not on the same number of acres as Alternatives 2 or 3. Open road densities would decrease as timber sales and associated activities are completed; disturbance to big game would be expected to decrease accordingly. Population numbers would likely remain about the same; herd distribution would improve. Total HEI ranking drops in several subwatersheds as compared to Alternatives 2 and 3; cover/forage ratios would not be as good.

Winter Range

Effects are similar to Alternatives 2 and 3. As in summer range, Alternative 4 reduces less cover habitat in winter range. Opportunities to increase or improve forage habitat are reduced. In winter range, differences between alternatives are much less than those that would occur in summer range.

Overall, HEI would improve or remain the same in all subwatersheds. In the Tincup/Little Butte and Granite Boulder Subwatersheds, HEI would improve significantly due to road closures. Open road densities would decrease as activities are completed; disturbance to big game would be expected to decrease accordingly. Winter forage would improve, although on less acres. Population numbers would likely remain about the same; herd distribution would improve. Total HEI ranking drops in several subwatersheds as compared to Alternatives 2 and 3; cover/forage ratios would not be as good.

Wildlife Emphasis Area

In the Dixie Butte Wildlife Emphasis Area, Alternatives 2, 3 and 4 are identical. Effects would be as described for Alternative 2. Total HEI would remain the same as the existing condition in three of four subwatersheds. In the Butte Subwatershed, HEI would improve incrementally due to road closures. The difference between these alternatives and the no action alternative is considered negligible. No impacts to population numbers or herd distribution would be expected. Deer and elk would continue to use the Dixie Butte Wildlife Emphasis Area during the summer due to cooler temperatures and higher stand densities that afford decreased human access and increased big game security. Total HEI ranks 1st in all four subwatersheds.

Cumulative Effects (HEI)

Cumulative effects would be the same as described for Alternative 2. For Alternative 4, fewer cover acres would be treated under this project, however overall trends would be similar.

4.2.6.3.5—Alternative 5 (HEI)

In Alternative 5, high priority is given to restoring historic vegetation conditions, in some subwatersheds, at the expense of thermal cover falling below *Land and Resource Management Plan* standards. Alternative 5 was purposely designed to increase public access, even at the expense of increasing disturbance to deer and elk.

Summer Range

Timber harvest would reduce total cover in all subwatersheds except Granite Boulder. *Land and Resource Management Plan* standards for total cover would be met in all subwatersheds except the Vincent Subwatershed, where harvest would reduce cover from 41% to 16%, below the *Land and Resource Management Plan* standard of 20%. A non-significant amendment to the *Land and Resource Management Plan* would be required to reduce cover below standard.

Satisfactory cover would be reduced in the Vincent, Vinegar and Little Boulder/Deerhorn subwatersheds, even though these subwatersheds are already at or below the *Land and Resource Management Plan* standard of 12%. Changes are described in detail below:

- In the Vincent subwatershed, all satisfactory cover, approximately 94 acres, would be entered, reducing the cover percentage from 3% to 0%. Harvest units 426, 444 and 446 would be shelterwood harvested (HSH); units 440 and 441 would be commercial thinned (HTH).
- In the Vinegar Subwatershed, about 126 acres of satisfactory cover would be entered, reducing the cover percentage from 2% to 1%. Harvest units 204, 212, 214, 216 and 218 would be shelterwood harvested (HSH).
- In the Little Boulder/Deerhorn Subwatershed, 230 acres of satisfactory cover would be entered, reducing the cover percentage from 12% to 9%. Harvest units 610, 636, 643, 644 and 646 would be commercial and precommercial thinned (HTH/SPC).

All units in satisfactory cover occur in mixed conifer or ponderosa pine stands in Dry Forest types. All stands are considered outside HRV; i.e., overstocked and likely unsustainable given the high risk of uncharacteristically severe wildfire or insect epidemics. Harvest would help move them back towards their historical condition. Hiding cover mitigation would help offset deficiencies in cover. A non-significant amendment to the *Land and Resource Management Plan* would be required to reduce cover below standard.

Open road density would increase in all subwatersheds except Granite Boulder. The Vincent subwatersheds' open road density of 3.66 miles of open road per square mile would no longer meet the *Land and Resource Management Plan* standard (3.2 miles of open road per square mile). All other subwatersheds would meet standards, but the trend is away from a desired open road density of 1.5 miles per square mile. Only two of seven subwatersheds would meet the *Land and Resource Management Plan* objective of 1.5 open road miles per square mile versus three of seven subwatersheds today. In the HEI model, all HEr values would decrease, except in the Granite Boulder subwatershed. A non-significant amendment to the *Land and Resource Management Plan* would be required to increase open road density beyond *Land and Resource Management Plan* standards.

Effects to HEI vary. Where total cover habitat is high, timber harvest would improve cover/forage ratios. In the Little Boulder/Deerhorn, Tincup/Little Butte, and Granite Boulder subwatersheds, HEI would increase over the existing condition. Forage would improve. Population numbers would likely remain about the same; herd distribution would improve. Losses in satisfactory cover in the Vinegar and Little Boulder/Deerhorn Subwatersheds would likely have minimal impact given the high percentage of total cover still remaining. HEI in the Davis/Placer subwatershed would decrease slightly due to increased road densities, however the change is insignificant.

In the Vincent subwatershed, treatments would reduce habitat effectiveness. HEI would fall below the *Land and Resource Management Plan* standard. Impacts to deer and elk would likely be greater at higher elevations where cooler temperatures and denser canopies provide some of the better summer range. Such stands also function as security and escapement cover during hunting season. Cover losses combined with increased road densities are likely to cause increased elk and deer vulnerability to poaching and harvest. Deer and elk numbers would likely decrease. Herds may move into adjacent subwatersheds with suitable amounts of cover. Impacts would be expected to last 15 to 20 years, after which time stand regeneration and an in increase in understory development would begin to provide hiding cover, increased security and relief from summer heat.

Total HEI rankings are often lower than HEI rankings for the other action alternatives.

Winter Range

Timber harvest would remove cover only in the Tincup/Little Butte and Butte Subwatersheds. *Land and Resource Management Plan* standards for cover would be met in all subwatersheds except Little Boulder/Deerhorn and Tincup/Little Butte where satisfactory cover is already deficient. In the Tincup/Little Butte subwatershed, thinning on 222 acres would reduce total cover from 31% to 22%, below the *Land and Resource Management Plan* standard of 25%. Only marginal cover would be treated, no satisfactory cover would be entered. Recommended units in marginal cover are units 23, 29, 30, 31, 39, 41, and 46. Only a portion of units 31 and 41 are in winter range. These units would be commercially thinned (HTH) and/or pre-commercially thinned (SPC). Units occur in mixed conifer or ponderosa pine stands in Dry Forest types. These stands are considered outside HRV; i.e., overstocked and likely unsustainable given the high risk of uncharacteristically severe wildfire or insect epidemics. Harvest would help move them back towards their historical condition. Hiding cover mitigation would help offset deficiencies in cover.

As in summer range, road access in winter range would be increased at the expense of increased disturbance to deer and elk. Although some roads would be closed, the general trend would be towards greater access and a more even distribution of open roads. Open road miles would increase significantly in the Little Boulder/Deerhorn and Butte Subwatersheds; these subwatersheds would no longer meet the *Land and Resource Management Plan* standard for open road density (2.2 miles of open road per square mile). Open road densities would be reduced in the Tincup/Little Butte and Granite Boulder Subwatersheds, although only the Tincup/Butte Subwatershed would meet standards. No subwatershed would meet the *Land and Resource Management Plan* objective of 1.0 open road miles per square mile. HEr values would not meet standards.

The Granite Boulder Subwatershed would not meet the total HEI standard due to high road densities. The Little Boulder/Deerhorn, Tincup/Little Butte, and Butte Subwatersheds would meet total HEI standards, primarily due to good cover/forage ratios. In reality, habitat effectiveness would probably still be low due to high road densities, particularly in the Little Boulder/Deerhorn and Butte Subwatersheds. High road densities would likely elevate vehicular traffic and increase disturbance to deer and elk. Animals would likely avoid portions of winter range, forcing herds into adjacent subwatersheds and concentrating them into smaller areas. Easy access on forest roads would also lead to reduced deer and elk escapement during hunting seasons and facilitate illegal taking of game animals. In the Tincup/Little Butte Subwatershed, reductions in cover below standards would also decrease habitat effectiveness. Total HEI rankings are often lower than HEI rankings for the other action alternatives.

Wildlife Emphasis Area

No timber harvest or prescribed fire would occur within the Dixie Butte Wildlife Emphasis Area. No roads would be closed. Open road density would remain static. Effects would be as discussed for Alternative 1 – No Action. Recommended management under Alternative 5 is nearly identical to actions recommended in Alternatives 2, 3 and 4 as well. The only difference is Alternatives 2, 3 and 4 would reduce open road density incrementally in the Butte subwatershed from 0.8 to 0.7 miles of open road per square mile.

Total HEI would remain the same as the existing condition in all four subwatersheds. The difference between the action alternatives and the no action alternative is considered negligible. Effects would be as discussed for Alternative 1 – No Action. No impacts to population numbers or herd distribution would be expected. Deer and elk would continue to use the Dixie Butte Wildlife Emphasis Area during the summer due to cooler temperatures and higher stand densities that afford decreased human access and increased big game security. Total HEI ranks 1st in all three subwatersheds, 2nd in one subwatershed due to a slightly higher open road density.

Cumulative Effects (HEI)

Cumulative effects would be similar to those described for Alternative 2. Across the Middle Fork John Day subbasin timber harvest, prescribed burning, road closures, and hardwood planting and protection are expected to improve habitat effectiveness. Only in SE Galena, where Alternative 5 prescribes more intensive treatment, are effects more variable. Additional cover acres would be treated and open road densities would generally increase rather than reduce. In some subwatersheds, habitat effectiveness would be reduced. Deer and elk may be forced to move, concentrating them in smaller areas located elsewhere in the subbasin. Given the amount of cover loss due to the Summit and Reed fires, additional reductions in habitat effectiveness may not be desirable.

4.2.6.4—Effects to Goshawks—Treatment in Post-Fledging Areas (PFAs)

Alternatives 1 and 4

For existing condition of Northern Goshawk *Accipter gentilis* see page,191.

Alternatives 1 and 4 do not enter potential fledging areas (PFAs) for timber harvest or precommercial thinning. No direct, indirect or cumulative effects to goshawks would be anticipated.

Alternatives 2, 3 and 5

Alternatives 2, 3 and 5 propose timber harvest within the Sulpher Potential Fledging Areas (PFA). Units 808 and 810, 38 acres, would be shelterwood harvested. Harvest will convert these stands from SEOC to SI (see structural stage definitions page 145). These units/stands are in the Dry Forest type and were originally harvested under Ragged Timber Sale, Unit 13, with a current canopy closure of 27%. Harvest on the timber sale thinned the stands, removing overstory ponderosa pine and retaining the grand fir. The grand fir is currently in poor condition. Harvest reentry under Southeast Galena would retain a minimum 15 to 20 trees per acre as shelter trees, predominantly ponderosa pine tree, if available. Sites would be planted with ponderosa pine. The objective of harvest is to regenerate sites to restore the seral (pine) component.

These stands currently do not provide nesting habitat for goshawks, but they likely provide foraging habitat. Timber harvest treatment would reduce canopy cover to less than 20%. Goshawk feeding habitat would likely improve. More open stand conditions would create foraging habitat that would permit this raptor to detect and acquire prey more efficiently.

The Southwestern Guide for managing goshawks (USDA 1992) recommends that PFAs be managed for the following structural stages and percentages: OFMS and YFMS at 60%, SEOC and UR at 20%, SI at 10% and grass/forbs at 10%. Harvest treatment would convert approximately 10% of the PFA to a SI structural stage; meeting distribution recommendations. Foraging habitat within the PFA should improve.

The remaining stands in the PFA have high canopy covers ranging from 45% to 77% closure; these stands will not be entered at this time.

Alternatives 2,3 and 5 do not enter the three other established PFA's for timber harvest or precommercial thinning. No direct, indirect or cumulative effects to goshawks would be anticipated.

4.2.7 TREATMENT OBJECTIVES FOR NOXIOUS WEEDS

Noxious weeds are invading the ecosystem and displacing native species.

*See **1.2.2.7 Desired Condition: Noxious Weeds** page 28; **ISSUE 1.4.8—Effects of Toxic Chemicals** page 32; and **3.2.7—Noxious Weeds** , page 203 4.3.8.3—Noxious Weeds, page392.*

Table 155 Noxious Weeds

Statement of Need	Desired Restorative Outcome or objective
A need exists to control populations of noxious weeds while enhancing the vigor of native vegetation to reduce future weed infestations.	The landscape is free of noxious weeds and native vegetation is vigorous and resistant to future weed invasion.

Effects by Alternative

The result of ineffective noxious weed control is an increase in numbers of noxious plants, and of acreage adversely affected by their presence. As noxious weeds increase, they displace native vegetation. Eliminating as many weed seed sources as possible will help slow this process. The rate at which it progresses varies depending on the species involved, the weather, amounts of moisture available, competition from surrounding plants, amount of canopy cover, winds, presence of animal "carriers", soil types, amounts and degree of soil disturbance, etc. Accurate forecasts of the spread rates of weeds are virtually impossible to make; however, relative rates for the alternatives can be projected based on the most predictable factor - relative amounts of disturbance.

It should be recognized that infestation by noxious weeds does not necessarily follow the creation of newly disturbed seedbeds. Disturbance has been on-going for over 100 years, and at this point in time, the MFJD watershed has a total of 67.3 acres of inventoried noxious weeds, scattered over more than 200,000 acres.

4.2.7.1—Alternative 1

Direct /Indirect Effects

There are no direct effects with this alternative. Under the No Action alternative, the district would continue monitoring of newer noxious weed sites as funding allows. Populations included in the *2000 Malheur National Forest Noxious Weed Environmental Assessment* would be treated as analyzed in that document. All of the newer weed infestations would persist, enlarge, and/or spread seed to new locations, displacing an ever-enlarging area of native vegetation.

There is no issue of chemical risk to the ecosystem or to understory vegetation with this alternative.

Without road construction, reconstruction, logging, or prescribed burning, new habitat for noxious weeds will be limited to natural burn areas and ground disturbance by cattle, wildlife, and off-road vehicle travel. Existing road size will remain the largest proportion of susceptible habitat.

If severe wildfires occur in areas of heavy fuel loading, large patches of un-vegetated habitat, including fire lines, will provide prime opportunities for establishment of noxious weeds, which are likely to spread quickly to the newly disturbed soils. Early seral plant communities with little or no canopy cover will favor the rapid expansion of such populations, requiring intensive and expensive eradication measures.

As weeds spread, excluding native plant species, cover vegetation could decrease in diversity as well as in moisture and soil-holding capacity, and run-off and sedimentation rates could increase. As soil horizons are lost following a decrease in root structure, so is the likelihood of restoring the native species.

Disturbed areas are always the most susceptible to infestation by noxious weeds. Therefore the avoidance of ground and vegetative disturbance with this alternative reduces the likelihood of new populations establishing, even with the persistence of local weed seed sources that is likely without herbicide use. Wildfire, on the other hand, would probably increase the rate of weed spread, depending on severity of the burn.

Grazing can create small areas of ground disturbance and compact the soils, favoring the spread of weedy plants. It can weaken the root systems of native plants, as well as decreasing the aboveground biomass that the plants provide. This combination opens niches that several noxious weed species are able to exploit to become established. Cattle, as well as wild ungulates, can act as seed "carriers", spreading weed seed from areas of initial infestation to distant sites that offer susceptible habitat. Grazing practices are the same across all alternatives for this project.

The *Noxious Weed EA* specifies chemical treatment of several known noxious weed populations within these subwatersheds for a total of 35.3 acres within the project area (see Table 157, page 323). The area of herbicide use by Grant County along Highway 20 totals approximately 9.5 acres, all within the road prism of the highway. Alternative one does not increase cumulative effects of chemicals to those subwatersheds.

The cost and logistics of treating weed populations manually decrease the likelihood of effective containment in the long run, compared to treating with herbicides. Lack of effective containment may lead to expansion of both numbers and size of infestations, resulting in a "snowball" effect on both expense and inefficacy of future treatments. The time scale of this trend is unpredictable, as it involves numerous variables. Long-term productivity of non-forest lands, as well as biodiversity, is likely to decrease as exotic species increase.

Failure to eradicate existing weed populations within this project area could offset the effects of treatments under the *Noxious Weed EA*, allowing untreated populations to re-infest the treated areas. In the long run, this could offset the effort and expense of eradication efforts within the watershed, and add to the burden of off-forest weed seed that will inevitably initiate new infestations.

Cumulative Effects

The potential disturbance in the Middle Fork of the John Day River area would be fewer than those in the recommended action by 32,730 acres.

Acres of disturbance for the future Northwest Galena analysis area were estimated at the same percentage of total as is recommended for Southeast Galena.

Table 156— Middle Fork of the John Day River (MFJD) potential disturbance acres Alternative 1.

MFJD Watershed Acres	Crawford	Olmstead	Southeast Galena (Alt 1)	Summit Fire	Northwest Galena	Total Disturbance Acres
200,910	18,540	5,080 (less roads)	0	30,000	29,800	83,420

Effects Common to all Action Alternatives

Direct /Indirect Effects

There are no direct effects common to all the action alternatives. The major effect to understory vegetation of all the action alternatives comes from an increase in ground disturbance. While the amount of disturbance will vary according to the particular alternative (see table below), in all cases the disturbance increases the potential seedbed for noxious weed establishment over the No Action alternative.

A less drastic effect common to all the action alternatives is the decrease in canopy cover (vegetation disturbance), which varies in degree according to the particular prescription. Decreases in overstory

shading increase potential weed habitat, at least temporarily, although not to the same extent as soil disturbance.

To the degree that the action alternatives decrease the risk of uncharacteristically severe wildfires, the potential for new seedbeds for weed establishment and spread are also reduced. Although harvest activities do create ground disturbance, the affected acreage is both appreciably smaller and notably more accessible to treatment than the acreage potentially disturbed by a large, severe wildfire. While prescribed fires may offer limited, patchy seedbeds for noxious species, resulting invigoration of native understory plants by fire would increase competition with any invading weeds and largely offset negative effects of the burning.

Total acres to be treated offer a general measure for comparison of relative disturbance for the 5 alternatives. Reconstructed or newly constructed roads and trails, dispersed campsites, and logging units, respectively, provide the most suitable habitats for noxious weed increase (see table below).

Because the trend of introduction of weed seed from surrounding lands is increasing over time, disturbed areas will increase in susceptibility to infestation by noxious species. Ground disturbance increases the likelihood of new populations establishing for 2 to 3 years after the disturbance, or until the ground is successfully re-vegetated. Decreases in canopy cover will further increase the likelihood of new weed populations establishing and spreading.

Cumulative Effects

Past grazing practices have removed biological soil crusts and altered the native ground vegetation from pre-European conditions, allowing noxious weeds to establish, and predisposing much of the landscape to weed invasion and spread throughout the Middle Fork John Day watershed. Past road and railroad construction and mining activities have altered soil horizons, and have exposed mineral soil and tailings that can support only early seral forbs and grasses that are easily out-competed by noxious weeds.

Grazing can create small areas of ground disturbance, and also compact soils, thus favoring the spread of weedy plants. It can weaken the root systems of native plants, as well as decreasing the aboveground biomass that the plants provide. This combination opens niches that several noxious weed species are able to exploit to become established. Cattle, as well as wild ungulates, can act as seed “carriers”, spreading weed seed from areas of initial infestation to distant sites that offer susceptible habitat. Grazing practices are the same across all alternatives for this project.

The Summit Fire of 1996 not only eliminated all canopy cover from approximately 30,000 acres; it also severely burned the soils on approximately 7,000 of those acres, opening large tracts to potential noxious weed establishment. Several new infestations have been found within its boundaries since the fire. While much of the burn is re-vegetating rapidly, there are still areas on which native plants have not re-established, probably due to the localized severity of the fire, and these areas remain susceptible to noxious weed infestation.

Within the analysis area, recent logging on the Moe Timber sale has created areas of ground disturbance on skid trails and landings. Canopy loss is creating some vegetation disturbance as well. Road maintenance on Highway 20, as well as on Forest Service roads, produces narrow corridors of on-going disturbance that are highly susceptible to noxious weed invasion.

The adjacent Crawford project proposes road construction and reconstruction, commercial logging, and prescribed burning, all involving soil disturbance. Future watershed restoration efforts in the northwestern portion of the Middle Fork drainage (NW Galena project area) will likely involve similar activities.

Grant County annually applies a mix of herbicides in 4 foot wide bands on either side of the pavement along portions of the Highway 20 road corridor. The total area treated by the county is approximately 9.5 acres, along 19 miles of roadway.

The potential deleterious effects of weed infestations related to recommended , past, ongoing, and future ground-disturbing activities are tied to the scale of ground disturbance and vegetation disturbance resulting from all these activities.

Table 157below shows total acres subject to vegetative disturbance by projects within the MFJD (including the Upper MFJD) watershed from about 1996 through 2010, using Alternative 2.

Acres for the future Northwest Galena analysis area are estimated at the same percentage of total as is recommended for Southeast Galena.

4.2.7.2—Alternative 2

Direct Effects

1.5 acres will be subject to wick or spot application of herbicide to noxious weed plants, with the expectation that all of the 6 populations involved will be eliminated in 2 to 5 years. 0.4 acres of weeds will be treated manually, with the expectation that the 4 populations involved will be reduced in size, and prevented from setting and dispersing seed during all years that they are treated. These populations may not be completely eliminated, and will likely require long term monitoring. Very small areas of ground disturbance will accompany the pulling or grubbing of weeds at the 4 manual treatment sites.

Indirect Effects

Spread of weeds from the sites treated with herbicide will be eliminated, and from sites treated manually will decrease drastically. At the same time, 22,140 acres will be subject to ground and/or vegetation disturbing activities, creating seedbeds that could be infested from seed sources either outside the project area, or simply not identified yet within the project area.

Combining acres with those from the *Noxious Weed EA*, which will be treated simultaneously, the total acres to be chemically treated for noxious weeds within each of the affected subwatersheds are shown in the following table.

Table 157 Chemical Treatment Areas

SWS NAME	Noxious Weed EA ACRES	SE GALENA ACRES	TOTAL ACRES
Bridge	2	0	2
Davis/Placer	0.3	0	0.3
Vinegar	12.2	0	12.2
Vincent	7.4	0	7.4
Little Boulder	7.2	0	7.2
Tincup	2.3	0.1	2.4
Butte	0.9	1.2	2.1
Granite Boulder	1.6	0	1.6
Beaver/Ruby	1.2	0.1	1.3
Dry/Sunshine	0.2	0.1	0.3

EA Acres include all sites to receive chemical treatment under the Weed EA.

SE Gal Acres are all those analyzed for chemical treatment in this document.

Cumulative Effects

Ground and vegetation disturbance within the watershed over 14 years may be as high as 58% of the total acres.

The trend for noxious weed populations is one of increasing numbers and increasing size. The risk of noxious weed invasion within the analysis area is amplified and accelerated by the recommended activities in direct proportion to the amount of ground disturbance associated with the alternative. This one proposes the second largest number of disturbance acres of any of the action alternatives.

Table 158—MFJD Potential Disturbance Acres—Alternative 2

MFJD Watershed Acres	Crawford	Olmstead	Southeast Galena (Alt 2)	Summit Fire	Northwest Galena	Total Disturbance Acres
200,910	18,540	5,080 (less roads)	22,140	30,000	29,800	106,560

4.2.7.3—Alternative 3

Direct Effects

Under this alternative, the district will continue monitoring and containment by hand of newer noxious weed sites as funding allows. (Populations included in the *Noxious Weed EA* will be treated as analyzed in that document.)

Alternative 3 will have no chemical effects from noxious weed treatment. Very small areas of ground disturbance will accompany the pulling or grubbing of weeds.

Indirect Effects

Because manual treatment methods are not always effective, some of the newer weed infestations are likely to persist, enlarge, and/or spread seed to new locations. Spread of known populations will be slower, and amount of seed dispersed will be less, than in the no action alternative, but both may continue if the infestations cannot be eliminated. The need for monitoring and hand treatment will continue into the foreseeable future. 18,970 acres will be subject to ground and/or vegetation disturbing activities, opening potential seedbeds for noxious species.

Cumulative Effects

Ground and vegetation disturbance within the watershed over 14 years may be as high as 57% of the total acres.

The trend for noxious weed populations is one of increasing numbers and increasing size. The risk of noxious weed invasion within the analysis area is amplified and accelerated by the recommended activities in direct proportion to the amount of ground disturbance associated with the alternative. This one proposes the third largest number of disturbance acres of any of the action alternatives.

Table 159—MFJD Potential Disturbance Acres—Alternative 3

MFJD Watershed Acres	Crawford	Olmstead	Southeast Galena (Alt 3)	Summit Fire	Northwest Galena	Total Disturbance Acres
200,910	18,540	5,080 (less roads)	18,970	30,000	29,800	102,390

4.2.7.4—Alternative 4

Direct Effects

Under this alternative, the district will continue monitoring and containment by hand of newer noxious weed sites as funding allows. (Populations included in the noxious *Noxious Weed EA* will be treated as analyzed in that document.)

Alternative 4 will have no chemical effects from noxious weed treatment. Very small areas of ground disturbance will accompany the pulling or grubbing of weeds.

Indirect Effects

Because manual treatment methods are not always effective, some of the newer weed infestations are likely to persist, enlarge, and/or spread seed to new locations. Spread of known populations will be slower, and amount of seed dispersed will be less, than in the no action alternative, but both may continue if the infestations cannot be eliminated. The need for monitoring and hand treatment will continue into the foreseeable future. 20,010 acres will be subject to ground and/or vegetation disturbing activities, opening potential seedbeds for noxious species.

Cumulative Effects

Ground and vegetation disturbance within the watershed over 14 years may be as high as 53% of the total acres.

The trend for noxious weed populations is one of increasing numbers and increasing size. The risk of noxious weed invasion within the analysis area is amplified and accelerated by the recommended activities in direct proportion to the amount of ground disturbance associated with the alternative. This one proposes the third largest number of disturbance acres of any of the action alternatives.

Table 160—MFJD Potential Disturbance Acres—Alternative 4

MFJD Watershed Acres	Crawford	Olmstead	Southeast Galena (Alt 4)	Summit Fire	Northwest Galena	Total Disturbance Acres
200,910	18,540	5,080 (less roads)	20,010	30,000	29,800	103,430

4.2.7.5—Alternative 5

Direct Effects

This alternative proposes chemical treatment of 6 weed sites totaling 1.5 acres.

1.5 acres will be subject to wick or spot application of herbicide to noxious weed plants, with the expectation that all of the 6 populations involved will be eliminated in 2 to 5 years. 0.4 acres of weeds will be treated manually, with the expectation that the 4 populations involved will be reduced in size, and prevented from setting and dispersing seed during all years that they are treated. These populations may not be completely eliminated, and will likely require long term monitoring. Very small areas of ground disturbance will accompany the pulling or grubbing of weeds at the 4 manual treatment sites.

Indirect Effects

Spread of weeds from the sites treated with herbicide will be eliminated, and from sites treated manually will decrease drastically. 23,150 acres will be subject to ground and/or vegetation disturbing activities, creating seedbeds that could be infested from seed sources either outside the project area, or simply not identified yet within the project area.

Combining acres with those from the *Noxious Weed EA*, which will be treated simultaneously, the total acres to be chemically treated for weeds within each of the affected subwatersheds are the same as for Alternative 2.

Cumulative Effects

Ground and vegetation disturbance within the watershed over 14 years may be as high as 58% of the total acres.

The trend for noxious weed populations is one of increasing numbers and increasing size. The risk of noxious weed invasion within the analysis area is amplified and accelerated by the recommended activities in direct proportion to the amount of ground disturbance associated with the alternative. This one proposes the third largest number of disturbance acres of any of the action alternatives.

Table 161—MFJD Potential Disturbance Acres—Alternative 5

MFJD Watershed Acres	Crawford	Olmstead	Southeast Galena (Alt 5)	Summit Fire	Northwest Galena	Total Disturbance Acres
200,910	18,540	5,080 (less roads)	23,150	30,000	29,800	106,570

4.2.7.6—Effects to Culturally Significant Plants

Two of the ten sites analyzed for chemical treatment occur near known populations of edible plant species of cultural significance, however the small areas to be treated with herbicide would not affect the edible plants. Site 300726 near the junction of Highway 20 and the 4550 Road is small (a total of less than 0.1 acres), and, because it is in the riparian area, will be treated only with direct wick or spot application of herbicide. Such application precludes any problem of drift or air movement of herbicide. The nearby chokecherry stand starts more than 300 feet away from the noxious weed population, with numerous intervening riparian shrubs, and would not be affected by treatment of the weeds.

The second site occurs on an upland scab that supports biscuitroots (*Lomatium species*) and probably yampah (*Perideridia species*). However, this population of St. Johnswort consists of only one small group of plants covering less than a square yard, and its treatment by spot herbicide application would, at most, affect other plants within the square yard treatment area. Main concentrations of the edible root crops are several hundred feet from the weed site.

There will be no direct, indirect, or cumulative effect to culturally significant plants.

4.2.7.7—Effects to Sensitive Plant Species

No populations of plant species designated as sensitive on the Forest Service Region 6 Sensitive Species List, 1999, have been found in areas adjacent to noxious weed sites. Only one of the weed treatment sites occurs in potential habitat for sensitive plants. That site is #300732, and contains a few plants of St. Johnswort (*Hypericum perforatum*) occupying approximately one square yard of upland dry scab that could potentially support Henderson's ricegrass (*Achnatherum hendersonii/wallowensis*). Surveys of the area have not documented any populations of the ricegrass, or of any other sensitive plant species.

Treatment of noxious weed populations will have no effect on any sensitive plant species.

4.3—PREDICTED EFFECTS ON RELEVANT RESOURCES OF ALL ALTERNATIVES—BY ISSUE

*Issues are described in detail in Chapter 1.0 in section **1.4 Issues Studied in Detail**, page 30.*

4.3.1—ISSUE 1.4.1—RESTRICTED ACCESS

*The Agency's recommended action to decommission and close some roads will reduce motorized access within the project area. See **ISSUE 1.4.1—Restricted Access**, page 30 and* Appedix G--Roads Analysis.

BACKGROUND

Alternatives 2, 3, and 4, (see Chapter 2.0 Alternatives Considered in Detail, page, 44) display essentially the same access plan for the Southeast Galena Restoration Project Area. Included in this analysis are proposals to construct, reconstruct, decommission, and close roads. These alternatives do not provide access to the Deerhorn and Little Butte subwatersheds. The existing transportation system within these two subwatersheds would be decommissioned with the implementation of any of these alternatives.

Alternative 5 displays the same considerations but includes additional lands accessed by new roads compared to Alternatives 2, 3, and 4. Alternative 5 provides access to the Deerhorn and Little Butte subwatersheds by proposing a connector road off of Forest Road 2614452. Additional roads would also be left open for motor vehicle travel by users and for management of National Forest lands.

ALTERNATIVE 1—Restricted Access

Overall road density and open road density would remain the same as they are currently. No changes or new restrictions to roads, trails, or dispersed camping sites would occur under this alternative.

Safety concerns associated with the use of the Davis Creek Trail by ATVs would continue causing potential conflicts and hazards with other users.

Ecological values associated with fish, terrestrial and plant habitats and associated populations of species, water quality, vegetation and fire regimes would continue in an undesirable condition. The risk of wildfires resulting from overstocked stand conditions will continue to increase.

The existing road system provides relatively rapid access for ground based fire suppression forces to manage wildfires for about two thirds of the area and most of the roads in this area can be utilized as fire breaks due to locations and fuel types present. However, a large portion of the area south of the Middle Fork has native surface roads that are narrow and deeply rutted. Many of these roads are not safely drivable making it dangerous to conduct prescribed burning or suppression activities in much of that area.

About one third the project area is not accessible for fuels management activities due to lack of roads. The areas with no roads, or those areas with narrow roads not passable for most types of vehicles, can be staffed with smoke jumpers or helitack crews, provided these types of crews are available and use of helicopters and airplanes can be utilized to drop water or retardant. However, if an extended attack is needed it will remain difficult to staff fires or to bring in equipment and the result would be fire suppression at a reduced capacity and larger fires are likely to result because this portion of the project area is unroaded.

ALTERNATIVES 2, 3, & 4—Restricted Access

Open road miles inside the project area would decrease from about 132 miles to about 91 miles for Alternatives 2 and 3, and to 89 miles in Alternative 4. Open road density for the project area will have

decreased from 1.71 to about 1.18 miles per square mile for Alternatives 2 and 3, and slightly lower for Alternative 4.

These changes would result in a decrease in road maintenance funding needs because of the reduction in both open road miles and total road miles. Decommissioning work will produce some contracting and employment opportunities, which could support some locally available skills and equipment over the next 10 years.

Average daily traffic (ADT) numbers on virtually all roads that remain open would be higher, because of a moderate increase in the amount of recreational and other use will result in more traffic using a smaller amount of open road miles.

People who prefer more primitive and non-motorized settings will be positively affected by decreases in the quantity of motorized access, while those that prefer more motorized uses will be negatively affected. Decommissioning of existing open roads would decrease motorized access for recreation experiences and non-timber forest products gathering, but would increase the quality of recreational activities for those seeking non-motorized experiences.

These alternatives would not provide any motorized access to the Little Butte Creek drainage and the west half of the Deerhorn Creek drainage except for the existing Davis Creek ATV trail.

Closing the Davis Creek Trail to OHV use under Alternative 4 would eliminate motorized use of the area and displace ATV users. Non-motorized use would be enhanced for hikers, horseback riders and mountain bikers. These activities would have no effect on cross-country skiers or snowmobile use.

In Alternatives 2 and 3, improvements in the safety and quality of the trail conditions and facilities associated with the Davis Creek trail and increases in access to the Blackeye Trail and other adjoining trails in the Scenic Area, would increase the quality of the dispersed recreation experience for hiking, wildlife viewing, mushroom collection, horn hunting, and ATV use.

Relocation of dispersed campsites or converting these sites to day use would displace some users but also would reduce resource impacts. Some users would potentially be displaced due to the change in location and their perception of the need for change. Dispersal of current and increased use in the area would increase social encounters and decreases in quality of semi-primitive experience. Some use would potentially be displaced from the area due to this perception of change in quality. Motorized dispersed camping opportunities along FR4559 would be eliminated.

Under all of these alternatives, reductions in open and total road miles, and particularly reductions in RHCA miles, would provide improvements in water quality, fish habitat, and wildlife habitat. In the long-term (10 years+), the revegetated appearance of decommissioned roads would increase people's perception of the ecological value of the area. Moving dispersed campsites away from riparian zones would also improve fisheries and wildlife habitat.

The improvements to the open and closed road system would provide improved access for ground based fire suppression forces to manage wildfires for about two thirds of the area. Most of these roads could be utilized as fire breaks due to locations and fuel types present.

About one third the project area will remain relatively inaccessible for fuels management and wildfire suppression activities due to lack of roads. The areas with no roads can be staffed with smoke jumpers or helitack crews, provided they are available and use of helicopters and airplanes can be utilized to drop water or retardant. However, if extended attack is needed or if project fires are in these areas, it will remain difficult to staff fires or to bring in equipment. The result is a restricted capacity to suppress fires, and larger fires are more likely to result.

These alternatives are not expected to significantly affect range resources, but decommissioning roads used by livestock for driveways would slow herding and increase the time a permittee spends managing and moving livestock.

ALTERNATIVE 5—Restricted Access

Open road miles would increase from about 132 miles to about 164 miles. Open road density for the project area will have increased from 1.71 miles to about 2.2 miles per square mile.

Over the long term (beyond 10 years), these changes would result in an increase in road maintenance funding needs because of the increase in open road miles, despite a decrease in total road miles. Decommissioning work will produce some contracting and employment opportunities, which could support some locally available skills and equipment over the next 10 years

Average daily traffic (ADT) numbers on local roads that remain open will be lower at least in the short-term, because despite a moderate increase in recreational and other uses, the amount of traffic will be dispersed over a larger number of open road miles.

People who prefer more motorized uses and settings will be positively affected by increases in the quantity and quality of motorized access, while those preferring more primitive uses and non-motorized settings will be negatively affected. Decommissioning of existing open roads would decrease motorized access for recreation experiences and non-timber forest products gathering in a few areas, but in those areas the quality of recreational activities for those seeking non-motorized experiences would be increased.

Alternative 5 would provide the most potential benefit to elderly or disabled people, or low-income groups that prefer or require motorized access to participate in recreational activities such as hunting, dispersed camping, subsistence firewood gathering, or collection of non-timber forest products.

Closing and decommissioning of existing roads would decrease motorized access for dispersed driving and camping and increase hunting experience for hikers and other users of seeking non-motorized experiences.

This alternative would provide motorized access to the Little Butte Creek drainage and the west half of the Deerhorn Creek drainage in addition to the existing Davis Creek ATV trail.

In this alternative, improvements in the safety and quality of the trail conditions and facilities associated with the Davis Creek trail and increases in access to the Blackeye Trail and other adjoining trails in the Scenic Area, would increase the quality of the dispersed recreation experience for hiking, wildlife viewing, mushroom collection, horn hunting, and ATV use.

Relocation of dispersed campsites or converting these sites to day use would displace some users but also would reduce resource impacts. Some users would potentially be displaced due to the change in location and their perception of the need for change. Dispersal of current and increased use in the area would increase social encounters and decreases in quality of semi-primitive experience. Some use would potentially be displaced from the area due to this perception of change in quality. Motorized dispersed camping opportunities along FR4559 would be eliminated.

The improvements to the open and closed road system would provide improved access for ground based fire suppression forces to manage wildfires for about two thirds of the area. Most of these roads could be utilized as fire breaks due to locations and fuel types present.

The amount of the project area that remains relatively inaccessible for fuels management and wildfire suppression activities due to lack of roads would be reduced by about 2500 acres. The areas with no roads can be staffed with smoke jumpers or helitack crews, provided they are available and use of helicopters and airplanes can be utilized to drop water or retardant. However, if extended attack is needed or if project fires are in these areas, it will remain difficult to staff the fires or to bring in equipment. The result is a restricted capacity to suppress fires, and larger fires are more likely to result.

These alternatives are not expected to significantly affect range resources, but decommissioning roads used by livestock for driveways would slow herding and increase the permittee's time managing and moving livestock.

4.3.2—ISSUE 1.4.2—EFFECTS OF ALL TERRAIN VEHICLE (ATV) USE

The Agency's proposal is inadequate in addressing ATV use that is causing resource damage, especially within RHCAs. See Chapter 1.0 ISSUE 1.4.2—Effects of All Terrain Vehicle (ATV) use page 31.

BACKGROUND

The Notice of Intent (NOI) initiating this analysis did not clearly describe the recommended actions concerning ATV use. The description of the recommended action was modified in C0hapter 1 to clearly define the actions. The issue is twofold: 1) ATV use on existing trails and 2) cro ss country use of ATVs. In the past 10 years, the number of off-highway vehicles accessing the area has increased due to greater interest in horn hunting, mushroom collecting, pleasure driving, and hunting. Most of these activities are adjacent to or within the stream course. Many areas are now being impacted from this increased use, especially during wet seasons. Cross-country ATV travel is impacting streams and riparian areas by channeling water and sediment and increasing width to depth ratios in fish bearing reaches. Travel across moist and wet meadows is causing compaction and other soil damage. One trail in particular, the Davis Creek Trail (Forest Trail #244), extends from Davis Creek to Butte Creek. This trail is open to motorcycles, ATVs, horseback riders, and hikers. The condition and location of Trail 244 near the end of the Road 2614 and Trail 244 is impacting a segment of Davis Creek. Current use is causing bank instability, sediment input and contains at least one crossing in a fish bearing reach.

Forest Service resource specialists are concerned about Butte Creek and Davis Creek which contain threatened species, summer-run steelhead, a sensitive species, redband trout, and are listed as historic bull trout streams (bull trout occupied prior to 1990).

ALTERNATIVE 1—Effects of ATV use

No changes would be made to the Davis Creek Trail. Increased trail use and cross-country travel is expected to exacerbate chronic disturbances. Use of 6 unimproved stream crossings and trails in RHCAs would continue to channel water and sediment to Butte, Davis and Placer Creeks and degrade stream baseline conditions. This would impact fish and fish habitat.

Impacts to fish and to fish habitat include disturbance of spawning activities of fall spawning fish (bull trout), direct damage to redds, sediment covering redds before eggs hatch, disturbance to rearing of both juveniles and to adult fish, and sediment influx in both wet and dry conditions from ATV usage in and around the stream. Suspended sediments caused from bank erosion of recreational trails can also negatively affect rearing salmonids.

No effects are expected beyond direct and indirect effects to fish in project area streams or in the Middle Fork John Day River and baseline condition listed above. Risk that stream bank and stream bed at crossings would be modified by motorized vehicles use remains elevated compared to a pristine condition and contributes to the overall chronic disturbance in the project area.

Alternatives 2 and 3— Effects of ATV use

Several chronic sediment sources to three streams would be reduced by the construction of trail/road improvements (where ATV trail segments are located on roads) or by relocation of trail segments. The ford on Placer Gulch will be improved by constructing a bridge of appropriate width for ATVs. The Davis Creek ford on Road 2614, currently open to highway vehicles and ATVs, would be replaced with a bridge. The streamside (Davis Creek) section of Road 2614/Trail 244 would be improved. An additional, unofficial streamside trail segment and ford near the end of Road 2614, currently used only by ATVs because of a

short blockage of natural regeneration and down logs, would be removed with decommission of that portion of Road 2614 under the ATM plan. Reconstruction of 9 trail bridges 6 rock fords where fords or bridges designed for motorcycles exist would reduce sediment input to Davis Creek and the tributaries of this stream. Portions of the Davis Creek Trail would be relocated out of the Butte Creek RHCA and the segments currently in the RHCA would be decommissioned (see Table 162 Trailheads, stream crossings miles of ATV trails improved by Alternative, page 331). Three stream crossings (fords) on fish-bearing segments of Butte Creek would be removed and stream banks rehabilitated and 2 fords at intermittent crossings would be constructed when the trail is relocated.

Sediment inputs to streams during bridge construction are expected to be equivalent to that created by the current use of the ford in one year. Sediment inputs to streams are expected to be reduced up to 90% over the long term (after year one when the banks stabilize) with use of the trail bridges.

The Davis Creek trailhead (on Butte Creek) and beginning portion of the trail along with 3 fords would be removed from the riparian area and relocated (constructed) upslope off Road 2050-020. The old trail will be blocked at the existing barricade with additional boulders and planted with native hardwoods and conifers to make it visually blend with the surrounding landscape to stop further motorized use. This new trail will not enter fish bearing RHCAs. Two crossings of intermittent streams and associated RHCAs would be constructed with mitigation measures such as waterbars, rocking, trail bridges, culverts and energy dissipating structures to minimize effects. Reducing the number of crossings, relocating crossings and improving those recommended for future use are expected to reduce sedimentation, bank damage and risk of detrimental modification of stream channel morphology after year one. No sediment is expected to reach fish bearing portions of Butte Creek from the construction or use of the new trail.

ATVs are currently using the trail, which was originally designed for motorcycle and non-motorized use. The trail would be widened to 62 inches to accommodate ATV use. Since the trail is already being used by ATVs, reconstruction to trail standards at the new width is expected to mitigate soil disturbance and damage that has already occurred and would be likely to worsen without reconstruction. Trailheads would be enlarged and developed with proper drainage and hardened to reduce watershed impacts. Alternative 5 includes measures that would address this segment of the trail in the same manner.

The direct deposition of gas and lubricants to streams from leaking motorized vehicles and risk of larger spills would likely be reduced with these alternatives. Posting signs at trailheads requesting ATV users to utilize trail bridges and avoid instream ATV use is expected to reduce impacts to the stream course. The potential for harassment of listed fish would likely be reduced with these action alternatives.

Table 162 Trailheads, stream crossings miles of ATV trails improved by Alternative

Improvements	Alternatives 2 & 3	Alternative 4	Alternative 5
Improved or relocated trailheads	2	0	2
Number of improved stream crossings	15	1	15
Number of relocated stream crossings	3	1	3
Miles of ATV trails improved and upgraded	8.3	0	8.3

Information would be posted at trailheads concerning cross county use of off-road vehicles and the potential resource impacts under all action alternatives. A larger scale planning process is beginning to address the issue of ATV use on National Forest land that is beyond the scope of this analysis. Strategies and direction from that effort would be incorporated as it becomes available.

The effects of ATV use on fish and fish habitat will be reduced with these alternatives and result in an upward trend.

Cumulative effects to the Middle Fork John Day River would not likely change drastically as ATV use is a small impact relative to effects of all other activities taking place in the analysis area. Risk that stream bank and bed at crossings would be modified by motorized vehicles use remains elevated compared to a pristine condition and contributes to the overall chronic disturbance in the project area.

ALTERNATIVE 4—Effects of ATV use

Alternative 4 would differ by reclassifying the existing trail to horse and foot traffic only with no reconstruction. Reclassifying the trail would require a *Land and Resource Management Plan* amendment. Soil disturbance and damage that has already occurred under ATV use would be likely to worsen without reconstruction. Additional sedimentation and compaction caused by active ATV use is expected to be eliminated. The Davis Creek ford on Road 2614, currently open to highway vehicles and ATVs, would be replaced with a bridge with effects similar to those described for Alternatives 2 and 3.

Horse use in wet weather or when intermittent streams are flowing is expected to cause some disturbance, such as localized sedimentation and bank trampling near stream-trail crossings, except at the improved Davis Creek/2614 crossing. There would still be some sedimentation and bank sloughing at the unimproved crossings, caused mainly from horses, but most of the damage will be minimized because of no ATV usage.

The direct deposition of gas and lubricants to streams from motorized vehicles using the trail will be eliminated.

This alternative will be beneficial to fish and to fish habitat because it will likely reduce the sedimentation and bank sloughing caused by ATV use. Generally, under this Alternative the contribution to chronic disturbance is expected to be the smallest of the Action Alternatives. Loss of access to a maintained motorized trail in this area is expected to result in increased cross-country travel and effects would be similar in nature to those described for Alternatives 2 and 3 or greater because there are no area closures planned with this alternative.

Since ATV use is not expected to change the Middle Fork John Day River under Alternatives 2 and 3, the change to lighter foot and horse use is also not expected to modify the river channel. There would be no potential for motorized vehicles to adversely affect stream crossings. A lower risk that stream bank and bed at crossings would be modified is associated with horses and hikers; this risk level is slightly elevated compared to the undisturbed condition and trail use would contribute to the overall chronic disturbance in the project area.

ALTERNATIVE 5— Effects of ATV use

The effects of Alternative 5 for the relocation of the Davis Creek Motorized Trail are similar to those described for Alternatives 2 and 3. Additional soil disturbance, in the form of compaction, loss of ground cover, and risk of concentration of surface flow, is expected to occur on the segment of recommended new trail in the Deerhorn subwatershed. The effects of cross-country ATV use would be similar to those described for Alternatives 2 and 3.

The loop portion of the Davis trail would utilize existing roads except at the west terminus of Road 452 in the Deerhorn subwatershed. It would also utilize a road segment constructed for timber activities under this alternative. A section of trail would be constructed to connect the road segments into a loop. The impacts of the road are discussed in the peak flow, water quality, fish habitat needs sections and under issue 4.3.3 (Harvest Activity and Road Construction Affect Aquatics and Hydrology). The risk of impacts is greater with this alternative than any other alternative due to continued use of this crossing.

The direct deposition of gas and lubricants to streams from leaking motorized vehicles will likely be reduced except at the new crossing in the Deerhorn subwatershed. The deposition of sediment, continuation of bank damage as well as the potential for harassment of listed fish will likely be reduced with this alternative. This would be an improvement for fish and fish habitat baseline conditions.

This new trail segment is expected to contribute to the overall chronic disturbance of the project area, creating additional points where soil disturbance may become connected to form larger disturbances which may result in erosion of ephemeral draws and the conversion of ephemeral draws to intermittent streams according to the PACFISH definition.

The Middle Fork John Day River would not likely change drastically as ATV use is a small impact relative to effects of all other activities taking place in the project area. Risk that stream banks and bed at crossing would be modified by motorized vehicles use remains elevated compared to the undisturbed condition and contributes to the chronic disturbance in the project area.

Comparison of Alternatives— Effects of ATV use

Alternative 1 does not alleviate any of the problems ATVs are currently causing in the analysis area. Alternatives 2 and 3 eliminate most impacts caused by. Alternative 5 has greater impacts associated with development and continue use of the stream crossing at Deerhorn Creek. Otherwise, it is identical to Alternatives 2 and 3. While there would be some small, short term impacts associated with trail relocation, much of the disturbance is in upland areas. Alternative 4 reduces impacts by ATVs on trails crossing fish bearing streams by changing use to foot and horse travel only. Under Alternative 4 only one stream crossing, in conjunction with road reconstruction, is improved. Alternative 4 does not address the overall need for controlled ATV use opportunities in the project area and may promote expanded cross-country use.

4.3.3—ISSUE 1.4.3—EFFECTS OF GROUND BASED SYSTEMS

The Agency's recommended action of tree harvest with associated activities (new roads) would cause unnecessary damage to the hydrologic function of the area's soils and streams. See ISSUE 1.4.3—Effects of Ground Based Systems, page 31.

There are numerous impacts that influence hydrologic processes. The effects on many of these were discussed in Section 4.2.3 Water Quantity Need. Harvest and related activities affect two processes primarily (1) soil compaction and (2) concentration of water runoff. Increases in these processes tend to result in decreases in water infiltration and increases in risk of sediment transport.

These impacts raise the risk of potential sediment increases on nearby riparian habitats and increase the potential cumulative impacts to fish populations. Possible increased sediments equates to potential degradation to fish habitat and fish populations

Alternatives 2, 3, and 5 do propose different levels of harvest activities including new roads displaying different degrees of impacts and risks toward hydrologic function due to compaction and concentration of water runoff. Alternative 4 proposes no harvest. All action alternatives propose a reduction in total road miles throughout the project area.

Measures:

- Acres of ground-based systems used in each alternative and specifically on sensitive soils.
- Acres of skyline-based system used in each alternative and specifically on sensitive soils.
- Miles of road construction per subwatershed.
- Miles of road reconstructed per subwatershed.

- Miles of decommissioned roads per subwatershed.
- Miles of roads removed from RHCAs.
- Miles of open and closed roads.
- Total road density and open road density per subwatershed.
- Equivalent Roaded Acres cumulative effects model.
- Acres of Harvest in RHCAs

Alternatives 2, 3, and 5 propose similar harvest and related activities, including new road construction, but at different intensities. The alternatives display different degrees of impacts and risks toward hydrologic function due to difference in amount and distribution of compaction and concentration of water runoff. Alternative 4 does not propose any harvest although it includes 2.2 miles of new road construction, which are also common to all action alternatives. The construction of these road segments removes road from RHCAs and reduces the number of crossings and relocates access to the uplands.

BACKGROUND

The Galena Watershed Analysis recommended development of an access and travel management plan based on geology, sediment production, impacts on stream channels, including road location. The action alternatives used road location (valley bottom or hillslope) as the primary criterion to identify roads for decommissioning or for major improvements. Two Access Travel Management Plans (ATMs) were developed for the action alternatives (see also Appendix G developed later than these plans). ATMB is associated with Alternatives 2, 3 and 4 while ATMA is associated with Alternative 5. The road miles are slightly different for each alternative, even those under the same ATM, because of the different harvest unit pool and access needs.

The matrix of pathways and indicators for bull trout (USF&W 1998) lists road densities of <1 mi/mi^2 with no valley bottom roads as Properly Functioning, 1-2.4 mi/mi^2 with some valley bottom roads as Functioning at Risk, and densities over 2.4 mi/mi^2 as Functioning at Unacceptable Risk. The matrix of pathways and indicators for steelhead (NMFS 1996) lists road densities of <2 mi/mi^2 with no valley bottom roads as Properly Functioning, 2-3 mi/mi^2 with some valley bottom roads as Functioning at Risk, and densities over 3 mi/mi^2 with many valley bottom roads as Not Properly Functioning. Based on PACFISH/INFISH/SCREENS listed in the Regional Forester's Eastside Forest Plan Amendment #2, a neighboring forest in the Blue Mountains, the Wallowa-Whitman National Forest, recommends reducing road mileage and emphasizes road closure, obliteration, and revegetation at total road densities over 2.0 mile/mi^2 in high priority watersheds. Since this Forest is very similar in geology and habitat as well as location, these indices may be useful.

Current fisheries information shows Granite Boulder Creek and Vinegar Creek as containing bull trout and steelhead so USF&W matrix screens will be used. All other streams contain steelhead so the NMFS matrix will be applied as a guideline.

ALTERNATIVE 1—Ground Based Systems

Current baseline conditions will remain. Road maintenance, which can be considered a benefit from re-grading roads, cleaning plugged culverts and cleaning blocked ditchlines, would continue. No direct impacts such as sediment from timber harvest, road construction, reconstruction, realignment (relocation) or decommission would occur with this alternative.

This alternative will leave the road systems as they are, except for on-going maintenance. No road mitigation improvement, relocation or decommissioning projects would occur with this alternative. All open roads within the riparian areas will continue to be left open. Overall road densities and road miles in RHCAs would remain at current levels listed in Table 163. Some roads have been decommissioned prior to this project.

Road densities and miles in RHCAs would remain high (see Table 163). The Little Boulder/Deerhorn subwatershed density would remain at Functioning at Risk for this element of the NMFS matrix for TES species inhabiting those streams. All other subwatersheds would remain "Not Properly Functioning" for this element according to appropriate matrices by NMFS and USF&W.

Roads would continue to degrade fish habitat by contributing sediment to the stream, increasing the stream's width/depth ratio through bank damage, decreasing the shade component by firewood cutting or current road conditions adjacent to streams, and/or by further impacting threatened fish numbers through easy angler access. Stream sedimentation caused by roads would continue to adversely impact stream attributes such as pool riffle ratios, pool to pool spacing and lack of quality deep pool habitat; these attributes would continue to remain out of balance compared to those expected for the analysis area streams. Compacted roadbeds would continue to confine the stream meander pattern.

Roads in the project area that occur within RHCAs or cross stream channels would continue to impact the aquatic resource more than roads located in uplands. Current amounts of rilling and gullying would continue to occur where road drainage is not adequate for the site and would be likely to worsen. These streams would continue to route run off to the streams more rapidly and to intercept soil water and route it more rapidly routed to streams as surface flow. Mass failures and landslides are expected to remain rare in the current climate regime. Peak, near peak, and base flows would remain altered in the project area. Peak flow events would remain at current levels.

Other effects of this alternative include continued vegetation succession without harvest or thinning activities resulting in an increased risk of catastrophic wildfire. In the event of catastrophic wildfire, surface sediment and flow response yields would increase, thus impacting fish and/or habitat.

Species such as bull trout that are dependent on adequate water levels and temperatures during base flow periods for access to tributaries for spawning activities may be unable to reproduce or have limited success.

Fish populations and fish habitat downstream in the Middle Fork John Day River would continue to be adversely affected by current conditions. Temperature, sediment, flow magnitudes and duration all have the ability to affect TES fish, particularly fluvial bull trout and chinook salmon, in the entire sub basin. There is potential for effects from catastrophic wildfire and post-fire events to affect both temperature and sediment in the Middle Fork John Day River.

Table 163 Road Information Summarized by Subwatershed for All Alternatives[68]

Alternative	Davis / Placer	Vinegar	Vincent	Little Boulder / Deerhorn	Little Butte / Windlass	Butte	Granite Boulder	Total
Miles of Open and Closed Road								
Alternative 1 [No Action]	45.2	42.1	30.6	41.7	37.1	28.2	40.1	265.0
Alternative 2	37.9	37.4	29.3	33.4	29.3	20.4	31.3	219.0
Alternative 3	37.9	37.4	29.3	33.4	29.3	20.4	31.3	219.0
Alternative 4	35.7	33.1	25.2	31.3	27.1	20.1	31.2	203.7
Alternative 5	38.8	38.4	30.0	36.9	32.5	20.5	31.3	228.4
	Miles of Open and Closed Roads in RHCAs♠ / # Stream Crossings (Percent of Open and Closed Road Miles in RHCAs)							
Alternative 1 [No Action]	9.9/75 (22%)	8.8/93 (21%)	7.1/53 (23%)	10.1/71 (24%)	8.0/53 (22%)	5.8/42 (21%)	9.8/80 (24%)	59.5/467 (22%)
Alternative 2	5.1/35 (13%)	5.0/48 (13%)	4.6/34 (16%)	5.9/35 (18%)	6.2/35 (21%)	3.0/29 (15%)	5.9/46 (19%)	37.7/262 (17%)
Alternative 3	5.1/35 (13%)	5.0/48 (13%)	4.6/34 (16%)	5.9/35 (18%)	6.2/35 (21%)	3.0/29 (15%)	5.9/46 (19%)	37.7/262 (17%)
Alternative 4	5.0/35 (14%)	5.0/48 (15%)	4.6/34 (18%)	5.9/35 (19%)	6.2/35 (23%)	3.0/29 (15%)	5.9/46 (19%)	35.6/262 (17%)
Alternative 5	5.4/38 (14%)	5.0/49 (13%)	4.6/34 (15%)	6.4/40 (17%)	6.3/36 (19%)	3.0/29 (15%)	6.0/46 (19%)	36.7/272 (16%)
	Total Decommissioned Road Miles							
Alternative 1 [No Action]	5.5	5.5	12.0	5.0	2.4	4.0	6.5	41.9
Alternative 2	15.5	17.3	17.1	17.2	12.6	12.1	15.3	107.1
Alternative 3	15.5	17.3	17.1	17.2	12.6	12.1	15.3	107.1
Alternative 4	15.5	17.3	17.1	17.2	12.6	12.1	15.3	107.1
Alternative 5	14.7	17.1	17.5	15.6	10.3	12.6	15.3	103.1
	Open and Closed Road Density (mi/mi^2)							
Alternative 1 [No Action]	3.88	3.55	5.20	2.43	3.20	3.71	3.48	3.43
Alternative 2	3.25	3.16	4.97	1.95	2.52	2.69	2.71	2.83
Alternative 3	3.25	3.16	4.97	1.95	2.52	2.69	2.71	2.83
Alternative 4	3.06	2.79	4.28	1.82	2.33	2.65	2.70	2.64
Alternative 5	3.33	3.24	5.09	2.15	2.80	2.70	2.71	295
♠RHCA information includes roads on public, County and private land								

[68] ♠This table is based on an earlier version of roads layers in the Geographic Information System than in other tables in this document consequently values may differ slightly.

ALTERNATIVE 2—Ground Based Systems

Harvest Systems

Ground based harvest systems cause the largest amount of ground-disturbance because of road and skid trail building/use required for yarding timber. Skyline yarding compacts or otherwise disturbs less ground. Helicopter yarding causes very little disturbance in harvest units; landings associated with helicopter yarding are commonly 2-6 times the size of tractor landings. The effects of these different harvest systems on water yield and associated soil disturbance are discussed in section 4.2.1 Treatment Objectives for Early Season Peak and Near Peak Stream Flows page 239. Risk of sedimentation is associated with concentrated flows and decreases in water absorption and storage were described. Risk of sedimentation would be expected to increase when concentrated flows increase and when water absorption and storage decrease. Table 164 displays area by different yarding systems and subwatersheds. Table 121 (section 4.2.1 Treatment Objectives for Early Season Peak and Near Peak Stream Flows) displays activity area by sensitive soil by harvest system.

Table 164 Alternative 2 Logging System Acres

SUBWATERSHED	Tractor (Sensitive soil acres[69])	Skyline	Helicopter
Davis/Placer Gulch	1,530 (443)	210	80
Vinegar	800 (117)	450	460
Vincent	960 (62)	460	180
Little Boulder/ Deerhorn	960 (16)	320	630
Tincup/Little Butte	740 (100)	400	1,010
Butte	100 (223)	270	310
Granite Boulder	0	0	0
TOTAL	5,090	2,110	2,670

Harvest effects are generally considered pulse disturbances which tend to be greatest in the first few years after harvest and decline as the ground recovers and revegetates after harvest. However in the project area, previous disturbance may interact with new disturbance, synergistically increasing the effects of either disturbance pulse. Also, because of the history of human activity in the area one pulse of disturbance tended to be followed by another pulse while the first disturbance was in the recovery stage. In addition, inherent characteristics of the soil and much of the previous disturbance contribute to the concentration of flows and more rapid run off as described in section 4.2.1 Treatment Objectives for Early Season Peak and Near Peak Stream Flows *Land and Resource Management Plan* Standard #126 for detrimental soil condition is expected to be met at the completion of unit activities.

Harvest and thinning activities will reduce the potential for stand replacing wildfires. Catastrophic wildfires could negatively fish and fish habitat in project area streams. These effects are discussed in more detail in Section 4.2.1 Treatment Objectives for Early Season Peak and Near Peak Stream Flows .

Roads

Increases in sediment yield beyond a stream's ability to transport the material can decrease the amount of instream habitat available. Road construction, especially in both the clayey/loamy and in ash soils may have adverse effects to watershed condition. Alternatives may result in short term increases in sedimentation, which may result in increased embeddedness of gravel and cobble substrates. This effect is greatest in the first year following construction.

[69] Includes all types of sensitive soils as described in soils descriptions, beginning page 114 and Table 87, page 115.

Table 165 Road Construction ATM B

Subwatershed	Mi./Mi. in RHCA
Davis/Placer Gulch	2.7/0.07
Vinegar	4.5/0.02
Vincent	3.9/0.0
Little Boulder/ Deerhorn	3.8/0.0
Tincup/Little Butte	2.4/0.03
Butte	0.3/0.0
Granite Boulder	0.1/0.0
TOTAL	17.7/0.12

An essential part of the action alternatives is to decommission roads in valley bottoms impacting RHCAs and streams and to relocate transportation systems higher on the landscape where impacts will be minimized. Some existing roads will be decommissioned after use for harvest/haul as part of this project.

Realignment/relocation of some roads, minimum of 2.8 mi. with ATM B, would place new road construction in uplands where impacts to aquatic resources are reduced. Fewer roads would be encroaching on streams and active floodplains. Removing roads in riparian areas allows the stream to meander, reducing slope and stream energy. New roads would remain on the landscape. Impacts to streams (peak flow increase, sediment, etc.) would remain but they would be fewer and smaller in magnitude than the baseline impacts caused by the roads that were removed. Road realignment activities would create short term impacts (2-5 years) associated with disturbance of soils but would have long term benefits (from 5 years on) to streams and fish by removing or reducing sediment inputs from chronic sediment producing areas and reducing interception of ground water from roads to be decommissioned.

Table 166 lists miles of reconstruction by subwatershed (and in RHCAs) for each alternative. Major reconstruction activities would create short term impacts (2-3 years) associated with disturbance of soils but would have long term benefits to streams and fish by removing or reducing sediment inputs from chronic sediment producing areas. The recommended minor reconstruction would be considered maintenance on many roads. Currently degraded Forest Service roads would be brought up to standard with this work. Culverts that are currently barriers to fish should be replaced in a manner benefiting fish of all life stages with access as reconstruction occurs. Benefits of replacing undersized culverts would also be seen with any large runoff event. The roads would remain on the landscape; impacts to streams (peak flow increase, lower LWD, etc.) would remain.

Table 166 Road Decommission ATM B

Subwatershed	Mi./mi. in RHCA
Davis/Placer Gulch	10.01/4.87
Vinegar	12.66/4.53
Vincent	5.72/2.56
Little Boulder/ Deerhorn	12.16/4.17
Tincup/Little Butte	10.20/1.81
Butte	8.11/2.78
Granite Boulder	9.19/4.05
TOTAL	68.05/24.77

Decommission projects total 68 miles with Alternative 2. Table 166 lists decommission activity for the alternative by subwatershed. Total road densities would be less than existing conditions in every

subwatershed with this alternative (see Table 163). Road densities in Butte Creek and Little Butte/Windlass subwatersheds, which contain steelhead, would improve from Not Properly Functioning to Functioning at Risk (NMFS standards) by going below the 3 mi/mi^2 threshold. However, road density would still be greater than 3 mi/mi^2 (considered Not Properly Functioning by NMFS) in Davis/Placer and Vincent Creek subwatersheds which contain steelhead. The streams containing bull trout (Granite Boulder and Vinegar Creek) would both still be considered Functioning at Unacceptable Risk by USF&W after project implementation but road densities would drop by 0.55 mi/mi^2 to be 3.00 mi/mi^2 in Vinegar Creek and drop by 1.05 mi/mi^2 to be 2.41 mi/mi^2 in Granite Boulder Creek (2.4 mi/mi^2 is the break to Functioning at Risk). Roads in RHCAs would be reduced by 25 miles.

Stream crossings would be rehabilitated (recreated) when decommissioning roads. This entails removing culverts and through fill material, resloping the banks to mimic the natural grade of the valley bottom and planting native grasses, forbs, hardwoods and conifers to stabilize the area. While closing roads can reduce sediment concerns from use during periods of concern to fisheries, decommissioning is more effective at reducing or removing impacts.

There would be some disturbance or impacts associated with decommission activities and realignment of roads from valley bottoms to locations higher in the subwatersheds but these would be short term in nature and would have long term benefits to fish and fish habitat. The projects would likely contribute some sediment to area streams but this would be minimized because proper design criteria and mitigation measures are included in the project. Decommission without realignment would show a greater benefit to fisheries but would not meet needs of other resources within the Forest Service.

Table 163 located at the end of the Alternative 1 section shows the total number of road/stream crossings for each ATM plan. It is important to note that while the number of stream crossings increases, they are on intermittent or non-fish bearing streams. Crossings on perennial fish bearing streams are reduced (see hydrology section). All action alternatives show a substantial reduction in the total miles of roads and miles of roads within RHCAs.

It is expected that peak and base flows would improve with this alternative and that stream flows would allow better access and temperatures for TES fish in project area streams. Fish habitat and populations should begin to show benefits within 7-10 years and will likely show vast improvements from 25years and into the future.

Potential cumulative effects of harvest are the addition of sediment to the Middle Fork John Day River and/or changes in flow regime associated with harvest activities that could impact fish and fish habitat. Another potential effect is that of the reduction in likelihood of catastrophic wildfire and resultant sediment input and temperatures on the Middle Fork John Day River as well as effects on fish habitat and fish populations contained within.

Cumulative effects of harvest from Alternative 2 are expected to include reduced sediment loads, lower stream temperatures and greater discharge during low flow periods entering the Middle Fork John Day River from project streams in the long term. This would result in benefits to fish and fish habitat in the subbasin. Chinook salmon reproduction would greatly benefit these conditions because they hold from May through August then spawn during September in the Middle Fork John Day River. Connectivity for fluvial bull trout would also be improved with this alternative.

ALTERNATIVE 3—Ground Based Systems

Harvest Systems

Effects of different harvest systems were discussed in Alternative 2.

Table 167 Harvest acres, including those on sensitive soils, by subwatershed.

SUBWATERSHED	TRACTOR	SKYLINE	HELICOPTER
	Acres (Sensitive Soil Acres)	Acres	Acres
Davis/Placer Gulch	1,300 (443)	190	30
Vinegar	750 (117)	450	460
Vincent	880 (62)	390	170
Little Boulder/Deerhorn	710 (12)	250	190
Tincup/Little Butte	840 (100)	210	120
Butte	100 (100)	230	120
Granite Boulder	0	0	0
TOTAL	4,580	1,720	1,090

There is a total of 6,747 acres harvested in Alternative 3. Harvest acres, including those on sensitive soils, are listed in Table 183 Harvest on Sensitive Soils, page 359. Project area streams would have additional protection in the Category 4 riparian areas of 125 feet placed on a total of 0.44 miles.

Harvest and thinning activities will reduce the potential for stand replacing wildfires. Catastrophic wildfires could negatively fish and fish habitat in project area streams. These effects are discussed in more detail in 4.2.1 Treatment Objectives for Early Season Peak and Near Peak Stream Flows, page 239. In this portion of the document, the risk of sedimentation associated with concentrated flows and decreases in water absorption and storage was described. Risk of sedimentation would be expected to increase when concentrated flows increase and when water absorption and storage decrease. *Land and Resource Management Plan* Standard #126 for detrimental soil condition would be met at the completion of unit activities, as described.

Roads (ATM B)

Access Travel Management Plan B is associated with Alternative 3; the road miles are slightly different from Alternatives 2 and 4, because of different harvest unit pool and access needs.

Table 168 Road Construction ATM B

SUBWATERSHED	Mi./Mi. in RHCA
Davis/Placer Gulch	2.6/0.07
Vinegar	4.3/0.02
Vincent	4.1/0.0
Little Boulder/ Deerhorn	3.4/0.0
Tincup/Little Butte	2.2/0.03
Butte	0.3/0.0
Granite Boulder	0.1/0.0
TOTAL	17.0/0.12

The effects of road realignment/relocation, construction, reconstruction, and decommissioning were discussed for Alternative 2. Table 169 lists miles of reconstruction by subwatershed (and in RHCAs) for each alternative. Table 163, page 336 shows numbers of road/stream crossings existing and for each ATM plan.

Table 169 Road Reconstruction ATM B

Subwatershed	Mi./mi. In RHCAs
Davis/Placer Gulch	29.16/3.26
Vinegar	32.41/4.73
VINCENT	24.25/4.19
Little Boulder/ Deerhorn	26.19/3.89
Tincup/Little Butte	21.03/2.16
Butte	18.07/3.09
Granite Boulder	20.54/1.32
TOTAL	171.65/22.64

Total road densities would be lower than existing baseline conditions in every subwatershed with this alternative (see Table 163 Road Information Summarized by Subwatershed for All Alternatives, page 336). Decommission projects total 68 miles with Alternative 3. Road densities in Butte Creek and Little Butte/Windlass subwatersheds that contain steelhead would drop from Not Properly Functioning to Functioning at Risk (NMFS standards) by going below the 3 mi/mi^2 threshold. However, road density would still be greater than 3 mi/mi^2 (considered Not Properly Functioning by NMFS) in Davis/Placer and Vincent Creek subwatersheds which contain steelhead. Vinegar Creek, which contains bull trout, would both still be considered Functioning at Unacceptable Risk by USF&W after project implementation but road densities would drop by 0.55 mi/mi^2 to be 3.00 mi/mi^2. Granite Boulder Creek would change categories to Functioning at Risk by reducing road miles by 1.05 mi/mi^2 to a new density of 2.40 mi/mi^2. Twenty-five miles of road in RHCAs would be decommissioned under this alternative (see Table 8). Impacts would be minimized if proper design criteria and mitigation measures were implemented.

Table 170 Road Decommission ATM B

Subwatershed	Mi./Mi. in RHCA
Davis/Placer Gulch	10.01/4.87
Vinegar	12.66/4.53
Vincent	5.72/2.56
Little Boulder/ Deerhorn	12.16/4.17
Tincup/Little Butte	130.20/1.81
Butte	8.11/2.78
Granite Boulder	9.19/4.05
TOTAL	68.05/24.77

It is expected that peak and base flows will improve with this alternative and will allow better access and temperatures for TES fish in project area streams. Fish habitat and populations should begin to show benefits within 7-10 years and will likely show vast improvements from 25 years and into the future.

Potential cumulative effects are the addition of sediment sent to the Middle Fork John Day River and/or changes in flow regime associated with harvest activities that could impact fish and fish habitat.

Cumulative effects of road activities from Alternative 3 are expected to include reduced sediment loads, lower stream temperatures and greater discharge during low flow periods from project streams to the Middle Fork John Day River in the long term. This would result in benefits to fish and fish habitat in the subbasin. Chinook salmon reproduction would greatly benefit these conditions because they hold from

May through August then spawn during September in the Middle Fork John Day River. Connectivity for fluvial bull trout would also improve with this alternative.

ALTERNATIVE 4—Ground Based Systems

Alternative 4 does not propose any harvest; therefore, tractor skidding, skyline skidding, or helicopter yarding would not occur. There would be no short-term impacts associated with this alternative.

The risk of high intensity wildfire is greater with this alternative than the other action alternatives because current stocking levels will remain and controlled burning would not be completed in some areas without prior mechanical treatment. Catastrophic fire could impact fish and fish habitat by large input of sediment and reduction in riparian shade/cover associated with high intensity wildfire.

Roads (ATM-B)

Access Travel Management Plan B is associated with Alternative 4; the road miles are different from Alternatives 2 and 3, because there is no harvest and there are different access needs. The roads numbers displayed on Table 171 shows road construction by subwatershed. These roads are necessary for relocation.

Table 171 Road Construction ATM B

SUBWATERSHED	Total Miles	Miles in RHCAs
Davis/Placer Gulch	0.5	0.1
Vinegar	0.0	0.0
Vincent	0.0	0.0
Little Boulder/ Deerhorn	1.7	0.0
Tincup/Little Butte	0.0	0.0
Butte	0.0	0.0
Granite Boulder	0.0	0.0
TOTAL	**2.2**	**0.1**

Effects of road realignment/relocation, construction, reconstruction, and decommissioning were discussed for Alternative 2. Table 172 lists miles of reconstruction by subwatershed (and in RHCAs) for each alternative. Table 163 located at the end of the Alternative 1 section shows numbers of road/stream crossings existing and for each ATM plan.

Table 172 Road Reconstruction ATM B

SUBWATERSHED	Total Miles	Miles in RHCAs
Davis/Placer Gulch	29.16	3.26
Vinegar	32.41	4.73
Vincent	24.25	4.19
Little Boulder/ Deerhorn	26.19	3.89
Tincup/Little Butte	21.03	2.16
Butte	18.07	3.09
Granite Boulder	20.54	1.32
TOTAL	**171.65**	**22.64**

Total Road densities would be less than existing conditions in every subwatershed with this alternative (see Table 163 at end of Alternative 1 section). Road densities would decrease the most with this alternative because less construction is planned since no timber harvest activities are associated with this alternative.

Table 173 Road Decommission ATM B

Subwatershed	Total Miles	Miles in RHCAs
Davis/Placer Gulch	10.01	4.87
Vinegar	12.66	4.53
Vincent	5.72	2.56
Little Boulder/ Deerhorn	12.16	4.17
Tincup/Little Butte	10.20	1.81
Butte	8.11	2.78
Granite Boulder	9.19	4.05
TOTAL	**68.05**	**24.77**

Decommission projects total 68 miles with Alternative 4. Road densities in Butte Creek, Davis/Placer and Little Butte/Windlass subwatersheds, which contain steelhead, would drop from Not Properly Functioning to Functioning at Risk (NMFS standards) by going below the 3 mi/mi^2 threshold. However, road density would still be greater than 3 mi/mi^2 (considered Not Properly Functioning by NMFS) in the Vincent Creek subwatershed which contains steelhead. Vinegar Creek, which contains bull trout, would still be considered Functioning at Unacceptable Risk by USF&W after project implementation but road densities would drop by 0.91 mi/mi^2 to be 2.64 mi/mi^2. Granite Boulder Creek, which contain bull trout, would change categories to Functioning at Risk by reducing road miles by 1.05 mi/mi^2 to a new density of 2.40 mi/mi^2. Twenty-five miles of road in RHCAs would be decommissioned under this alternative. Table 1, located in the Alternative 1 section, lists pertinent road data by subwatershed for each alternative.

It is expected that peak and base flows will improve with this alternative and will allow better access and temperatures for TES fish in project area streams. Fish habitat and populations should begin to show benefits within 7-10 years and will likely show vast improvements from 25 years and into the future.

Cumulative Effects (ATM-B)

Without any harvest, fish populations and fish habitat downstream in the Middle Fork John Day could be impacted if catastrophic wildfire were to occur in the project area. Temperature, sediment, flow magnitudes and duration all have the ability to effect TES fish in the entire subbasin.

Cumulative effects of road activities from Alternative 4 are expected to include reduced sediment loads, lower stream temperatures and greater discharge during low flow periods from project streams to the Middle Fork John Day River. This would result in benefits to fish and fish habitat in the subbasin. Chinook salmon reproduction would greatly benefit these conditions because they hold from May through August then spawn during September in the Middle Fork John Day River.

ALTERNATIVE 5—Ground Based Systems

Harvest Systems

Effects of different harvest systems were summarized for Alternative 2, Direct and Indirect Effects.

Table 174 Alternative 5 Logging System Acres

Subwatershed	Tractor	Skyline	Helicopter
	Acres (Sensitive Soil Acres)	Acres	Acres
Davis/Placer Gulch	1,540 (1436)	250	190
Vinegar	1,090 (968)	780	480
Vincent	1,120 (1118)	610	230
Little Boulder/ Deerhorn	1,270 (1270)	360	550
Tincup/Little Butte	1,200 (916)	340	690
Butte	100 (100)	270	430

Subwatershed	Tractor	Skyline	Helicopter
Granite Boulder	0	0	0
TOTAL	**6,320 (5808)**	**2,610**	**2570**

There is a total of 11,500 acres harvested in Alternative 5. Harvest acres, including those on sensitive soils, are listed by subwatershed in table . These effects are discussed in more detail in 4.2.1 Treatment Objectives for Early Season Peak and Near Peak Stream Flows, page 239. Risk of sedimentation is associated with concentrated flows and decreases in water absorption and storage were described. Risk of sedimentation would be expected to increase when concentrated flows increase and when water absorption and storage decrease. *Land and Resource Management Plan* Standard #126 for detrimental soil condition is expected to be met at the completion of unit activities, as described.

ROADS—(ATM-A)

Access Travel Management Plan (ATM) A is associated with Alternative 5. The total number of open and closed roads for ATM A is similar to the total for Alternative 2. ATM A constructs more roads, leaves more roads open, closes fewer roads, and decommissions only slightly fewer roads.

Table 175 ATM A Road Construction

SUBWATERSHED	Total Miles	Miles in RHCAs
Davis/Placer Gulch	2.7	0.07
Vinegar	5.3	0.03
Vincent	4.8	0.00
Little Boulder/ Deerhorn	5.8	0.30
Tincup/Little Butte	3.2	0.03
Butte	0.3	0.00
Granite Boulder	0.1	0.00
TOTAL	**23.2**	**0.43**

Effects of road realignment/relocation, construction, reconstruction, and decommissioning were discussed for Alternative 2. Table 176 lists miles of reconstruction by subwatershed (and in RHCAs) for each alternative. Table 163, page 336 shows numbers of road/stream crossings existing and for each ATM plan.

Table 176 Road Reconstruction ATM A

SUBWATERSHED	Total Miles	Miles in RHCAs
Davis/Placer Gulch	29.47	3.35
Vinegar	29.65	4.17
Vincent	24.51	4.12
Little Boulder/ Deerhorn	26.99	3.69
Tincup/Little Butte	22.56	1.83
Butte	16.81	0.65
Granite Boulder	21.03	4.24
TOTAL	**171.02**	**22.05**

Total Road densities would be less than existing conditions in every subwatershed with this alternative (see Table 163 Road Information Summarized by Subwatershed for All Alternatives, page 336). Decommission projects total 63 miles with Alternative 5 (see Table 177). Road densities in Butte Creek, Little Boulder/Deerhorn and Little Butte/Windlass subwatersheds, which contain steelhead, would drop from Not Properly Functioning to Functioning at Risk (NMFS standards) by going below the 3 mi./mi.^{2} threshold. However, road density would still be greater than 3 mi/mi^2 (considered Not Properly Functioning by NMFS) in Davis/Placer and Vincent Creek subwatersheds which contain steelhead, a threatened fish species. Vinegar Creek, which also contains steelhead (see ODF&W BIOLOGICAL Surveys, page 132), would still

be considered Functioning at Unacceptable Risk by USF&W after project implementation but road densities would drop by 0.44 mi/mi^2 to be 3.11 mi/mi^2. Granite Boulder Creek, a bull trout stream, would drop by 1.08 mi/mi^2 to 2.38 and would be considered Functioning at Risk. This alternative reduces road miles in RHCAs by 24 miles. Table 163, page 336 lists pertinent road data by subwatershed for each alternative.

Table 177 Road Decommission ATM A

SUBWATERSHED	Total Miles	Miles in RHCAs
Davis/Placer Gulch	9.06	4.61
Vinegar	11.76	4.41
Vincent	5.88	2.55
Little Boulder/ Deerhorn	10.69	4.00
Tincup/Little Butte	8.28	1.83
Butte	8.02	2.78
Granite Boulder	9.13	3.99
TOTAL	**62.82**	**24.17**

It is expected that peak and base flows will improve with this alternative and will allow better access and temperatures for TES fish in project area streams. Fish habitat and populations should begin to show benefits within 7-10 years and will likely show vast improvements from 25 years and into the future.

Cumulative Effects (ATM—A)

Potential cumulative effects of harvest are the addition of sediment to the Middle Fork John Day River and/or changes in flow regime associated with harvest activities that could impact fish and fish habitat. Another potential effect is that of the reduction in likelihood of catastrophic wildfire and resultant sediment input and temperatures on the Middle Fork John Day River as well as effects on fish habitat and fish populations contained within.

Cumulative effects of road activities from Alternative 5 are expected to include reduced sediment loads, lower stream temperatures and greater discharge during low flow periods from project streams to the Middle Fork John Day River over the long term. This would result in benefits to fish and fish habitat in the subbasin. Chinook salmon reproduction would greatly benefit from these conditions because they hold from May through August then spawn during September in the Middle Fork John Day River.

Comparison of Alternatives—Ground Based Systems

Alternative 1(ATM-A)

Alternative 1 has no short-term impacts but the greatest long-term impacts for fish and fish habitat.

No harvest or thinning activities would occur. This alternative leaves the greatest chance of catastrophic wildfire without any removal of understory vegetation in dense multistory stands.

This alternative would not modify the transportation system in the project area so no short term impacts associated with road construction, realignment, reconstruction or decommission would occur. However, roads in RHCAs and crossing streams will continue to impact fish populations and habitat in the long term.

Alternative 4 (ATM-A)

Alternative 4 has short term impacts that would be slightly greater than Alternative 1, but the greatest long term improvement is expected from this alternative.

Thinning and prescribed burning activities would occur. Prescribed fire has the potential to impact fish and fish habitat if burning does not meet expectations but wildfire has greater likelihood of damaging fish populations and habitat.

This alternative would create short term impacts associated with road realignment, reconstruction and decommission activities. In the long term this is expected to increase fish populations by improving fish

habitat. The only road construction associated with this alternative is 0.2 miles of realignment and there are no commercial harvest units.

Alternative 3 (ATM-A)

Alternative 3's short-term impacts would be slightly greater than Alternatives 1 and 4 because some commercial harvest is planned in addition to prescribed burning and thinning activities.

Prescribed fire has the potential to impact fish and fish habitat if burning does not meet expectations but wildfire has greater likelihood of damaging fish populations and habitat.

This alternative would create short-term sediment impacts associated with road realignment, reconstruction and decommission activities. In the long term this is expected to increase fish populations by improving fish habitat. There would be some road construction associated with this alternative, as there are commercial harvest units. Road construction activities are additional impacts associated with this alternative.

Alternative 2 (ATM-A)

Alternative 2's short-term impacts are greater than Alternatives 1, 3 and 4 because additional commercial harvest and road construction would occur in addition to prescribed burning and thinning activities.

Prescribed fire has the potential to impact fish and fish habitat if burning does not meet expectations but wildfire has greater likelihood of damaging fish populations and habitat.

This alternative would create short-term sediment impacts associated with road realignment, reconstruction and decommission activities. In the long term this is expected to increase fish populations by improving fish habitat. Road construction activities are additional impacts associated with this alternative.

Alternative 5 (ATM-A)

Alternative 5 has the greatest short-term impacts of all alternatives. This alternative includes more ground-based harvest and road construction activities than any other alternative.

Prescribed burning is similar in size to Alternatives 2 and 3. Prescribed fire has the potential to impact fish and fish habitat if burning does not meet expectations, but wildfire has greater likelihood of damaging fish populations and habitat.

This alternative would create short-term sediment impacts associated with road realignment, reconstruction and decommission activities. In the long term this is expected to increase fish populations by improving fish habitat. Road construction activities are additional impacts associated with this alternative.

4.3.4—ISSUE 1.4.4—EFFECTS OF HEAVY EQUIPMENT IN RHCAS

The Agency's proposal using heavy equipment within Riparian Habitat Conservation Areas (RHCAs) to create a meandering nature to stream channels, to enhance aspen stands, and to place in-stream structures may damage stream channel functioning.

BACKGROUND

Heavy equipment operating within RHCAs may compact soil, damage stream banks, and contribute sediment to streams. Access through the RHCA to the project site would also compact these sensitive soils and possibly damage vegetation and down woody material.

Alternative 2 and 5 would display the anticipated short and long-term trade-offs of using heavy equipment within RHCAs while Alternatives 3 and 4 would not use heavy equipment. Alternatives 2 and 5 would also use heavy equipment to remove conifers from RHCAs to enhance aspen stands and reduce fuel loading.

Stream channel profiles are not currently those expected for the geomorphology of the area. Width to depth ratios are elevated. Many fish bearing streams are currently lacking adequate habitat diversity. Analysis of recent stream surveys shows several very long lengths of riffle (in excess of 400 feet to over 1500 feet) in fish bearing, low gradient segments on Granite Boulder, Butte Creek and Vinegar Creek. Vinegar Creek is actively improving or "rehabilitating" by cutting new channels, building sinuosity and decreasing channel slope; pool habitat is forming and substrate composition is improving. However the upper culvert at the 618 road and Vinegar Creek is a fish passage barrier. Granite Boulder Creek and Butte Creek are maintaining current conditions but not actively recovering. Stream temperatures do not meet State standards for temperature; several streams are on the State 303d List of Water Quality Limited Streams for temperature. The water at the origin of some of these streams is commonly within 10 degrees Fahrenheit of the State standard during summer months and generally approaches the State standard for a few days each summer. Downstream water temperatures are generally warmer than but correlated with upstream ones. The current structures in Granite Boulder Creek and Butte Creek are not creating deep pool habitat, have no cover and are barriers to upstream movement by fish at low flows. An unmaintained log culvert in Butte Creek is modifying the channel profile and may cause erosion. Caribou and Vincent creeks formerly interacted with large areas of floodplain that provided cold water storage for late season base flows.

Aspen were formerly a larger component of the landscape, possibly up to 20 times as abundant. Aspen stands in riparian areas provided shade and detritus. Ground water relations in aspen stands in the Blue Mountains are not well understood. It is assumed that ground water relations would be more similar to historical ones if aspen stands were reestablished, regardless of whether the aspen actually influence ground water movement or merely serve as an indicator that ground water is present.

ALTERNATIVE 1—Heavy Equipment in RHCAs

No heavy equipment is recommended for use in RHCAs or in stream channels. Stream channel function, floodplain function, water absorption and capture, summer base flows, and fish habitat quality would not be improved along Granite Boulder Creek, Butte Creek, Vinegar Creek, Vincent Creek and along the Middle Fork at Caribou Creek and would remain as described in the Affected Environment. Current structures in Granite Boulder Creek and Butte Creek would not function as designed and would reduce habitat quality as well as connectivity for fish (particularly juvenile movement upstream). Non-functional or functional-at-risk channels would not be rehabilitated. Current degraded channel conditions would be maintained. Fish habitat (particularly pools) quality and quantity would remain degraded. Stream temperatures would remain elevated during summer low flow conditions. Temperatures would not meet state water quality standards and optimums for local fish populations. Deep pool habitat would not be improved in Granite Boulder and

Butte creeks, maintaining the current, limited winter rearing habitat for resident and anadromous salmonid populations. Fish would not be able to move upstream beyond the upper Road 618 crossing (culvert) in Vinegar Creek. Movement would continue to be limited to downstream only.

Natural restoration of habitat diversity to these disturbed and degraded systems in a Dry Forest ecosystem such as the Malheur NF may take several decades if not hundreds of years. Natural recruitment of coarse woody material is expected to occur from 50-125 years and beyond with channel adjustment to restore floodplain function following. Both processes are described in 4.2.1 Treatment Objectives for Early Season Peak and Near Peak Stream Flows , beginning on page 239. Fish habitat parameters described above would improve correspondingly.

Bull trout spawning habitat and resulting productivity would remain reduced with the no action alternative because of reduced base flows and elevated stream temperatures during August and September.

Declining aspen stands would be expected to continue in this downward trend. Shade and detritus contributions would remain at current levels and decrease as stands continued to decline.

Project area streams contribute water and sediment to the Middle Fork John Day River. Water temperatures are expected to remain elevated as described in the Affected Environment and flow regimes (peak and base flow timing and magnitude) in the subbasin would remain modified. Until wood falls in the tributary streams, the lack of improvement in downstream water temperatures and flow regime would continue to negatively impact holding (summer) and spawning (fall) activities of Chinook salmon, reducing fecundity of the species in this subbasin. High water temperatures in the past have resulted in broad, large-scale mortality of these sensitive listed fish before spawning activities began; large-scale mortality would continue to occur when certain weather and hydrologic conditions occurred.

If flows in the Middle Fork John Day River subside too early or water temperatures become too high before bull trout reach spawning areas in tributaries to the Middle Fork John Day, physical or thermal barriers are created. This reduces genetic diversity shared between subpopulations by fluvial fish and further reduces fecundity of the species. Prior to fall spawning, Chinook salmon adults would continue to hold under elevated stream temperatures in the Middle Fork John Day River during the summer. The no action alternative will maintain the current situation and continue to impact these species.

ALTERNATIVE 2 and 5—Heavy Equipment in RHCAs

Displayed in Table 178 are the activities for which large equipment would be used to complete projects within stream channels or RHCAs. These alternatives would install in-stream Rosgen style structures such as vortex rock weirs, upstream log “Vs”, “J” Hooks and wing deflectors in Granite Boulder Creek, Butte Creek and Vinegar Creek (see Table 178 for numbers) to provide connectivity and habitat diversity, particularly deep pools, for threatened fish species. Hydrologic function and water storage would be improved on all streams where heavy equipment would be used in stream channels. Benefits would be expected to begin within one year of implementation and continue indefinitely.

Table 178 Stream and Channel Improvement Projects Using Large Equipment

STREAM	NEW INSTREAM STRUCTURES	IMPROVE EXISTING INSTREAM STRUCTURE	STREAM CHANNEL MODIFICATIONS	ASPEN IMPROVEMENT CONIFER REMOVAL	Culvert Removal or Replacement to Improve Fish Passage
Davis/ Placer					2
Vinegar	3 Structures			About 4-6 ac.	5
Vincent			About 2 miles	About 2 ac.	3
L. Boulder/ Deerhorn			About 1 mile	About 5 ac.	2
Tincup/ L. Butte				About 1 ac.	6
Butte	About 14 Structures	29 Instream Structures			2 Removals of Log Culverts
Granite Boulder	62 Structures	7 Instream Structures			4
TOTAL	**79**		**3 miles**	**12-14 ac.**	**24**

Improvements in width to depth ratios and water storage capacity would extend beyond the structures both upstream and downstream. Narrowing of streams and increasing water storage capacity would also contribute to better maintenance of cool stream temperatures. Less water surface would be exposed to sunlight and subsequent radiant heating. Water tables that are raised change floodplain conditions and support riparian vegetation that provide shade and hiding cover for fish.

One culvert should be modified or replaced and another removed in connection with these projects. Culvert modifications in Vinegar Creek at the upper crossing of Road 618 include installing in-stream structures that would immediately reconnect 0.5 miles of summer rearing cold-water habitat for anadromous, fluvial and resident salmonids if implmented. If needed, baffles would be installed in the culvert to enhance fish passage. The culvert is currently a barrier to upstream migration at base flow. Population viability of fish in Vinegar Creek would be improved because of increased mobility among individuals.

Effects associated with the use of heavy equipment in the RHCAs in Alternatives 2 and 5 will create short-term impacts with long-term benefits. Bringing excavators or spider hoes into the RHCAs and using them to modify existing in-stream structures or to implement other activities is likely to result in disturbance to the riparian soils and vegetation. Harassment of listed fish would occur during the short (1 day) work period at each site. However, the use of heavy equipment is expected to result in improvements to watershed function and fish habitat that could not be otherwise accomplished by natural means in human timeframes. The disturbance associated with the use of heavy equipment is expected to minimumly counter the beneficial effects of the recommended activities.

Table 179 Aquatic improvement Results of Alternatives 2 & 5

Stream	Acres of RHCA Affected	Miles of Enhanced Connectivity
Davis		
Vinegar	1 Acre	0.5 Miles
Vincent		
Caribou		
Granite Boulder	7 Acres	3 Miles
Butte	3 Acres	4 Miles

Bringing equipment into the RHCAs to modify existing in-stream structures and to access other RHCA project sites, except the aspen projects discussed below, is likely to result in less than 0.5% of the travel

way becoming detrimentally compacted. This estimate is based on design criteria that equipment would enter and exit the RHCAs on zigzag paths and would travel outside the RHCAs between clusters of sites and on the amount of compaction correlated with single and repeat passes. The effects from increasing compaction by 0.5% are expected to be negligible. Compaction is expected to be alleviated by year 50. Increases in surface erosion potential are expected to be immeasurable because mitigation requires that organic material be placed across any bare ground exposed by using heavy equipment. The increase to chronic disturbance and departure from hydrologic potential is expected to be immeasurable. It is expected that flows will generally not be concentrated under the mitigated conditions of Alternatives 2 and 5 since continuous flow paths are unlikely to develop.

It is expected that, even under the prescribed mitigation, up to 0.25 cubic yard of sediment (from streambed, banks and instream deposits) may enter streams at each new in-stream structure work site at and immediately following the time (1-2 years) that log structures are placed. Re-shaping stream banks to the natural grade and planting native riparian hardwood shrubs and sedges to provide immediate ground cover where logs are keyed in is part of the design of the project and is expected to limit disturbance of stream banks to fewer than 5 years by which time the shrubs are expected to have become established. These plantings would also provide shade to maintain stream temperatures and create hiding cover for fish in the long-term (10-25 years) where none currently exists. No short-term impacts to stream temperature are expected. Stream temperatures would be maintained more efficiently immediately after the project implementation due to the creation of deep pool habitat and changes in width to depth ratios. The modified and the newly installed structures would create self-cleaning, deep pools and improve stream connectivity at low flows in the short term (within 1 year) and improve sinuosity, provide shade to maintain stream temperatures and act as hiding cover for fish over the long term (10 years and beyond).

Projects are recommended to re-shape channels in Vincent Creek and Caribou Creek and re-connect them with floodplains. The objective of these recommended activities is to move stream channels and rebuild them in new locations with new dimensions that are in balance with the hydrologic system in order to move toward hydrologic and channel potential. Disturbance from displacement and replacement of soils and rocks is a design element and would be expected. Most of the material that would be displaced has been previously displaced by mining and post-mining activities. Much of the material to be moved is mining tailings or previously flattened tailings; rock cannot be further compacted. Mitigation is designed to limit sediment inputs to streams and to limit compaction. It is estimated that up to 20 cubic yards of sediment could enter streams directly as a result of these projects. Design elements to move the hydrologic system toward potential are expected to promote infiltration and floodplain use throughout the project areas. Compaction that exceeds *Land and Resource Management Plan* standards would be alleviated as part of project design so that *Land and Resource Management Plan* standards would be met when these activities are completed. Soil would be replaced in layers to promote soil functioning and sediment from flooding would be allowed to deposit to create typical floodplain soils. Planting hardwood shrubs, sedges and similar species would establish riparian vegetation at higher densities than currently occur, further promoting floodplain function. Down woody material imported from hill slopes in the project areas would be placed as needed. Stream channels would be moved toward Proper Functioning Condition. These projects could increase base flows improving potential for fish in these streams currently intermittent in flow regime but fish bearing. This would improve sub-population viability by improving connectivity and survival of individuals in these streams.

Skidders or forwarders would enter 12 aspen stands (up to 30 acres total) in RHCAs to remove conifer logs for commercial purposes. Generally, these RHCAs are located on seeps and springs, ephemeral channels or Category 4 streams. There are 2 sites on Category 1 streams, Vinegar Creek and Vincent Creek and 2 sites on Category 2 streams, Vincent Creek and Tincup Creek, where logs would be removed. Designated skid trails would be used to limit compaction to less than 20% so that *Land and Resource Management Plan* standards would be met. It is expected that compaction would actually be less than 20% since some trails would be used for single passes. Since skid trails would be allowed as close as 25 feet of stream

channels, the risk that erosion pathways, which commonly develop along skid trails, would reach active stream channels is increased relative to traditional logging. This risk of connection is countered by two conditions limiting the likelihood that erosion would be initiated. First, the more limited, expected use of each trail should result in less exposure of bare ground. Second, the normally more abundant ground cover found within RHCAs is also expected to reduce the amount of bare ground exposed. Additional mitigation measures such as helicopter logging or winter logging on frozen ground or when soil moisture is less than 10%, would further reduce compaction potential. A fisheries biologist or hydrologist would inspect the site before implementation and locate/delineate areas unsuitable for skidding. In balance, the risk of sediment reaching streams would be elevated in the event of high intensity, short duration rainstorms or of rapid snowmelt, proportional to the number and length of skid trails located at each site.

Cumulative Effects—Heavy Equipment in RHCAs

Project area streams contribute water and sediment to the Middle Fork John Day River.

Temperatures would be more effectively maintained in project area streams and proportionally in the Middle Fork John Day River. In the long term (10-25 years), the effects of these projects are would reduce temperatures during base flow and increase base flows in the Middle Fork John Day River. These changes would result in an upward trend for fish and fish habitat in the Middle Fork John Day River. Since project area streams contribute only a portion of water to the Middle Fork John Day River, it is unlikely these projects alone would restore historic conditions in the river but they would aid in removing it from the 303(d) List for Water Quality Impaired Streams in Oregon.

Projects improving habitat in area streams would complement channel and fencing projects on the Middle Fork John Day River planned by the Confederated Tribes of the Warm Springs on land leased from The Nature Conservancy and John Forest. In particular, connectivity to Butte Creek, Granite Boulder, Vinegar Creek, and Davis Creek would be improved by instream rehabilitation using heavy equipment on private land. The Warm Springs Tribes are building corridor fence in several locations on the Middle Fork John Day River to protect sensitive riparian areas from use by cattle and to allow recovery of streamside vegetation.

Chinook salmon, particularly adults, dependent on the Middle Fork John Day River for holding and spawning will benefit from these projects. Water temperatures are expected to remain elevated and flow regimes (peak and base flow timing and magnitude) will remain modified in the subbasin but these projects would improve conditions in the subbasin.

Fluvial bull trout depend on flows and temperature in the Middle Fork John Day River for seasonal migrations from larger rivers to smaller streams in the project area. If flows in the Middle Fork John Day River subside too early or water temperatures become too high before these threatened fish reach spawning areas, physical or thermal barriers are created. Projects associated with these alternatives are designed to improve conditions for bull trout. Genetic diversity is expected to be increased among subpopulations through contact with fluvial fish.

ALTERNATIVES 3 & 4—Heavy Equipment in RHCAs

Impacts will be minimized by using the design criteria (not including heavy equipment use) listed under Alternative 2 and 5.

The “Modification of Instream Structures” projects shown in Table 179 under Alternative 2 and 5 would be implemented without the use of large equipment. The risk of sedimentation, stream bank disturbance, and compaction resulting from use of large equipment would remain at zero since no disturbance from large equipment would occur. Conditions would remain as described in the Affected Environment and the No Action Alternative, except near existing in-stream structures in Granite Boulder Creek and Butte Creek. Existing structures would be modified by hand crews using power tools. Harassment of listed fish would occur during the short (1-3 day) work period at each site. Logs would be added to existing structures to

improve function. Modifying the structures by hand with power tools is expected to move the log weirs and shift their concrete anchors, resulting in the shifting and exposure of up to about 10 sq. ft. of bare soil per structure (5 ft. per bank). Less than 0.25 cubic yard of sediment is expected to enter streams during and for 1-2 years following handwork at each structure. Coarse wood and other organic material shifted during work would be replaced and supplemented to reduce exposed mineral soil. Planting and protecting native riparian grasses, shrubs and trees at the project sites would increase bank stability. There is also the potential for spills of volatile chemicals associated with chainsaws during project implementation; these would be minimized using mitigation measures listed under Alternatives 2 and 5. The modified structures would create self-cleaning, deep pools and improve stream connectivity at low flows in the short term (within 1 year) and improve sinuosity, decrease width to depth ratios as well as provide shade to maintain stream temperatures and act as hiding cover for fish over the long term (10-25 years). Most low flow fish passage barrier would be eliminated.

Table 180 Results of Alternatives 3 & 4

Stream	Acres of RHCA Affected By Heavy Equipment	Miles of Enhanced Connectivity
Davis	0	
Vinegar	0	1
Vincent	0	
Caribou	0	
Granite Boulder	0	3
Butte	0	4

Fish passage would be improved in Vinegar Creek with the modification or replacement of the culvert at the upper crossing of Road 618. The culvert would still likely be a barrier at some flows since in-stream structures would not be placed. The log culvert modifying channel profile and potentially causing erosion in Butte Creek would remain.

Without creating new structures, several sections of Granite Boulder Creek and Butte Creek will continue to have long riffle sections (over 400 feet) without pool habitat. Summer and winter rearing habitat for steelhead and bull trout will remain at levels lower than expected for the geomorphology of these streams. Connectivity would be improved but remain impaired compared to Alternatives 2 and 5 in those streams. Thermal barriers would likely continue to be an issue in bull trout or potential bull trout streams for the future.

Conifers would be girdled or felled where encroaching aspen stands. Logs would not be removed so there would be no additional soil disturbance. As conifers fall following girdling, fuel loading in aspen stands may increase to levels which would promote long fire residence times. Large fuels burn slowly and keep fire in the same area increasing severity and damage to vegetation and soils. Long term aspen viability may also be affected by the hazard and the distribution of fuels. The level and severity of impacts to fish depends on distance from aspen stands to stream channels and fish.

Effects from these instream projects would be supplemented by effects from other stream and riparian improvement projects. Combined effects locally and downstream on the Middle Fork John Day River would be similar to those described for Alternatives 2 and 5 except smaller in magnitude and in area since fewer streams and stream segments would be treated under these alternatives. Projects on adjoining land would complement the recommended activities as described for Alternatives 2 and 5.

Chinook salmon, particularly adults, dependant on the Middle Fork John Day River for holding and spawning will benefit from these projects. Water temperatures are expected to remain elevated and flow regimes (peak and base flow timing and magnitude) will remain modified in the subbasin but these projects

should improve conditions in the subbasin. Long term benefits would be expected to be less than Alternatives 2 and 5 since less stream channel projects would be implemented.

Fluvial bull trout depend on adequate flows and optimum water temperature in the Middle Fork John Day River for seasonal migrations from larger rivers to smaller streams in the project area. If flows in the Middle Fork John Day River subside too early or water temperatures become too high before these threatened fish reach spawning areas, physical or thermal barriers are created. Projects associated with these alternatives are designed to improve conditions beneficial for bull trout and thus increase genetic diversity shared between subpopulations by fluvial fish.

Comparison of Alternatives—Heavy Equipment in RHCAs

Alternative 1

Alternative 1 has the least short-term impacts as well as the least long-term benefits for fish and fish habitat. There are no short-term impacts as no in stream work or riparian habitat improvement projects would be completed. However, Alternative 1 only maintains the current degraded baseline conditions in project area streams. In the long term this alternative is the least beneficial to fish and fish habitat in project area streams or the Middle Fork John Day sub-basin as a whole. Subwatershed conditions may improve over 50-100 or more years. Current flow regimes are unlikely to change the current stable in degraded condition toward one of recovery. Changes would be dependent on infrequent to rare weather and runoff events.

Alternatives 2 and 5

Alternatives 2 and 5 have the greatest short-term impacts due to extensive channel improvement projects using heavy equipment in Category 1, 2 and 4 streams. These alternatives also have the greatest long-term benefits due to large-scale improvements expected within 1-5 years in stream channels, fish habitat and populations. Improvements in associated riparian areas and water storage are expected within 5-10 years.

Alternatives 3 and 4

Alternatives 3 and 4 have some short-term impacts associated with improvement of existing in stream structures in Granite Boulder Creek and Butte Creek using hand tools. These alternatives would have fewer short-term impacts than Alternatives 2 and 5 since using heavy equipment would not be used in RHCAs. However they are expected to create smaller long-term benefits for water quality, fish and fish habitat. Overall benefits would be greater than under the no action alternative since water storage and fish habitat would be improved along segments of two streams.

4.3.5—ISSUE 1.4.5—EFFECTS OF PRESCRIBED FIRE IN RHCAS

The Agency's proposal to allow prescribed fire to burn within some Riparian Habitat Conservation Areas (RHCAs) will reduce riparian vegetation, affecting aquatic and terrestrial habitat. See ***ISSUE 1.4.5—Effects of Prescribed Fire*** in RHCAs *page 32.*

Burning within RHCAs carries risk that the fire may be too intense due to existing fuel levels and ladder fuels. Fire can kill riparian vegetation.

BACKGROUND:

Riparian areas are essential to fish and stream habitat. Riparian vegetation provides cover for fish, shade to maintain stream temperatures, stream bank stability, insect prey for fish and overall maintenance of the

stream channel in a static condition (Platts 1991). See Chapter 3, Fisheries and Hydrology sections for additional description of riparian habitats.

Terrestrial wildlife species use riparian areas disproportionately more than any other habitat (Thomas et al., 1979). About 75% of the terrestrial wildlife species found in the Blue Mountains are either directly dependent on riparian habitats or utilize them more than other habitats. Wildlife use riparian habitats for water, cover, shade and food. Riparian areas often provide travel corridors for movement and dispersal of many terrestrial species. See Chapter 3, Wildlife section for additional description of riparian habitats.

Riparian vegetation is adapted to periodic fire with a return interval slightly longer than that of the upland fire regime (Olson 2000). In Dry Forests, riparian areas were probably subject to fire return intervals of 20 to 50 years, versus 10 to 35 years in the upland areas. Aquatic and terrestrial species have survived for eons of time through many burning events. Species can be considered resilient to the effects of fire, at least when they occur under fire regimes. Fire can both positively or negatively affect habitats.

The wildfire hazard and risk in RHCAs is elevated compared to historic conditions. High intensity wildfires commonly occur during dry conditions where fuels have accumulated. Historically areas of elevated fuels were probably distributed in a patchy manner along streams. Today fuels are elevated along large contiguous stream segments (see Affected Environment, Watershed and Fire sections). Consequently, risks to aquatic and terrestrial species that are dependent on riparian systems are also elevated.

RESOLUTION:

In all action alternatives, initial ignition for prescribed fire would be prohibited in RHCAs. In Alternatives 2, 4, and 5, fire would be allowed to back (or creep) into RHCAs. Design criteria directs that at least 95% of shrubs and trees be retained within RHCAs. Chapter 2 includes mitigation to keep fires within stated parameters. If it appears mortality will exceed 5%, then suppression activities will be initiated. Alternative 3 would prevent fire from burning in RHCAs by avoiding burning near riparian areas, constructing fireline, creating blacklines or using a combination of these strategies. Fires that threaten RHCAs will be suppressed. Alternative 1, the no action alternative, does not use prescribed fire.

Measures:

- RHCA acres that could potentially burn.

ALTERNATIVE 1—Prescribed Fire in RHCAs

No prescribed burning would be implemented with this alternative.

In the absence of fire, it is expected that riparian vegetation will continue to maintain soil holding capacity, stream morphology, cover, shade, browse and forage, as stated in the background statement. The riparian vegetation, particularly hardwood habitats, would remain in degraded condition as described in the Affected Environment.

Alternative 1 does little to restore natural fire regimes. Fuel accumulations in RHCAs and uplands would remain elevated or increase as described in the Fire Effects section. Consequently, risk of intense wildfire entering RHCAs would remain elevated. Fire hazard would also remain elevated. The hazard is likely to increase over time as fuels continue to accumulate.

With increased fuel loadings in the RHCAs and uplands, it is expected that uncharacteristically severe wildfire would occur as described in the Fire Effects section. Wildfire that enters RHCAs is more likely to be of a higher intensity than historically occurred. Increased fire intensity in nearby uplands would pre-dry the elevated fuels in the RHCAs, similar to that which occurred during the Summit Fire. Drying of normally moist fuels has an effect similar to increasing fuel loads, i.e., increased fire hazard. Under intense wildfire, long, contiguous stream segments and adjacent riparian areas are likely to burn. Soil and vegetation damage is expected to be moderate to severe (Forest Service Handbook 2509.13), killing over 40-100% of

the above ground vegetation. Damage to vegetation, soils, watershed, and terrestrial and aquatic species is expected to be more severe.

Loss of vegetation impacts salmonid fish and habitat. Reduced shade increases summer temperatures, decreases winter temperatures and decreases cover (Swanston 1991), proportional to the amount of vegetation lost. Experience from the Summit Fire indicates that sprouts from root systems of damaged shrubs would grow vigorously and are likely to provide shade and fish cover 5-10 years after a fire. Shade from conifers would be re-established within 20-30 years.

Loss of ground cover and other fire effects on soil increase the risk of soil erosion immediately after wildfires; effects last until both live and dead ground cover are replaced. Increased sedimentation would occur, potentially degrading spawning and rearing habitat. Roots of killed trees generally continue to hold soil for about 7-9 years after plants die, reducing the immediate risk of mass wasting. It is unlikely that roots from new vegetation would be sufficiently established to hold soil at pre-fire levels until about year 20. Consequently, reduced soil holding capacity during the 7 to 20 year period may leave RHCAs vulnerable to mass wasting.

One positive effect of wildfire to riparian habitat is that streams can be much richer in insects and aquatic life due to ash and other nutrients from the burned trees that fall into streams (Brassfield 2000).

Bull trout populations are likely to be most impacted because they live in small streams during the period when wildfires are most likely to occur. Risks to populations of anadromous fish may be lower because they spend part of their life cycle in the ocean and may not return until stream condition has improved. The generation returning to fresh water for spawning immediately after the wildfire could be impacted by modified stream condition. Pre-smolt individuals in project area streams at the time of a wildfire would also be affected. Effects to individual anadromous fish would not affect the viability of populations.

Under a catastrophic fire situation, impacts to terrestrial species could include losses in cover, forage, and travel and migratory corridors. Species that are more strongly associated with riparian habitats, and consequently less widely distributed, would be those most affected. Species strongly associated with riparian hardwoods include Lewis's woodpecker, Williamson's sapsucker, red-naped sapsucker, downy woodpecker and willow flycatcher. The Columbia spotted frog, a sensitive species, could be affected. Some terrestrial species, such as small migratory birds, small mammals, and amphibians, may begin to reuse these habitats once shrubs recover; animals that require dense forest cover may be displaced for longer periods of time.

An intense wildfire crossing several subwatersheds may increase sedimentation of fish habitat (reducing habitat diversity, particularly pools), increase summer water temperatures and decrease winter water temperatures downstream in the Middle Fork John Day River. Mass wasting events which result in modifications to the channel morphology of the Middle Fork John Day River would be more likely to occur. These changes could impact fish using the Middle Fork John Day River, particularly chinook salmon and fluvial bull trout. There would be less impact to steelhead because they use the main stem as a migration corridor when temperatures are lower and spawning activities occur in smaller subwatersheds.

If an uncharacteristically severe wildfire crosses several subwatersheds, more than one riparian corridor may be lost in one event. Adverse effects to cover, forage and travel and migratory corridors would be amplified. Species that are strongly associated with riparian habitats would be most affected. Sensitive species, such as the Columbia spotted frog, may be at high risk. Populations that depend on riparian corridors for movement and dispersal may become isolated from each other. Species that are not strongly tied to riparian habits may simply shift their use patterns.

Assumptions Common to Action Alternatives 2, 4, and 5

Prescribed burning would be implemented when weather and fuel conditions allow for reductions in ground fuels while minimizing the risk of crown fires. Spring or fall burning normally allows for optimum moisture

conditions to control fires. Riparian areas commonly contain higher moisture levels than upland areas, particularly in the spring, so there is less likelihood of fires burning out of prescription. More importantly, prescribed fire treatments in upland areas would reduce risk of crown fire over a substantial potion of the Dry Forest types including the outer fringes of RHCAs. Risks of controlled burning getting out of prescription are low due to design criteria and mitigation measures. Table 181 displays acres of uplands and RHCAs within prescribed fire areas.

Table 181 Acres of Uplands and RHCAs within Prescribed Burn Areas

Subwatershed	Alt 2		Alt 3		Alt 4		Alt 5	
	Upland	RHCA	Upland	RHCA	Upland	RHCA	Upland	RHCA
Davis/Placer	2428	332	2290	0	1218	242	2548	332
Vinegar	2680	460	3070	0	2760	460	3260	460
Vincent	2,903	597	3110	0	3123	597	3153	597
Little Boulder/Deerhorn	5857	1093	5160	0	3889	751	5927	1093
Tincup/Little Butte	4097	553	3230	0	3161	499	4097	553
Butte	1385	285	1450	0	1068	292	1385	285
Granite Boulder	885	195	880	0	885	195	885	195
Total	**20235**	**3515**	**19190**	**0**	**16,124**	**3036**	**21255**	**3515**

Experience has shown It is unlikely that total acres of RHCAs would be affected by fire during prescribed burning activities due to elevated moisture conditions. Treatments would not occur in one year; rather they would be implemented over a 10-year period, allowing ground vegetation to recover in some areas before other areas are burned.

ALTERNATIVES 2 & 5—Prescribed Fire in RHCAs

Prescribed burning would be completed on 20,235 acres for Alternative 2 and 21,255 acres for Alternative 5 in the project area, including up to 3,515 acres in both alternatives in RHCAs.

Within the RHCAs, fire would be expected to burn relatively cool, move slowly, and leave a mosaic of burned and unburned patches. Fire at the recommended intensity is not expected to kill more than 5% of mature shrubs or conifers. Individual or small groups of trees or shrubs would be killed. The majority of plant mortality is expected to occur in the outer, drier portions of RHCAs. Low intensity fire (flame lengths less than 24 inches) is likely to burn the fine and small fuels (0-3 inches), char larger dead wood and burn lower limbs of small trees and decadent shrubs as well as the finer branches of well-hedged shrubs. Because 95% of the tree and shrub vegetation is expected to remain intact, few impacts to aquatic or terrestrial wildlife would be expected.

Shade and fish cover would be maintained because fire is not likely to reach stream banks. Surface erosion rates are not expected to increase since mitigation requires that an average of ¼ inch of organic material be left on the forest floor. Since less than 5% of RHCA plants would be killed, remaining vegetation would be sufficient to maintain soil stability. Even where hardwoods are burned, root strength and resulting soil stability would not change, as most vegetation below the root collar would remain alive. Shrubs would be expected to resprout vigorously up to 3-4 feet in the first year after the fire. Adverse effects to aquatic species would be unlikely.

Riparian vegetation would continue to provide cover, shade and food for terrestrial species. Prescribed fire would likely have the most effect on ground level and lower canopy vegetation. There may be some immediate, temporary loss of security/hiding cover for some terrestrial species. Spring burns often correspond to breeding and rearing seasons; birds that nest on or near the ground, for example, may be affected. Potential effects to individuals would not affect the viability of populations. Prescribed burn plans will incorporate mitigation to protect calving and fawning areas. Riparian areas would still provide sufficient cover to provide for movement and dispersal of many terrestrial species. Currently, shrub communities are

deteriorated, in part due to the loss of fire as a natural ecological component. Fires would likely improve forage and browse opportunities, although at low levels considering the recommended intensity of treatment. Several wildlife species are strongly associated with riparian hardwoods, including Lewis's woodpecker, Williamson's sapsucker, red-naped sapsucker, downy woodpecker and willow flycatcher. Low intensity fire may provide some additional snags for primary cavity excavators. Standards for large down logs would be met.

The combination of upland fuel treatments and RHCA burning would reduce the risk of catastrophic fire compared to the No Action Alternative. Within RHCA's, prescribed fire would reduce ground fuels and some ladder fuels, decreasing fire hazard. Because upland fire hazard is also reduced, any wildfire entering RHCA's from upland areas is likely to be of lower intensity. The risk of losing an RHCA to catastrophic wildfire would be reduced

Cumulative Effects

Effects of prescribed burning in outer fringes of RHCAs to aquatics would be insignificant and not measurable immediately downstream or in the Middle Fork John Day River. There are no expected impacts to fish or fish habitat in the Middle Fork John Day River.

No cumulative effects to terrestrial populations would be expected. Even if all RHCAs were entered, only 5% of the available habitat would be affected. Riparian habitat would remain intact. Wildlife corridors would be maintained across the project area.

ALTERNATIVE 3—Prescribed Fire in RHCAs

Alternative 3 proposes prescribed burning in a total of 19,190 acres in the project area and no acres within RHCAs. No burning will be allowed within RHCAs to ensure more short-term protection for stream corridors. Aquatic and terrestrial habitats would remain as described in the Affected Environment in Chapter III or the No Action discussion for this issue.

Fire hazards would remain elevated in RHCA's. However, burning activities in adjoining uplands are expected to reduce the likelihood of catastrophic wildfire. Any wildfire entering RHCAs from upland areas is likely to be of lower intensity. The risk of losing an RHCA to catastrophic wildfire would be reduced.

Cumulative Effects

Cumulative effects would be similar to those described for Alternatives 2 and 5. Risks of catastrophic fire in RHCAs are reduced, although to a lesser degree than in Alternatives 2 and 5.

ALTERNATIVE 4—Prescribed Fire in RHCAs

Prescribed burning would be completed on 16,124 acres in the project area, including up to 3,036 acres in RHCAs. This alternative proposes fewer acres of upland burning than alternatives 2 and 5, and consequently less RHCA acres are exposed to burning operations. The effects would be similar to those described under Alternatives 2 and 5 but would be smaller in spatial scale.

Cumulative Effects

Cumulative effects would be similar to those described for Alternatives 2 and 5. Risks of catastrophic fire in RHCAs are reduced, although to a lesser degree than in Alternatives 2 and 5.

Comparison of Alternatives—Prescribed Fire in RHCAs

Because 95% or the tree and shrub vegetation is expected to remain intact, few direct or indirect impacts to aquatic or terrestrial wildlife would be expected under any of the Action Alternatives. Reducing the likelihood of catastrophic fires impacting RHCAs is due more to the amount of upland burning than to allowing fire to creep into RHCAs. Accordingly, the difference in effects between burning and not burning within RHCAs becomes negligible. Alternatives 2 and 5 reduce the likelihood of catastrophic fires

impacting RHCAs most by implementing prescribed burning and/or tree removal over the most upland and RHCA acres. Alternative 3 burns fewer upland acres than 2 and 5 but more than Alternative 4. Alternative 1 (no action) would not implement any prescribed burning; this alternative would ensure short-term protection of existing habitat but forgoes the long-term goal to reduce high intensity wildfire risk.

4.3.6—ISSUE 1.4.6—INADEQUATE RHCA SIZE

The Agency's design to apply Pac Fish buffers may be inadequate in size to protect fish and their habitat.

BACKGROUND

Some RHCAs are located in areas with soils that are more susceptible to management activities e.g. Clarno soil types. Additional precautions or mitigations should be taken around Category IV streams to ensure protection from possible compaction due to skidding equipment. These impacts may create more intense overland flows and potential sediment delivery to streams.

These RHCAs, in particular the Category IV streams, may require additional widths to ensure protection from possible compaction from skidding equipment creating more intense overland flows and potential sediment delivery due to displacement. In areas containing sensitive soils, the standard RHCA for Category IV stream from Pac Fish direction should be increased for equipment from the current standard of 100 feet (200 feet total).

Alternatives 2, 4, and 5 apply standard PacFish RHCAs. Alternative 3 increases the buffers on Category IV streams by 25ft for a total RHCA plus additional buffer of 125 feet either side of the channel. This increase would be a no equipment buffer; trees may still be removed in the expanded area.

Table 182 Acres of activity in 25 feet outside of RHCA for Alternatives 2/5 and increased "No Equipment" RHCA for Alternative 3

SUBWATERSHED	Alternative 2 Acres where machine activity would occur in extended RHCA	Alternative 3 Acres of increased "No Equipment" RHCA in Tractor Units	Alternative 5 Acres where machine activity would occur in extended RHCA
Davis/Placer Gulch	3.5	3.4	3.5
Vinegar Creek	1.8	1.8	1.9
Vincent Creek	4.7	4.6	4.8
Tincup/Little Butte Creek	2.7	2.6	2.7
Little Boulder Creek/Deerhorn	4.3	4.2	4.4
Butte Creek	0.1	0.1	0.1
Granite Boulder Creek	0.0	0.0	0.0
Total	17.1	19.7	17.5

Harvest prescriptions, methods and mitigation measures were designed with the aid of fisheries and hydrology personnel and were tailored to protect riparian areas as well as fish and fish habitat. Many potential units were dropped from consideration early in the NFMA/NEPA process due to concerns about compaction, runoff, and other impacts that could affect fish or fish habitat. Key watershed designation increased RHCA size from 50 to 100 feet to further protect fish and fish habitat from disturbance. The standard RHCAs extend beyond the actual riparian areas of streams.

ALTERNATIVE 1—Inadequate RHCA Size

No timber activities would occur with this alternative. No increase in erosion in stream channels is expected.

ALTERNATIVE 2—Inadequate RHCA Size

Discussion under Undesired Conditions 1.2.3 Peak Flows and Issue 1.4.5.3 and in the Affected Environment described the natural tendency of soils in the area to concentrate surface flows, the greater tendency and increased risk of surface flow being concentrated due to past soil disturbance, and the risk of surface flows being concentrated following recommended activities when standard PACFISH RHCAs are applied to Category IV (intermittent) streams. There is also greater risk of interactions occurring among these three factors; the increased magnitude of concentrated flows resulting from such interactions increases the risk that dry swales or ephemeral draws would channelize and become intermittent channels, increasing the drainage network. It is estimated that there are about 50 segments of intermittent streams, based on the number of intermittent segments located on clayey soils, where erosion potential would be increased. Erosion of these channels would allow concentrated surface flows, turbidity and sediment to reach streams. Water concentrated from overland flow in uplands would reach streams more rapidly, increasing peak flows. More importantly, more rapid runoff tends to decrease base flows later in the year. These trends would not change until the addition of coarse woody material or similar events interrupted the concentrated flows, enhancing infiltration and sediment trapping. Generally, coarse woody material is not expected to enter channels for over 150 years since most of these areas were railroad logged in the early 1900s.

Table 183 Harvest on Sensitive Soils

Harvest Method	Alternative 2 Acres (Disturbance acres)	Alternative 3 Acres (Disturbance acres)	Alternative 5 Acres (Disturbance acres)
Tractor	2079 (413)	2021 (400)	2110 (419)
Skyline	549 (77)	468 (68)	806 (103)
Helicopter	1585 (81)	336 (16)	1581 (81)
Total	4213 (571)	2825 (484)	4497 (603)

Adequate base flows are critical to survival of ESA listed fish species in the project area and downstream in the Middle Fork John Day River. Bull trout would be impacted during low flows because available spawning habitat would be reduced and temperatures would be more likely to rise above lethal thresholds for fish during spawning activities in September. Fish populations could be impacted at sub-lethal elevated temperatures; spawning behavior can be modified and egg mortality increased reducing fecundity.

According to Burroughs and King (1989) 150 feet is sufficient to trap sediment under conditions of concentrated flow on granitic soils with high to very high erosion risk. Extending these findings to the conditions of the project area where erosion risks are elevated for the reasons listed, it is expected that the risk of concentrated flows and soil particles (either turbidity or sediment) would reach Category IV (intermittent streams) is higher under the existing disturbed conditions, which tend to accelerate erosion. Standard RHCAs would likely trap sediment if activities were recommended on undisturbed soils. Consequently, the risk that sediment would reach streams with standard RHCA protection is increased because the width of standard RHCAs would not be adequate to absorb the increased concentration of water and sediment contributed from previously disturbed areas. The increase in risk varies by site, depending on the particular mix of soils, past soil disturbance, and recommended disturbance.

Erosion and sediment input to streams reduce quality of fish habitat. The risk that pool depth, pool riffle ratios and available spawning substrate would be reduced is higher when more sediment is available for transport to streams. Pool to pool spacing, cobble embeddedness and amounts of fine substrate would also be increased with additional sediment. Width to depth ratios could be increased or recovery of stream channel profiles could be retarded. Habitat quantity, complexity and quality necessary for all life stages of threatened and sensitive fish species in the project area would be reduced.

Cumulative Effects

Many of the streams classified as Category IV streams are ephemeral in flow regime. They are classified as Category IV (intermittent) streams based on the PACFISH definition which relies on "evidence of annual scour or deposition." Other classification systems would consider these streams to be damaged ephemeral draw bottoms that do not have the channel development and stability of long-established channels. Consequently, it is expected that, if concentrated flows reached these channels more frequently, as would be expected with the increased risk associated with activities occurring along standard RHCAs, erosion in these previously degraded channels would increase. Extending the drainage network would also increase the chronic disturbance of the area, further increasing the rate at which water leaves the hill slopes and decrease base flows.

The risk that fish and fish habitat in the Middle Fork John Day River would be affected by water yields and sediment is expected to increase proportional to the increase in drainage network. There is also increased risk that chinook salmon spawning habitat in the Middle Fork John Day River would be reduced in quantity and quality with addition of sediment and reduction of base flows.

ALTERNATIVE 3—Inadequate RHCA Size

Alternative 3 increases the protection on Category IV streams with sensitive, clayey soils by 25% to 125 feet from either side of the channel in units that would be harvested using ground based systems. Alternative 3 proposes tractor harvest on about the same amount of sensitive, clayey soils as Alternative 2. Impacts from tractor logging would be reduced on about 17 acres of sensitive soils. Impacts from ground based logging would shift from skidding to winching as no equipment would enter the additional 25 feet Trees would be removed from the area, but no heavy equipment would be allowed within it. Winching over current ground cover may create small, isolated openings, generally estimated to be less than a square foot in area, in the ground cover but would not be expected to cause compaction or other soil disturbance which would result in the concentration of surface flows and the initiation of erosion. The likelihood of rilling or gullying connecting to about 50 segments of intermittent streams (PACFISH) would be reduced.

While only a small amount of ground would be protected compared to the total subwatershed or unit, the selected areas are considered key to improving aquatic conditions. Bull trout and steelhead matrix standards (from USF&W and NMFS) for drainage network increase, sediment, large woody debris, pool frequency and quality, large pools, wetted width/maximum depth ratio and temperature would be better protected with the increased buffer. This could potentially help move parameters toward "Properly Functioning" or "Appropriately Functioning" watershed condition. While the risk of impacting TES fish species or habitat would not be removed with this alternative, it would be reduced relative to Alternative 2 or 5.

Cumulative Effects

As described for Alternative 2, many of the channels classified as Category IV streams have ephemeral flow regimes. They are actually damaged ephemeral draw bottoms that do not have the channel development and stability of long-established channels. It is expected that, since fewer concentrated flows are expected to reach these channels, the risk of erosion in these channels would be reduced. Also, the chronic disturbance of the area would be increased to a lesser extent than under Alternatives 2 and 5.

Changes in water yield and sediment from harvest activities on sensitive soils could affect fish and fish habitat in the Middle Fork John Day River even with increased "No Equipment" buffers. However, risk would be decreased compared to Alternatives 2 and 5. Chinook salmon spawning habitat could be reduced in quantity and quality with addition of sediment and reduction of base flows.

ALTERNATIVE 4—Inadequate RHCA Size

No harvest activities would occur with this alternative. No increase in erosion in these stream channels is expected due to activities.

ALTERNATIVE 5—Inadequate RHCA Size

Effects are expected to be similar to those described for Alternative 2 except for a slight increase in magnitude. About 100 more acres of sensitive, clayey soils would be harvested with ground based systems than under Alternative 2. It is estimated that the potential for rilling or gullying to connect with about 2 more intermittent channels or degraded ephemeral draw bottoms would increase.

Cumulative effects are expected to be similar to those described for Alternative 2 except that erosion risk in about 2 (4%) more intermittent channels or degraded ephemeral draw bottoms would increase, contributing to a further increase in the chronic disturbance of the area. Risks to fish habitat would increase proportionately.

Comparison of Alternatives—Inadequate RHCA Size

Alternative 1 and Alternative 4 do not have any harvest associated with them and consequently have no change in the direct/indirect or cumulative effects associated with harvest.

Alternative 3 has more risk than Alternatives 1 and 4 because harvest activities would take place on sensitive soils. Increasing “No Equipment” buffers by 25 feet on Category 4 streams and reducing tractor skidding on sensitive soils reduces but does not entirely remove risk. Alternative 2 has more risk than alternatives 1 and 4 associated with impacts from harvest activities on sensitive soils. Alternative 5 has the most risk as it contains the greatest amount of harvest on sensitive soils near PacFish RHCAs.

4.3.7—ISSUE 1.4.7—BLOW DOWN IN VINCENT/VINEGAR RHCAS

The Agency's recommended action to remove material from within RHCAs may adversely impact the riparian resource. Harvest, associated activities, and new stream crossings may reduce riparian functioning. See ***ISSUE 1.4.7—Blow down in Vincent/Vinegar*** RHCAs *page 32.*

BACKGROUND

This issue is two-fold: 1) The removal of dead material within Pac Fish buffers in the area known as the "Banner Blow-Down" area of Vinegar Creek, and removal of live conifers in RHCAs of several subwatersheds with units designated for aspen regeneration; and 2) The removal of material within new stream crossings. Management activities within these RHCAs may decrease current and future coarse woody debris, decrease shade to streams, and increase risk of sedimentation from logging-related activities. Alternatives 2 and 5 propose to remove 50-80% of the blow down material within the outer one-half of the Pac Fish buffers only in the Vinegar Creek headwaters. Alternatives 3 and 4 would not remove any material in the outer one-half of the Pac Fish buffers. Alternatives 2 and 3, propose one new stream crossing, in Alternative 4, no new stream crossings would occur, and Alternative 5 has two new stream crossings.

ALTERNATIVE 1 AND ALTERNATIVE 4—BLOW DOWN IN VINCENT/VINEGAR RHCAS

Under these alternatives no down wood would be removed from the Area where the "Banner" wind event occurred. Fuel loading would remain high in the area, increasing the risk of high intensity wildfire. The fire hazard is high because of the fuel loading. Hazard would be expressed both as long resident burn times, probably over 12 hours and as magnitude of fire. Wildfire would likely result in fire-damaged soils. Fuel conditions would support spread of fire throughout contiguous RHCAs, including those of tributaries. Fire damaged soil is more likely to result in sediment inputs to the streams both from surface erosion in the first three years after the fire, and from mass movement about 7 to 20 years later as roots become available to bind soil. This results in a temporary decline before recovering. Potential for insect infestation is also higher by not removing the large amount of dead wood in the Banner area where the wind event occurred. If uncharacteristically severe wildfire occurred in the RHCA, then Large Woody Debris most likely would be reduced below standards in the headwaters of Vinegar Creek, a stream with threatened fish species. These impacts could reduce viability of the subpopulation of threatened bull trout that may presently be re-colonizing Vinegar Creek (see Bull Trout, page 127).

Leaving aspen stands as they are would reduce viability of the clones and vegetative diversity of riparian areas. This would not be expected to have any short or long term effect on fish or fish habitat.

Cumulative Effects

Should an uncharacteristically severe wildfire take place in the area where the "Banner" wind event occurred, there is a risk of a sediment flush moving downstream through Vinegar Creek which would reach the Middle Fork John Day River. This would be similar to the debris torrent from upper Badger Creek that happened two years after the Summit Fire. Pool habitat quality and quantity would be reduced and banks would be destabilized, modifying channel profile and potential. Channel modifications following such events may result in increased wetted width to depth ratios that result in increased base flow temperatures. Warmer water would be contributed to the Middle Fork John Day. The degree to which this is possible is currently unknown and would be dependent both on the severity of the soil damage and subsequent

weather events after an uncharacteristically severe wildfire. Impacts from uncharacteristically severe wildfire could reduce overall population viability and genetic diversity of threatened bull trout in the Middle Fork John Day River sub basin, by directly impacting individuals that may presently be re-colonizing Vinegar Creek.

ALTERNATIVE 2—Blow down in Vincent/Vinegar RHCAs

Mitigation for removal of logs in the blow down area includes (mitigation for aspen enhancement project is listed under Issue 4):

A fisheries or hydrology specialist will identify and protect any logs in the portion of the RHCA where logs can be removed that have potential to become in-stream LWD.

- Logs will not be bucked if a portion of the log extends into the "no removal" part of the RHCA.
- Logs on the ground will not be moved. Only "stacked" logs will be removed from the site in the Banner Area.
- Landings would be located outside RHCAs.

Mitigation to remove only the upper pieces of jackstrawed wood in the outer half of RHCAs by helicopter, leaving in place the material in contact with the ground, is expected to result in undetectable soil disturbance, movement and stream sedimentation on about 72 acres. Logs would not be removed from the stream or immediate riparian area (as defined by obligate riparian vegetation) but rather from the outer half of the PacFish RHCA. No short-term (5 years or less) impacts to stream channels would likely be measurable with this prescription. The *Land and Resource Management Plan* Standard of 15-20 pieces of down woody debris per acre (for wildlife) will be met before anything is removed from the RHCAs. It is expected that there will be a decrease in soil organic matter and in soil nutrients proportional to the volume of wood recommended for removal. No additional long-term impacts (10, 25 or 50 years) are expected. No increases in water yield are expected because all wood to be removed is already dead.

Effects of landings located outside RHCAs are discussed in 4.2.1 Treatment Objectives for Early Season Peak and Near Peak Stream Flows, page 239; and in 4.3.3—ISSUE 1.4.3—Effects of Ground Based Systems, page 333.

The wood recommended for removal along Vinegar and Vincent creeks and their tributaries currently is not providing shade or current or future, potential instream large woody debris (LWD). Removing it is not expected to affect these parameters. The minimum size class is too small to become acting wood in area streams.

Only a small portion of Vinegar Creek stream channels included in the recommended activity area are fish bearing streams (Category 1) with 300 foot buffers on either side. Down wood could be removed from the outer 150 foot portion of the buffer with no wood removed from the 150 foot portion of the RHCA nearest the stream. No impacts to fish habitat or fish (such as harassment) are expected. Most of the removal would occur in the outer 75 ft. of Category 2 (non fish-bearing perennial streams) RHCA, leaving a 75 ft. "no removal" zone near the streams. Category 3 wetlands and Category 4 wetlands would be protected with 75 ft and 50 ft, respectively, "no removal" zones. Category 4 (intermittent) streams would have a 50 foot no removal buffer from the stream. No trees are expected to be removed from riparian areas defined by obligate vegetation.

Removing fuels from the blowdown area would reduce the risk of intense wildfire entering the RHCAs and reduce the intensity and resident time with which wildfires would be expected to burn. Also, the risk that fire would enter the inner portion of RHCAs and burn (with moderate to severe soil damage) is reduced by treating the outer portions of the RHCAs. Reducing these fire parameters is expected to reduce the potential soil hazard and subsequent effects described for the No Action Alternative. Potential for bug

infestation would also be lower with treatment. In the short and long term, adequate large woody debris will remain available in the RHCA.

Table 184 Conifer Removal & Removal of logs in RHCAs & New Road Construction in RHCAs ATM A & B

Subwatershed	Aspen Area with Conifer Removal in RHCAs	Acres in Banner Blowdown with Down Log Removal in RHCAs	New Road Construction in RHCAs ATM B		New Road Construction in RHCAs ATM A	
	Acres	Acres	Miles	Acres	Miles	Acres
Davis/Placer	3.0		0.07	0.25	0.07	0.25
Vinegar	9.5	71.5	0.02	0.07	0.03	0.11
Vincent	4.5		0	0	0	0
Little Boulder/ Deerhorn	11.75		0	0	0.3	1.1
Tincup/ Little Butte	0.75		0.03	0.11	0.03	1.1
Butte	0		0	0	0	0
Granite Boulder	0		0	0	0	0
Total	**29.5**	**71.5**	**0.12**	**0.43**	**0.43**	**2.56**

Conifers would be removed in RHCAs associated with aspen enhancement. Riparian vegetation diversity will be increased in the long term. This is unlikely to have any impact or benefit to fish or fish habitat in the area. Short-term impacts to fish and fish habitat will be minimized if mitigation measures are implemented.

Removing pieces of down wood from within the prism of recommended new roads in RHCAs is expected to reduce organic material and soil nutrients proportionately to the volume of the segments removed. Table 184 lists amount of road construction disturbance in RHCAs by subwatershed. It is important to note that only 0.12 miles (0.43 acres) of disturbance in RHCAs would be contributed due to road building under ATM B and these roads are replacing roads with greater lengths in RHCAs that are planned for decommission as part of this project. It is expected that soil disturbance greater than that caused only by road building would occur in RHCAs because logs would likely be skidded prior to the construction of the road prism. Disturbance includes locations at or near stream banks. Skid trails would increase likelihood of erosion paths developing and their location in the RHCA, near streams, would increase the risk that sediment and concentrated surface flows would reach streams. Some of these areas are located on sensitive soils with clayey surface or subsurface soils further increasing the risk due to the surface erosion potential of these soils. The use of designated skid trails is expected to meet *Land and Resource Management Plan* standards for detrimental soil disturbance. Felling trees in the road prism has additional effects on coarse woody debris recruitment and shade but the removal of the log lengths lying in the prism are not expected to affect these parameters because of the mitigation for felling of trees in RHCAs and because the log lengths lying in the road prism are not providing shade. Felling trees to construct new roads is expected to remove shade and modify coarse woody material recruitment. These effects are discussed in 4.2.1 Treatment Objectives for Early Season Peak and Near Peak Stream Flows, page 239; and in 4.3.3—ISSUE 1.4.3—Effects of Ground Based Systems, page 333.

Cumulative Effects

Removing currently available fuel would reduce fire intensity and is described in the Fire Effects section. The risk that sediment flushes would develop and move downstream through Vinegar Creek into the Middle Fork John Day River, modifying channels, would be reduced proportionately to the reduced fire intensity as compared to the No Action Alternative. Some, reduced risk would still be present that adverse effects described for the No Action Alternative would occur. Landings would add to the chronic disturbance of the area as described in 4.2.1 Treatment Objectives for Early Season Peak and Near Peak Stream Flows page239 and in 4.3.3—ISSUE 1.4.3—Effects of Ground Based Systems, page 333.

The skidding and landings necessary to remove the segments of trees lying in the prism of the recommended road would add to the chronic disturbance of the area. This is expected to increase risk of cumulative sedimentation but at an undetectable level. The construction of new stream crossings has other,

cumulative effects, additional to the removal of the woody material as discussed in Section 4..2., Water Quantity Needs (Peak flows) and in Section 4.3.3, Issue 3 Harvest Effects on Soils.

ALTERNATIVE 3—Blow down in Vincent/Vinegar RHCAs

No removal of wood from the Area where the "Banner" wind event occurred would occur. Conifers in aspen improvement units would be girdled or felled but left onsite. Effects would be similar to those described for the No Action Alternative except fuel loading would increase in alder stands. Effects of removing wood from within the prism of new roads are similar to those described above for Alternative 2.

Cumulative Effects

Cumulative effects are similar to the No Action Alternative, Alternative 4 and Alternative 2 except that chronic disturbance would be increased incrementally and at undetectable levels due to the removal of wood from road prisms only. There would be no increase due to the construction of landings for removal of Blowdown material. However, the risk of large-scale events that would contribute sediment to streams and modify channel profiles would be elevated as described for the No Action Alternative and Alternative 4.

ALTERNATIVE 5— Blow down in Vincent/Vinegar RHCAs

Effects of removal of wood from the blowdown area and aspen units would be similar to those described for Alternative 2. Effects of removing wood from within the prism of new roads are similar to those described above for Alternative 2 except that they would occur in more locations and total 0.43 miles or 2.56 acres . The additional locations would also be on sensitive soils with clayey surface and subsurface soils. At least one is located on a greater than 30% slope. The risk of sedimentation or concentrated flows reaching streams is increased more because of the higher surface erosion potential associated with these soils.

Cumulative Effects

Cumulative effects of removing wood from the blow down area aspen units are similar to those described for Alternative 2. Cumulative effects of removing logs from road prisms are similar to those described for Alternative 2 except greater in magnitude due to the increased number of locations, types of soils, and slope. Chronic disturbance and erosion risk would be increased in proportion to the amount of skidding and landings required, particularly on sensitive or steep soils.

4.3.8— ISSUE 1.4.8—EFFECTS OF TOXIC CHEMICALS

The Agency's proposal to use chemicals to control competing vegetation, pocket gopher populations and noxious weeds, may pose harmful risks to aquatic and terrestrial wildlife and humans using the area. See ***ISSUE 1.4.8—Effects of Toxic Chemicals*** *page 32.*

4.3.8.1—Competing Vegetation

BACKGROUND:

Competing vegetation is often the most important factor limiting conifer regeneration in the Inland Northwest. Competition between vegetation for site resources can result in reduced growth and survival of forest trees, in some cases limiting reforestation success. Early seral shrubs and forbs have the ability to rapidly occupy open sites caused by fire or other disturbances. They seed in or sprout from roots to quickly occupy the site and their rapid growth rates develop crown volumes that far exceed that of young conifers. Pinegrass (Calamagrostis rubescens) and elk sedge (Carex geyeri) are early seral plants that have the capacity to rapidly colonize disturbed sites and they can provide serious competition to tree seedlings. Sod forming grasses compete very effectively for moisture in the upper soil layers and adversely impact both growth and survival of tree seedlings.

RESOLUTION:

Alternative 1, the No Action alternative, and Alternative 4 do not propose any reforestation; therefore there is no need for controlling competing vegetation. Alternatives 2, 3, and 5 propose varying amounts and types of reforestation, which include treatments to decrease vegetative competition to tree seedlings. Alternatives 2 and 5 utilize both manual methods and herbicides to control competing vegetation. Alternative 3 uses only manual methods, i.e., non-chemical methods, to control competing vegetation.

Measures:

- Acres treated with herbicides for control of competing vegetation.

Herbicide toxicity and exposure levels.

Project Design

The Vegetation Management Plan (an Appendix to the *Integrated Fuels and Silvicultural Report*, "Silvicultural Diagnosis"—Southeast Galena Restoration, Analysis File) discusses the need for control of competing vegetation, the various control methods, and predicted acres of each treatment. Treatment acres are summarized by alternative in Table 185, page 367. Manual methods could include scalping, mulch mat placement and subsoiling. Chemical treatments could include application of the herbicides glyphosate or hexazinone. Table 186, page 367 displays recommended herbicide treatment acres by subwatershed.

Predicted amounts of each treatment method were based on the areas that are expected to exceed competition thresholds in the predicted year of planting. Areas planted immediately after harvest will have a greater range of treatment options, with an emphasis on preventative and early treatment. Where planting is delayed following harvest, treatment will require a higher proportion of corrective treatments, such as subsoiling and herbicides for sod control.

Application would be by hand within a 4-foot radius of tree seedlings (approximately 35% of the unit); the balance of the area (65%) would not be treated. Herbicide application would be required once during the average five-year tree establishment period; manual treatments might require multiple treatments. Herbicides would not be applied within RHCAs.

Effectively controlling competing vegetation would help reforestation units meet or exceed the historical 65% seedling survival rate average on the Blue Mountain Ranger District and help ensure reforestation success. The effects of competing vegetation control are generally short-term. They would occur during the 5-year reforestation period, and persist a few years past that time frame.

Herbicides Recommended for Use

Glyphosate (Accord formulation) would be used to control sod-forming grasses. It is a broad-spectrum herbicide, meaning that it kills nearly all vegetation, except broadleaf woody shrubs. Glyphosate is applied to foliage and is absorbed by the leaves. It prevents the plant from producing amino acids essential to growth. Application is by spot spraying a 1-2 percent solution at a rate of 20 gallons (1-2 lb. of active ingredient) per acre.

Hexazinone (Pronone 25-G formulation) would be used where control of both grasses and shrubs is needed. It is selective, killing only certain plant types. It is readily absorbed by plant roots and leaves and moves up through the plant and kills it by inhibiting photosynthesis. It remains in the soil and controls vegetation for up to three years. Application is in granular form (hexazinone coated clay particles, 25% by weight) in spot application at the rate of approximately 20 pounds (2-3 lb. of active ingredient) per acre.

Additional information may be obtained in the *Pacific Northwest Region Final Environmental Impact Statement for Managing Competing and Unwanted Vegetation*, Appendix C, Herbicide Use and Efficacy.

Predicted and Maximum Treatment Needs

All treatments that may be used are shown in the table below, which is the maximum for use in determining effects. The most effective treatment method will be based on individual site evaluation at the time the sites

become available for planting. Site availability depends on when harvest is complete and the treatment will depend on funding and other operational constraints.

Table 185 Acres of Competing Vegetation Treatments by Alternative

Treatment	Alt. 2 Acres	Alt. 3 Acres	Alt. 4 Acres	Alt. 5 Acres
No Treatment	844	508	0	1259
Subsoiling	193	193	0	266
Large Scalps or Mulch Mats	897	741	0	1318
Herbicides (Glyphosate & Hexazinone)	897	0	0	1318

Table 186 Acres of Chemical Treatment by Subwatershed

Subwatershed	Alt. 2 Acres	Alt. 3 Acres	Alt. 4 Acres	Alt. 5 Acres
Davis Ck/Placer Gulch	139	0	0	139
Vinegar Ck.	138	0	0	348
Vincent Ck.	131	0	0	342
L. Boulder/Deerhorn	129	0	0	129
Tincup/L. Butte	199	0	0	199
Butte Ck.	161	0	0	161
Granite Boulder Ck.	0	0	0	0
Totals	**897**	**0**	**0**	**1318**

ALTERNATIVE 1—Toxic Chemicals—Competing Vegetation

Alternative 1 does not propose reforestation activities, making site preparation and control of competing vegetation unnecessary.

Direct and Indirect Effects

Soil, Water Quality, and Fisheries

There would be no effects to threatened, endangered, or sensitive (TES) aquatic species.

Wildlife

There would be no effects to Threatened, Endangered, and Sensitive (TES) species, Management Indicator Species (MIS), or Species of Interest (SOI).

Sensitive Plants

There would be no effects to sensitive plant species.

Worker and Public Health & Safety

There would be no effects to worker and public health and safety.

Cumulative Effects

Under the *2000 Malheur National Forest Noxious Weed Environmental Assessment* (referred to as the *Noxious Weed EA* throughout the remainder of this section), approximately 200 noxious weed sites on 65 acres will be treated using both chemical and non-chemical methods. Effects to aquatic and terrestrial wildlife are disclosed in the *Noxious Weed EA*.

County Road crews would also spray herbicides along State Highways 7 and 26, and County Highway 20. Portions of these highways are located within the RHCAs for the Middle Fork John Day River and its

tributary streams. Highway maintenance crews spray herbicides along the right-of-ways to control roadside vegetation.

These herbicide applications were not expected to have adverse effects on aquatic or terrestrial species, or humans.

ALTERNATIVE 2—Toxic Chemicals—Competing Vegetation

In the Recommended Action, approximately 1,934 acres would be planted. As discussed above, about 897 acres of the total are expected to be over threshold for grasses. Site preparation and control of competing vegetation by all methods listed in Table 185, page 367 would be considered for use.

Direct and Indirect Effects

Soil, Water Quality, and Fisheries

Application will be by spot treatment around seedlings, there will be no aerial application of chemicals. The environmental issue with upland treatment is the potential for chemical transport through permeable soils to streams.

Glyphosate does not have herbicidal properties once it contacts soil, and is not absorbed by plant roots. Glyphosate has a very low potential for leaching into groundwater because it is strongly held by soil particles. It is broken down by soil microorganisms and remains in the soil from 3-249 days. It does not easily evaporate. It is slightly toxic to fish and is essentially non-toxic to aquatic invertebrates.

Hexazinone is moderately persistent in the soil, remaining in low concentrations for up to three years, until soil microorganisms break it down. It has a higher leaching potential than glyphosate, because it is not adsorbed well by the soil. It does not easily evaporate. It is practically non-toxic to fish and aquatic invertebrates.

Neither of these herbicides has been shown to have significant or long-term effects on mycorrhizae populations. In most instances, soil microbes are substantially responsible for eliminating these substances from the soil. There may be some reduction in soil microbial activity, but these microbes eventually degrade these herbicides over time. Decomposition is more rapid under the warmer conditions expected in the harvested area openings due to the reduction of shade. No sustained adverse effect on soil productivity is anticipated as a result of the recommended use of these herbicides.

The herbicides will be applied under dry conditions, outside of RHCAs, when soil water movement is limited. Under these conditions, it is unlikely that a herbicide will be transported to live stream water when the herbicide is at its highest toxicity level. Hexazinone has a longer period of persistence and may be moved by soil water while persisting in the soil at low concentrations, generally below the level of toxicity to aquatic organisms.

The potential impact of chemicals on fish and other aquatic organisms is a function of two factors: (1) the toxic characteristics of the compound, and (2) the concentration to which the organism is exposed. These two factors are used to determine the risk analysis for aquatic organisms.

The first part of the risk analysis is to determine toxicity levels for aquatic species. Glyphosate and hexazinone are characterized by relatively low aquatic toxicity. Toxicity levels can be quantified using the 96 hour-LC50. The 96-hour LC50 refers to the concentration that is lethal to 50 percent of the fish exposed at that level for 96 hours. The smaller the LC50, the more sensitive a given species is to the herbicide. Table 187 displays the 96-hour LC50 of glyphosate and hexazinone for various aquatic species.

Although the LC50 is frequently used as a toxicity standard, fifty percent fish mortality is generally not desirable. For this reason, a better parameter to evaluate effects is the "No Observable Effect Level" (NOEL). A NOEL is the highest dose in a particular test that did not result in adverse health impacts to the

test organism. None of the herbicides recommended for use have established NOELs. In the absence of long-term test results that provide safe concentrations or NOELs for many pesticides or herbicides, the EPA has recommended that the 96-hour LC50 be divided by 10 to set a standard for concentrations to protect aquatic species (U.S. EPA 1986). This calculation was used for glyphosate and hexazinone, which have no established NOELs for aquatic species. Table 187 displays the NOELs of glyphosate and hexazinone for various aquatic species.

Table 187 Levels of Herbicide Effects on Aquatic Species

Herbicide	Use Rate[1] (lbs/ac.)	Soil Adsorption	Half Life[2] (Days)	Toxicity to Aquatic Organisms	96-hour LC50[3] (parts per million-ppm)	NOEL[4] (parts per million-ppm)
Glyphosate (Accord)	1-2	Strong	3-249	Slight	86 ppm (rainbow trout) 780 ppm (Daphnia)	8.6 ppm EPA
Hexazinone (Pronone 25G)	2-3	Low	30-180	Slight	320 ppm (rainbow trout) 1686 ppm (salmonids)	32.0 ppm EPA 168.6 ppm EPA

[1] Use Rate is the amount of active ingredient of the chemical

[2] Half-life – Time required for the concentration of a chemical to decrease by one half.

[3] A Lethal Concentration 50 (LC50) is the dose that is lethal to 50 percent of the fish exposed at that level for 96 hours.

[4] A No Observable Effect Level (NOEL) is the highest dose in a particular test that did not result in adverse health impacts to the test organism.

Recent studies in the Columbia River's Hanford Reach have shown that levels as low as 1/100 of the LC50 have lead to acute affects to some species of fish (i.e., changes in hormone levels in female fish caused males to not breed with them). Other non-fatal affects being studied by the Natural Environmental Research Council, European Union include reproductive function of fish, including effects on steroidogenesis, fecundity, fertilization rate, and sperm quality.

The second part of the risk analysis is to evaluate potential exposure levels, given the recommended herbicide applications. A "worst case" scenario approach is used. "Maximum Allowable Acreage" (MAA) was calculated for each subwatershed based on toxicity levels (i.e., NOELs), stream flows and chemical application rate. MAA calculations were determined using the NOELs for rainbow trout because this species is the most sensitive to chemicals. MAA calculations also used the NOELs for glyphosate because this herbicide has the highest toxicity to aquatic species. Analysis assumes that if the MAA for glyphosate and rainbow trout is not exceeded, then this species as well as all other fish species, including threatened, endangered, and sensitive species, would not be harmed.

An alternative way to assess exposure thresholds is using a NOEL ratio. A NOEL ratio is derived by dividing the recommended treatment acres by the MAA. A NOEL ratio less than 1 indicates that NOEL thresholds will not be exceeded.

Table 188 lists the total acres recommended for treatment, the Maximum Allowable Acres that could be treated, and the NOEL ratios by subwatershed. For the complete discussion of methods, assumptions, calculations, and results refer to the *Malheur National Forest Noxious Weed Environmental Assessment,* Appendix H (pp. 18-21) and the Soil, Water and Fisheries Reports for this project.

Table 188. Alternative 2 Glyphosate Chemical Treatment for Competing Vegetation vs. Maximum Allowable Acres

Subwatershed or Drainage	Alt 2 Acres	Maximum Allowable Acres	NOEL Ratio
Placer Gulch	139	420	0.3310
Vinegar Ck.	138	2100	0.1657
Vincent Ck.	131	2100	0.1629
Deerhorn	107	2100	0.0510
L. Boulder	22	2100	0.0148
Murdock	51	420	0.1214
Windlass	148	420	0.3524
Butte	161	2100	0.0767
Totals	**897**	**Not Applicable**	

In no case did the rate of application exceed the NOEL or EPA guidelines for rainbow trout. No effects to threatened, endangered or sensitive species would be expected. See the Aquatic Biological Evaluation in Appendix B. The main risk of chemical contamination of fish habitat is from spills that could occur during transport of equipment and chemicals or while filling equipment. Design criteria and mitigation measures are incorporated in the recommended action to minimize these risks. See the *Noxious Weed EA*, Appendix H for additional detail on existing conditions.

Wildlife

Direct effects primarily relate to chemical use and can occur when terrestrial wildlife is exposed to herbicides. Direct exposure can occur if the animal:

- Is sprayed directly,
- Comes in contact with contaminated vegetation, soil or water,
- Inhales sprays mists, droplets or vapors,
- Drinks contaminated water, or
- Ingests residues or contaminated feathers of hair during grooming.

Indirect effects can occur from both chemical and non-chemical methods and relates to habitat loss. Vegetation provides food, cover, and nesting materials for some wildlife species.

Glyphosate has been tested on a variety of wildlife birds and mammals in both laboratory and wildland environments (SERA, 1996). Data on hexazinone has been primarily derived from experimental mammals in the laboratory (SERA, 1997). Studies generally indicate that glyphosate and hexazinone are characterized by relatively low toxicity to mammals and birds. These herbicides do not bioaccumulate in tissues of exposed animals, but rather are rapidly excreted in urine or feces (USDA 1992 and 1997).

As with aquatic species, the potential impact on terrestrial animals is a function of two factors: 1) the toxic characteristics of the compound, and 2) the concentration to which the organism is exposed. Effects can be quantified using LD50 values, i.e., the lethal dose at which 50% of test animals will die. The smaller the LD50, the more sensitive a given species is to the herbicide. A sampling of LD50 values for glyphosate and hexazinone are displayed in Table 189. Values reflect acute exposure; i.e., a single exposure or multiple exposures occurring within a short period of time, generally 24 hours or less. Values may not be as applicable in assessing chronic or long-term exposures.

As with aquatic species, a better parameter to evaluate effects is the "No Observable Effect Level" (NOEL). NOEL values have not been quantified for all chemicals or all species. In the absence of long-term test results that provide NOEL's, the EPA has recommended setting NOEL's for terrestrial animals at 1/5th of

LD50 values (U. S. EPA 1986), which are shown in Table 189. For threatened and endangered species, the EPA recommends setting NOEL's at 1/10th of LD50 values (U.S. EPA 1986).

Table 189 Levels of Herbicide Effects on Terrestrial Animals

Herbicide	Use Rate[1] (lbs/ac.)	Soil Adsorption	Half Life[2] (Days)	Toxicity to Terrestrial Animals	LD50[3] (milligrams per kilogram—mg/kg)	NOEL[4] (parts per million)
Glyphosate (Accord)	1-2	Strong	3-249	No more than slightly toxic to mammals and birds.	4320 mg/L (rat) - EPA 3800 mg/L (rabbit) 1500 mg/L (mouse) 1075 mg/L (bee) 1000 mg/L (quail)	864 ppm (rat) 760 ppm (rabbit) 300 ppm (mouse) 215 ppm (bee) 200 ppm (quail)
Hexazinone (Pronone 25G)	2-3	Low	30-180	Slightly toxic to mammals; practically non-toxic to birds	530 mg/L (rat) 1075 mg/L (bee) 2250 mg/L (quail)	106 ppm (rat) 215 ppm (bees) 450 ppm (quail)

[1] Use Rate is the amount of active ingredient of the chemical

[2] Half-life – Time required for the concentration of a chemical to decrease by one half.

[3] A Lethal Dose 50 (LD50) is the dose of a chemical calculated to cause the death of 50% of a defined experimental population over a specified observation period. The observation period is typically 14 days.

[4] A No Observable Effect Level (NOEL) is the highest dose in a particular test that did not result in adverse health impacts to the test organism.

Risk to terrestrial animals can be analyzed by comparing likely exposure rates to the LD50 and NOEL values. Sensitivity to herbicides varies from species to species. For glyphosate and hexazinone, smaller animals appear to be more sensitive than larger animals (SERA 1996, 1997). Consequently, exposure rates were estimated only for small mammals, those with a body weight of 20 grams, i.e., the approximate body weight of mice, voles, shrews and small bats (SERA 1996 and 1997). In addition, a small mammal is a good animal for characterizing risk because, in general, they will receive higher doses of an herbicide, compared with larger animals, at fixed levels of exposure.

As discussed previously, animals can be exposed to herbicides by more than one pathway. The SERA studies assumed "worst-case" dose scenarios for each exposure pathway and totaled values.

For example: At glyphosate application rates of 2 pounds of active ingredient per acre, a small mammal could receive a dose of 140 mg/kg if subjected to all avenues of exposure. This dose estimate is applicable to an exposure scenario in which an animal is sprayed directly with glyphosate, consumes a day's worth of water immediately after spraying, eats highly contaminated vegetation or prey, and remains in the area for one 24-hour period in contact with contaminated vegetation. A dose of 140 mg/kg is substantially below the acute LD50 and NOEL values in Table 189. This is not recommended as a plausible scenario; rather, its purpose is to illustrate that even with very conservative assumptions, the levels of glyphosate that terrestrial mammals and birds are likely to encounter are not likely to constitute a hazard (SERA 1996).

A similar worst-case analysis was conducted for hexazinone. For a hexazinone application rate of 3 pounds of active ingredient per acre, a small mammal could receive a dose of 91 mg/kg if subjected to all avenues of exposure (SERA 1997). Again, this dose level falls below the LD50 and NOEL thresholds displayed in Table 189.

Limited research and monitoring has been done to examine the effects of chemical herbicides on non-mammalian and non-avian species. Toxicology studies on glyphosate and hexazinone suggest insects, snails, and newts are no more sensitive than mammals (USDA 1997, SERA 1996, McComb 1990, SERA 1997).

The effects of "inert" ingredients on wildlife have not been well researched or documented. Inert ingredients are used in the formulations as surfactants, flow conditioners, emulsifiers, etc. and are protected from

disclosure as proprietary information belonging to the commercial manufacturer. The 1998 Regional *FEIS for Managing Competing and Unwanted Vegetation* requires formulations used contain only inert ingredients which are: 1) recognized as generally safe by the Environmental Protection Agency (EPA) or 2) of a low priority for testing by the EPA because no evidence from data or similarity of structure to other chemicals support a concern for toxicity or risk. The formulations recommended for use in this EA fall into one or the other of these categories (FEIS 1988, USDA Forest Service Herbicide Profiles 1992 and 1997).

The effects of herbicides on wildlife are addressed in further detail in the 1988 Pacific Northwest Regional *FEIS for Managing Competing and Unwanted Vegetation*, on pages IV-81 to IV-97 and in Appendix J. The 1988 *Record of Decision to the Regional FEIS* determined that the two herbicides recommended for use to control competing vegetation are among those that could be used with acceptable risk as long as precautions and mitigations included in the FEIS are applied. All of these mitigation measures would be complied with, as well as additional, more restrictive mitigation measures designed for this recommended project.

Both chemical and non-chemical treatments would indirectly affect terrestrial wildlife by reducing habitat for those animals that rely on early seral vegetation – grasses, forbs, and shrubs – for foraging, cover and nesting materials. Alternative 2 would treat 897 acres of reforestation units. The 4-foot radius competing vegetation treatments would reduce vegetation on 35% of each site (314 acres total); the balance of the area (65%) would not be treated. Ground vegetation would likely recover within 1 to 5 years depending on site and treatment method. Grasses usually reoccupy a site within 1 year following manual treatments and 2 to 3 years following herbicide treatments. The indirect effects of habitat loss on terrestrial species would be minimal.

Based on the available toxicity data and estimated levels of exposure, there is very little indication that herbicide application would likely cause adverse effects to Management Indicator Species (MIS) or Species of Interest (SOI). No effects to endangered or threatened wildlife species would be anticipated. No impacts to sensitive wildlife species would be anticipated. See the Wildlife Biological Evaluation in Appendix B.

Worker and Public Health & Safety

Risks to workers are associated with exposure to chemicals during transportation and application. Herbicide application, by law, will be under the direct supervision of a trained and licensed applicator, who must follow the label directions. Label directions prescribe the proper application rates and conditions, personal protection methods for workers, spill protection and response, and disposal procedures. When followed, these directions reduce risk to humans and the environment to acceptable levels.

The public may be exposed to herbicides through spray drift, an accident in transit, or dermal contact with treated plants. Spray drift would be very limited with the use of backpack sprayers. Treatment areas would be signed.

The effects of herbicides on humans is addressed in detail in the *Pacific Northwest Region Final Environmental Impact Statement for Managing Competing and Unwanted Vegetation*, pages IV-123 to IV-160, and in Appendices D and H of that document, and are incorporated into this document by reference. The Record of Decision found that 12 herbicides, including glyphosate and hexazinone, could be used with acceptable risk if precautions and restrictions were applied.

In summary, the two herbicides recommended for possible use in the project area have low to moderate potential toxic effects. Studies have shown that exposure levels remain far below the toxic levels for workers. Exposure to the public is expected to be much less.

Cumulative Effects

Under the *2000 Malheur National Forest Noxious Weed EA*, approximately 200 noxious weed sites on 65 acres will be treated using both chemical and non-chemical methods. Effects to aquatic and terrestrial wildlife are disclosed in the *Noxious Weed EA*.

County Road crews would also spray herbicides along State Highways 7 and 26, and County Highway 20. Portions of these highways are located within the RHCAs for the Middle Fork John Day River and its tributary streams.

Under this project, 1.5 acres of noxious weeds would be treated by herbicide application.

Under this project, pocket gophers will be strychnine baited on 1,439 acres, as analyzed in 4.3.8.2—Animal Damage, page 378.

Table 190 assesses cumulative effects of chemical applications to aquatic resources. Both herbicides and pesticides are considered. NOEL ratios (see Soil, Water Quality, and Fisheries, page 368 for description on how NOEL ratios were developed) have been calculated for each activity which introduces chemicals into the system: 1) noxious weed treatment identified in the *Noxious Weed EA*, 2) competing vegetation treatment recommended in this project; 2) noxious weed treatment recommended in this project, and 4) strychnine treatment of pocket gophers recommended in this project. Detailed calculations are in the *Noxious Weed EA* and Fisheries Specialist Report for this project.

NOEL ratios for these four activities were totaled for each subwatershed (see the "Cumulative Effects NOEL Ratio" column in Table 190). To ensure no effects to aquatic species, the "Cumulative Effects NOEL Ratio" should be less than 1.

Table 190—Cumulative Effects Multi-Chemical NOEL Ratio for Alternative 2

Stream	WEED EA Multi-Chemical NOEL Ratio	SE Galena NOEL Ratio for Glyphosate (competing Veg)	SE Galena NOEL Ratio for Glyphosate (Noxious Weeds)	SE Galena NOEL Ratio for Strychnine (Gopher Control)	Cumulative Effects NOEL Ratio
Placer Gulch	0.0017	0.3310	0.0002	0.3493	0.6822
Davis	0.0017			0.0940	0.0957
Vinegar	0.0086	0.0657		0.0860	0.1603
Vincent	0.0425	0.0624		0.0503	0.1552
L. Boulder	0.0320	0.0105		0.0387	0.0812
Deerhorn	0.0320	0.00510		0.0533	0.1363
Tincup	0.1984		0.0002		0.1986
Murdock	0.1984	0.1214		0.0680	0.3878
Windlass	0.1984	0.3524		0.2773	0.8281
Butte	0.0010	0.0767	0.0006	0.1023	0.1806
Beaver/Ruby	0.0120		0.0026		0.0146
Dry/Sunshine	0.0427		0.0026		0.0453

No subwatersheds in the Southeast Galena area exceeded 1 for the cumulative effects NOEL ratio. The concentrations of chemicals calculated for the worst-case scenario would be below NOEL levels. Only one subwatershed in the Middle Fork John Day Basin had a NOEL ratio exceeding a value of 1, i.e., the Idaho/Summit drainage which lies several miles upstream of the project area (this subwatershed is not displayed on the chart due to distance from project area).

At the treatment levels recommended , it is unlikely that any chemical would be detected in stream water. Application of site-specific Best Management Practices (BMPs) and mitigation measures (listed in Chapter 2, page 90) would further reduce the likelihood of chemicals being detected in stream waters, and the risk to water quality from recommended chemical treatments would be low in all subwatersheds. Risk to water quality, fish and fish habitat would likely be low in the Middle Fork John Day River.

Risks to terrestrial wildlife species would be minimal given the size of the land base, number of acres recommended for treatment, handling and application procedures, toxicity levels, chemical tolerance of animals and potential exposure levels. No adverse cumulative effects would be expected to terrestrial wildlife, including Threatened, Endangered and Sensitive (TES) species, Management Indicator Species (MIS) and Species of Interest (SOI). Cumulatively, the treating of noxious weed sites would have beneficial effects to wildlife by restoring native plant communities in existing noxious weed sites.

The total cumulative effects of these projects are considered to be not large enough to cause adverse impacts to aquatic or terrestrial species, sensitive plant species, or public safety or health.

ALTERNATIVE 3—Toxic Chemicals—Competing Vegetation

In this alternative, approximately 1,442 acres would be planted. About 741 acres are expected to be over threshold for grasses after the third growing season. Site preparation and control of competing vegetation by all mechanical or hand methods, ***except chemical herbicides***, would be considered for use.

Direct and Indirect Effects

Vegetation

Herbicides will not be used with this alternative. The use of manual methods as a corrective action will be increased since the option of using herbicides is not available. The effect on vegetation is that average third year survival could be reduced 50 percent, or less, due to increased vegetative competition. Cost of successful treatment of competing vegetation would be increased an average of approximately $75 per acre because of the need to use more expensive treatment methods and because there will be additional replanting and seedling protection costs.

There would be no impacts to sensitive plant populations, because no sensitive plants occur close to reforestation sites.

Soil, Water Quality, and Fisheries

No direct or indirect effects to aquatic species would be expected from manual treatments. Effects on fish would be the same as Alternative 1 -No Action. There will be no effects to aquatic TES species. See the Aquatic Biological Evaluation in Appendix B.

Wildlife

No direct effects to terrestrial species would be expected from manual treatments.

Manual treatments would indirectly affect terrestrial wildlife by reducing habitat for those animals that rely on early seral vegetation – grasses, forbs and shrubs – for foraging, cover and nesting materials. In reforestation units, competing vegetation treatments would reduce vegetation on 35% of each site; the balance of the area (65%) would not be treated. Ground vegetation would likely recover within 1 to 5 years depending on site and treatment method. Grasses usually reoccupy a site within 1 year following manual treatments, compared to 2 – 3 years following herbicide treatments. The indirect effects of habitat loss on terrestrial species would be minimal.

Effects to Management Indicator Species (MIS) and Species of Interest (SOI) would be minimal. No effects to threatened or endangered species would occur. No impacts to sensitive species would occur. See the Wildlife Biological Evaluation in Appendix B.

Worker and Public Health & Safety

Scalping and mulch mat installation would be done to a greater extent under this alternative than the other action alternatives. The effects to worker health would be the potential for more injuries due to the increased amount of hard, arduous work compared to the recommended action alternative. There would be no effects to public health and safety, the same as for the No Action alternative.

Cumulative Effects

Herbicides are not used to control competing vegetation with this alternative; therefore the effects on aquatic and terrestrial species would be the same as Alternative 1 -No Action. Chemicals are used on other projects within the project area; cumulative effects are discussed under Alternative 1 – Cumulative Effects. Chemical applications were not expected to have adverse effects on aquatic or terrestrial species, or humans.

ALTERNATIVE 4—Toxic Chemicals—Competing Vegetation

Alternative 4 does not propose reforestation activities, making site preparation and control of competing vegetation unnecessary.

Direct and Indirect Effects

The effects on this issue would be the same as for the No Action Alternative (Alternative 1). No direct or indirect effects to aquatic or terrestrial wildlife species would be expected. There would be no effects to Threatened, Endangered, and Sensitive (TES) species, Management Indicator Species (MIS), or Species of Interest (SOI). See Biological Evaluations in Appendix B.

Cumulative Effects

Cumulative effects are as described for Alternative 1 – No Action.

ALTERNATIVE 5—Toxic Chemicals—Competing Vegetation

In this alternative, approximately 2843 acres would be planted. As discussed above, about 1318 acres are expected to be over threshold for grasses after the third growing season. Site preparation and control of competing vegetation by all methods listed above would be considered for use.

Direct and Indirect Effects

Soil, Water Quality, and Fisheries

The effects of Alternative 5 on aquatic species would be similar to Alternative 2. Since there is an increase of 421 acres, there would be a proportional increase in the effects of Alternative 2. The expected amounts of herbicides to be used are still considerably below the Maximum Allowable Acres NOEL threshold for rainbow trout. NOEL ratios do not exceed the threshold of 1.

Table 191 Alternative 5 Glyphosate Chemical Treatment for Competing Vegetation vs. Maximum Allowable Acres

Subwatershed or Drainage	Alt 5 Acres	Maximum Allowable Acres	NOEL Ratio
Placer Gulch	139	420	0.3310
Vinegar Ck.	348	2100	0.1657
Vincent Ck.	342	2100	0.1629
Deerhorn	107	2100	0.0510
L. Boulder	22	2100	0.0148
Murdock	51	420	0.1214
Windlass	148	420	0.3524
Butte	161	2100	0.0767
Totals	1318	Not Applicable	

In no case did the rate of application exceed the NOEL or EPA guidelines for rainbow trout. No effects to threatened, endangered or sensitive species would be expected. See the Aquatic Biological Evaluation in Appendix B. The main risk of chemical contamination of fish habitat is from spills that could occur during transport of equipment and chemicals or while filling equipment. Design criteria and mitigation measures are incorporated in the recommended action to minimize these risks.

Wildlife

The effects of Alternative 5 on wildlife would be similar to Alternative 2. Since there is an increase of 421 acres being treated, there would be a proportional increase in the effects due to implementation of Alternative 5. The change in number of acres treated is negligible given the total number of acres in the Southeast Galena project acre.

Based on the available toxicity data and estimated levels of exposure, there is very little indication that herbicide application would likely cause adverse effects to Management Indicator Species (MIS) or Species of Interest (SOI). No effects to endangered or threatened wildlife species would be anticipated. No impacts to sensitive wildlife species would be anticipated. See the Wildlife Biological Evaluation in Appendix B.

Sensitive Plants

There would be no impacts to sensitive plant populations, because no sensitive plants occur close to herbicide application sites.

Worker and Public Health & Safety

There would be a moderate increase in the potential effects to worker health compared to Alternative 5, due to the increased chance of exposure, but would still be at acceptable levels. The effects to public health and safety would be also be moderately increased, but well within acceptable levels.

Cumulative Effects

Cumulative effects would be similar to those stated for Alternative 2.

Table 192 assesses cumulative effects of chemical applications to aquatic resources. Both herbicides and pesticides are considered. NOEL ratios (see Soil, Water Quality, and Fisheries, page 368 for description on how NOEL ratios were developed) have been calculated for each activity which introduces chemicals into the system: 1) noxious weed treatment identified in the *Noxious Weed EA*, 2) competing vegetation treatment recommended in this DEIS; 2) noxious weed treatment recommended in this DEIS, and 4) strychnine treatment of pocket gophers recommended in this DEIS. Detailed calculations are in the *Noxious Weed EA* and Fisheries Specialist Report for this project.

NOEL ratios for these four activities were totaled for each subwatershed (see the "Cumulative Effects NOEL Ratio"column in Table 192). To ensure no effects to aquatic species, the "Cumulative Effects NOEL Ratio" should be less than 1.

Table 192—Cumulative Effects Multi-Chemical NOEL Ratio for Alternative 5

Stream	WEED EA Multi-Chemical NOEL Ratio	SE Galena NOEL Ratio for Glyphosate (Competing Vegetation)	SE Galena NOEL Ratio for Glyphosate (Noxious Weeds)	SE Galena NOEL Ratio for Strychnine (Gopher Control)	Cumulative Effects NOEL Ratio
Placer Gulch	0.0017	0.3310	0.0002	0.3493	0.6822
Davis	0.0017			0.1413	0.1430
Vinegar Ck.	0.0086	0.1657		0.2830	0.4573
Vincent Ck.	0.0425	0.1629		0.2830	0.4884
L. Boulder	0.0320	0.0105		0.0387	0.0812
Deerhorn	0.0320	0.0510		0.0533	0.1363
Tincup	0.1984		0.0002		0.1986
Murdock	0.1984	0.1214		0.0680	0.3878
Windlass	0.1984	0.3524		0.2773	0.8281
Butte	0.0010	0.0767	0.0006	0.1023	0.1806
Beaver/Ruby	0.0120		0.0026		0.0146
Dry/Sunshine	0.0427		0.0026		0.0453

No subwatersheds in the Southeast Galena area exceeded 1 for the cumulative effects NOEL ratio. Within all sub-watersheds, the concentrations of herbicides calculated for the worst-case scenario would be below NOEL levels. Risk to water quality, fish and fish habitat would likely be low in the Middle Fork John Day River.

Risks to terrestrial wildlife species would be minimal given the size of the land base, number of acres recommended for treatment, handling and application procedures, toxicity levels, chemical tolerance of animals and potential exposure levels. No adverse cumulative effects would be expected to terrestrial wildlife, including Threatened, Endangered and Sensitive (TES) species, Management Indicator Species (MIS) and Species of Interest (SOI). Cumulatively, the treating of noxious weed sites would have beneficial effects to wildlife by restoring native plant communities in existing noxious weed sites.

The total cumulative effects of these projects are considered to be not large enough to cause adverse impacts neither to aquatic or terrestrial species nor to public safety or health.

4.3.8.2—Animal Damage

CONCERN:

Using chemicals (rodenticides) to control pocket gopher damage may pose harmful risks to aquatic and terrestrial wildlife and humans using the area.

BACKGROUND:

In some locations, pocket gopher damage to seedlings can adversely impact conifer regeneration survival and growth. Gophers damage or kill conifer seedlings by feeding on their root systems and girdling or clipping stems. This can result in reduced growth and survival of forest trees, in some cases limiting reforestation success. Damage can occur all year but increases in the fall and winter when herbaceous vegetation is less abundant and trees can substitute as a major food source. Increased seedling damage and mortality could reduce stocking levels below minimum levels as required by the National Forest Management Act (NFMA). Replanting could be required. Multiple plantings and additional control measures necessary to ensure full stocking could dramatically increase reforestation costs. If regeneration is left to natural seeding, the plantations may remain only marginally stocked for 20 years.

To ensure reforestation success, it is desirable to keep gopher populations at less than 2 gophers per acre. Where pocket gopher populations are at high or moderate levels, pocket gopher control is considered essential. Various control methods, both manual and chemical methods, are available to reduce gopher populations. Mechanical trapping is commonly used as a manual method. Strychnine baiting and aluminum phosphide fumigation are commonly used as chemical methods. Pocket gopher control would help protect the initial investment of tree planting.

RESOLUTION:

Alternative 1, the No Action alternative, and Alternative 4 do not propose reforestation activities, making pocket gopher control unnecessary. Alternatives 2, 3, and 5 propose reforestation, although treatment levels vary by alternative. Pocket gopher control would be used to reduce potential damage to tree seedlings. Alternatives 2 and 5 utilize rodenticides (strychnine baiting and aluminum phospide fumigation) to reduce pocket gopher populations. Alternative 3 uses manual methods (mechanical trapping) to reduce populations.

Measures:

- Acres treated with rodenticides for pocket gopher population control.
- Rodenticide toxicity and exposure levels

Project Design

Reforestation units would be surveyed the first and third years after planting. Pocket gopher control would be triggered when gopher activity (active burrows, fresh dirt mounds, winter casts, feeding plugs, or tree damage) is identified on 25 percent or more of the plots. In all alternatives, no rodenticides would be used within RHCAs.

Control Methods Recommended for Use

Strychnine baiting

The Environmental Protection Agency (EPA) registers the bait, oats coated with a 0.5% strychnine solution) for use in controlling pocket gophers. A metal probe would be used to open a hole in an active gopher burrow. The bait would then be placed underground in the burrow and the probe hole covered. Gophers consume the poisoned bait, and typically die within about two hours.

Aluminum phosphide fumigation

The EPA registers aluminum phosphide for use in controlling pocket gophers. Aluminum phosphide tablets are placed in active gopher burrows and the probe holes covered. The tablets react with moisture and decompose into phosphide gas (also called phosphine), which the animals inhale, causing chemical asphyxiation.

Application of aluminum phosphide has worked well as a pocket gopher fumigant in landscaped and agricultural areas where soil moisture is elevated (Marsh and Steele, 1992). Aluminum phosphide has not been extensively used in forested areas. The local office of USDA Animal and Plant Health Inspection Services-Wildlife Services (APHIS-WS) believes it could be used as a successful alternative to strychnine in forested areas. Timing control measures when ground moisture levels are higher should increase success.

Aluminum fumigation was added as an alternative control method in response to concerns that strychnine baiting could adversely affect non-target wildlife species. Aluminum phosphide fumigation eliminates the risk of secondary poisoning of non-target species. The estimated cost of fumigation is higher than strychnine baiting and the efficacy rate is typically lower, so it is recommended only in areas where there is an elevated wildlife concern.

Mechanical trapping

Treatment involves hand-placing traps below ground in active gopher burrows. On a site with moderate gopher activity, approximately 25-30 traps per acre would be required. The locations of the traps are flagged so that they may be relocated later. Traps would be checked within 1-3 days and the dead gophers would be buried. The traps would then collected, reset, or moved to new burrow systems as needed. One benefit this alternative has over chemical treatment is the ability to trap gophers near streams and wetlands.

Mechanical trapping is believed to be practical on small acres, in high value situations, and as a supplement or follow-up to other control methods (Crouch, 1982). Pocket gopher trapping on large areas can have a reasonable cost effectiveness if trapping is conducted before population levels reach populations of about five gophers per acre (Marsh and Steele 1992). Overall, the efficacy rate is less than strychnine baiting and aluminum phosphide fumigation and the cost is considerably more.

Predicted and Maximum Treatment Needs

Table 193 and Table 194 display acres of pocket gopher control by treatment method and alternative.

Table 193 Acres of Pocket Gopher Treatment

Treatment	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Strychnine Baiting	0	1,439	0	0	2,298
Trapping	0	0	1,197	0	0
Aluminum Phosphide Fumigation	0	250♠	0	0	300♠
Total Pocket Gopher Treatment	0	1,689	1,197	0	2,598
♠Acres are estimated as the amount of phosphide may change with additional wildlife sightings.					

Table 194 Acres of Chemical Treatment by Subwatershed

Subwatershed	Alt.1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Davis Ck/Placer Gulch	0	403	0	0	474
Vinegar Ck.	0	258	0	0	849
Vincent Ck.	0	151	0	0	398
L. Boulder/Deerhorn	0	276	0	0	276
Tincup/L. Butte	0	294	0	0	294
Butte Ck.	0	307	0	0	307
Granite Boulder Ck.	0	0	0	0	0
Totals	0	1689	0	0	2598

ALTERNATIVE 1—Toxic Chemicals—Animal Damage

Soil, Water Quality, and Fisheries

There would be no effects to Threatened, Endangered, or Sensitive (TES) aquatic species.

Wildlife

Where gophers are present, populations would continue to increase until the carrying capacity of the site is reached. Predator populations would fluctuate naturally with change in prey populations and habitat. There would be no effects to Threatened, Endangered, and Sensitive (TES) species, Management Indicator Species (MIS), and Species of Interest (SOI).

Worker and Public Health & Safety

There would be no effects to workers or public health and safety.

Cumulative Effects

Strychnine baiting is included in several other projects located within the Middle Fork John Day subbasin. The low proportion of reforestation and pocket gopher treatments in these projects is less than the level recommended in Southeast Galena, resulting in an overall level that is insignificant. The cumulative effects of all chemical applications in the project area are described in ALTERNATIVE 1, Competing Vegetation, Cumulative Effects, page 367. Chemical applications are not expected to have significant cumulative effects on aquatic or terrestrial species, or humans.

ALTERNATIVE 2—Toxic Chemicals—Animal Damage

Alternative 2 would plant approximately 1,934 acres, of which 1,689 acres would likely require pocket gopher control (see Table 193 and Table 194, page 379). Strychnine baiting would be used on about 1,439 acres and aluminum phosphide fumigation would be used on 250 acres to respond to wildlife concerns. See Chapter 2, **2.5.6.3.2—Mitigation for Pocket Gopher Control—Pesticide** Use, page 98.

Reforestation

Pocket gopher control would result in reduced gopher damage to conifer seedlings and improved overall stocking in treated plantations. Chemical treatment would help land managers meet the purpose and need to reforest plantations and meet stocking certification requirements as required by NFMA.

Strychnine baiting is considered the most economical and effective gopher control method, with efficacy rates of 70-100 percent, averaging 90 percent (Bonar, 1995). In plantations with moderate to high activity rates, a 90 percent success rate will reduce a gopher population of 20 gophers per acre to the desired level of 2 gophers per acre. The efficacy rate for aluminum phosphide fumigation is considered somewhat lower than for strychnine baiting, but results would be sufficient to ensure tree survival.

Soil, Water Quality, and Fisheries

Strychnine baiting

No direct effects to water quality or aquatic life are expected as a result of strychnine baiting. Streamside buffers and strict handling procedures will prevent the direct application of strychnine to open or running water.

No indirect effects to water quality are expected. There is very low risk that any surface runoff across the landscape would carry poison bait from the uplands, through a riparian zone, and into area streams. Strychnine baiting is applied underground and the burrow immediately closed. Application procedures are strict and require immediate clean up of any surface spillage. Bait application may be suspended during poor weather conditions (e.g., where ¼" or more rain falls in a 24-hour period) to avoid unnecessary exposure of strychnine to water as it is being applied.

Strychnine is relatively immobile in soil systems and it is not expected to leach rapidly (USDA, 1994). Strychnine biodegrades in the soil and has a half-life of 7-28 days under aerobic conditions and 28-112 days under anaerobic conditions (Howard et al, 1991). The majority of the sites slated for baiting are considered to be in an aerobic condition and consequently the shorter of the two biodegradation periods would apply. Rapid soil degradation and low persistence would suggest migration of strychnine in soils is unlikely. Therefore, there is little risk of strychnine leaching into subsurface water (USDA, 1994).

Aluminum phosphide fumigation

Aluminum phosphide fumigation will have no direct effects to water quality or aquatic life. The same no-treatment buffers required for strychnine use will be used for fumigation operations. To further guard against accidental spillage into streams, personnel carrying aluminum phosphide tablets off of system roads will be restricted from entering wetlands or traveling across flowing streams.

No indirect effects to streams are anticipated from fumigating gopher burrows located outside no-treatment buffers. Tablets will be placed underground in gopher burrows and the probe holes covered. Aluminum phosphide placed in pocket gopher burrows reacts quickly with soil moisture to form phosphine, a hydrogen phosphide gas that is insoluble in water (Snider, 1983). Persistence in soils is low due to rapid volatility and rapid decomposition underground of the chemical particulates (2-5 days, depending on soil moisture and temperature). Aluminum phosphide is naturally abundant in soils and addition of a small amount from fumigation will have little effect on soils before it decomposes. Above ground, phosphide gas is quickly dissipated through aeration. The use of the fumigant is expected to have little effect on soils or subsurface flow before it decomposes.

Table 195 displays LC50s and NOELs for strychnine and aluminum phosphide. Terms are defined in the footnotes in Table 195 and in more detail in ALTERNATIVE 2, page 368

Table 195. Rodenticide Effects to Aquatic Species

Pesticide	Use Rate1 (lbs/ac.)	Soil Adsorption	Half Life2 (Days)	Toxicity to Aquatic Organisms	LC 503 (parts per million-ppm)	NOEL4 (parts per million - ppm)
Strychnine	0.02	Strong	7-28	High	2.3 (rainbow trout)	0.23
Aluminum Phosphide	0.02	Not Available	5-7	High	0.0041 (rainbow trout)	0.00041

1Use Rate is the amount of active ingredient of the chemical
2 Half-life—Time required for the concentration of a chemical to decrease by one half.
3A Lethal Concentration 50 (LC50) is the dose that is lethal to 50 percent of the fish exposed at that level for 96 hours.
4A No Observable Effect Level (NOEL) is the highest dose in a particular test that did not result in adverse health impacts to the test organism.

Ketron, Inc. (1979) modeled a theoretical worst case scenario estimating the effects that might occur if a pound of 0.5 percent bait placed on an acre of ground was allowed to wash into a pool following a sudden downpour of rain. Researchers estimated that the strychnine concentration level of the pool could reach 0.057 parts per million. To consume a lethal dose, a duck would have to take in 182 quarts of water at one time; a coyote, 227 quarts; a person, 1,271 quarts; a sheep, 8,172 quarts; and a cow, 87,168 quarts. The Klamath National Forest in northern California reports an average application rate of 4.5 pounds per acre; this amounts to .02 pounds strychnine per acre (4.5 lb. bait times 0.5% strychnine = .02 lb. strychnine). The Emigrant Creek Ranger District (Burns,OR), on the Malheur National Forest, reports recent application rates ranging from .2 lb. to 2 lb. of bait per acre (.001 lb. to .01 lb. of strychnine). The lower application rates on the Malheur National Forest are likely due to lower gopher densities. Given the small amounts of poison applied per acre, even if some strychnine were to inadvertently reach area streams, the dilution of the poison would be great enough that an unreasonably high amount of water would need to be consumed to be lethal.

Table 196 lists the total acres recommended for chemical treatment, the Maximum Allowable Acres (MAA) that could be treated, and the NOEL ratios by subwatershed. For the complete discussion of methods, assumptions, calculations, and results refer to the *Malheur National Forest Noxious Weed Environmental Assessment,* Appendix H (pp. 18-21) and the Soil, Water and Fisheries Reports for this project. For definitions of MAA and Noel Ratio, see text preceding Table 188, page 370 in ALTERNATIVE 2.

Table 196 Alternative 2—Rodenticide Treatment Acres, Maximum Allowable Acres and Noel Ratio by Subwatershed.

Subwatershed or Drainage	Alt. 2 Acres	Maximum Allowable Acres	NOEL Ratio
Placer Gulch	262	750	0.3493
Davis	141	1500	0.0940
Vinegar Ck.	258	3000	0.0860
Vincent Ck.	151	3000	0.0503
Deerhorn	160	3000	0.0533
L. Boulder	116	3000	0.0387
Murdock	51	750	0.0680
Gorge	35	300	0.1167
Windlass	208	750	0.2773
Butte	307	3000	0.1023
Totals	1689	Not Applicable	Not Applicable

In no case did the recommended application rates exceed the Maximum Allowable Acres or a Noel Ratio of 1. No adverse effects to freshwater fish or other aquatic species would occur. Low application rates, underground baiting, streamside buffers, spillage mitigation, and the low mobility and persistence of

strychnine in soils and water reduce risks to very low levels. No effects to threatened, endangered or sensitive species would be expected. See the Aquatic Biological Evaluation in Appendix B.

Wildlife

This wildlife effects discussion reviews the potential direct and indirect effects of pocket gopher control on terrestrial wildlife. Effects are described in regards to 1) pocket gophers and 2) non-target species (species other than gophers).

POCKET GOPHERS

The most obvious effect of implementation of any gopher control program would be the reduction in pocket gopher populations. Local gopher populations would be reduced in treated areas. However, long-term effects on populations and loss of viability of pocket gophers would not be expected. Pocket gophers naturally lose 70-75% of their population each year but these losses are regained through reproduction. Gopher populations are very resilient to large changes in numbers of individuals (Bonar 1995). Pocket gophers would not be entirely eliminated under any action alternative; rather, control measures are intended to reduce populations to a level where tree damage levels would be tolerable. The goal of the gopher control program is to reduce populations to two or less gophers per acre during the stand reestablishment period.

Changes in pocket gopher habitat, rather than the actual killing of gophers, would lead to long-term reductions in populations on the sites recommended for treatment. As young trees increase in diameter and develop more complex root systems, gophers are less likely to kill them. Well-stocked forested areas are less attractive to pocket gophers than more open areas sparsely stocked with small trees. The change in habitat that occurs when young trees succeed into older age classes renders these areas less suitable for high densities of pocket gophers. Ground vegetation used by gophers as a food source tends to disappear from the ecosystem as tree canopies close in.

NON-TARGET SPECIES

The following discussion on non-target species is divided into two sections: 1) direct effects and 2) indirect effects. Direct consumption or inhalation of a poison by an animal is typically referred to as “primary consumption” or “primary poisoning.” Non-target animal can feed on poisoned baits intended for pocket gophers and die. Indirect consumption of a poison results when a predator or scavenger feeds on another animal that has been poisoned; this is typically referred to as “secondary consumption “ or “secondary poisoning.” Non-target animals can feed on gophers or non-target animals that have died from eating strychnine bait.

Direct Effects—Primary Poisoning

Strychnine Baiting

There would be a potential threat of poisoning non-target animals that come into contact with and consume strychnine treated oats. Standard application procedures minimize the risk of contact. Strychnine baits would be applied underground and the probe holes covered with soil.

The potential threat would be limited to those seed-eating animals that search underground for food and/or use gopher burrow systems. Small mammals such as chipmunks, ground squirrels, mice, voles and rabbits would be the likely non-target candidates for poisoning (Bonar 1995, Anthony et al. 1984, Fagerstone et al. 1980, USDA APHIS 1994). There is the potential that local populations of small mammals such as ground squirrels may be reduced in the short term; however, as with pocket gophers, these populations recover rapidly.

Seed-eating animals that do not dig into gopher burrows, such as songbirds and gallinaceous birds (e.g., grouse, etc.), would be unlikely to come in contact with the grain. Therefore there would be no anticipated loss of those types of animals. Amphibians and reptiles do not normally consume grain as part of their diet;

therefore, no direct effects would be expected to occur. Direct effects to insects appear to be minimal although information is limited (USDA APHIS 1994).

Chronic toxicity of strychnine appears minimal for non-target species, as strychnine does not accumulate in the body. As with pocket gophers, sub-lethal amounts of strychnine are completely detoxified within 24 hours and are completely eliminated from the body within a few days (Bonar 1995, USDA APHIS 1994). Also, strychnine is biodegradable and has moderately low persistence, thus the bait will not remain toxic very long after application. Soil biodegradation half-life under aerobic conditions was estimated in a study to be 7-28 days (USDA APHIS 1994).

Information on the effects to embryo or young of a sub-lethal dose of strychnine being ingested by pregnant or lactating female is not available and the effects are unknown. Because strychnine does not accumulate in the body (as do some other poisons such as DDT), long-term adverse effects to reproduction would not be expected.

There would be no risk of primary poisoning of Threatened, Endangered, and Sensitive Species (TES); Management Indicator Species (MIS); or Species of Interest (SOI). Many of these species do not consume grain and are unlikely to come in contact with poison baits. Their habitats rarely coincide with reforestation areas and in addition, strychnine baits are buried underground. See the Wildlife Biological Evaluation in Appendix B.

Aluminum phosphide fumigation:

Any non-target species inhabiting pocket gopher burrows where aluminum phosphide is applied would likely be killed. Potential non-target animals that are known to use gopher burrows include chipmunks, rabbits, deer mice, jumping mice, voles, short-tailed shrews, ground squirrels, kangaroo rats, rattlesnakes and lizards. The literature is unclear as to whether the effects of aluminum phosphide to invertebrates are the same as the effects to vertebrate species. No residues of phosphine would remain in the burrow for any length of time, and consequently, no chronic exposures would be expected to result. USDA APHIS (1994) suggests that direct effects to non-target species can be reduced, although probably not eliminated, by checking burrows carefully for signs of non-target animals before application of the fumigant, and not using the poison if non-target species appear to be using the burrow. Non-target species populations could be reduced in the short-term. Long-term effects would not be expected.

There would be no risk of primary poisoning of Threatened, Endangered, and Sensitive Species (TES); Management Indicator Species (MIS); or Species of Interest (SOI). The effects of fumigation are limited to those animals that inhabit underground burrows. No TES species, MIS, or SOI inhabit burrows. Consequently, no direct effects would occur to these species. See the Wildlife Biological Evaluation in Appendix B.

Indirect Effects—Secondary Poisoning

Predators of pocket gophers include badger, weasels, coyote, foxes, bobcat, skunks, marten, great-horned owl, long-eared owl, red-tailed hawk, Swainson's hawk, common barn owl, great gray owl, northern goshawk, America kestrel, bullsnake, gopher snake and rattlesnake (Teipner et al. 1983). Many of these species are potential predators of ground squirrels and other small mammals as well. The predators listed above occur on the Malheur National Forest. The American pine marten is identified in the *Land and Resource Management Plan* as a Management Indicator Species (MIS); eleven dedicated old-growth areas have been established in Analysis Area (Galena WA, Supplement—2002)for pine marten. The northern goshawk is identified as a Species of Interest (SOI) in the *Land and Resource Management Plan*; four post-fledging areas have been established in the project area. Not all potential predators are specifically addressed in this analysis; instead some representative predators for which research information is available are addressed.

There are two types of effects to secondary consumers: 2a) the effects of a reduced prey base and 2b) the effects of consuming poisoned prey or carrion.

Indirect Effects - Reduced Prey Base

Gopher control measures would, to some extent, reduce the gopher populations on the units recommended for treatment. Predators and scavengers, as listed above, do not prey exclusively on pocket gophers; rather, they are opportunistic and will take any prey that is available.

Projected reductions in gopher populations vary by the chemical used. The efficacy rate for strychnine baiting averages 90%; the efficacy rate for aluminum phosphide fumigation averages 85% or less. Reductions in prey would be limited to those acres actually treated. At lower efficacy rates, gopher populations should recover in as little time as a year.

The areas recommended for pocket gopher control likely represent a small portion of the total home range for most predators. About 1,689 acres or 3% of the 49,473-acre project area would be treated. It is unlikely that the reduction in gophers - and non-target, prey species - would result in a decline in any predator populations; rather, a predator is likely to simply shift the use areas within its home range. Some of the wider ranging species are unlikely to recognize the reduction in gopher numbers on such small portions of their home range.

Effects or a reduced prey base to Threatened, Endangered, and Sensitive Species (TES); Management Indicator Species (MIS); or Species of Interest (SOI) would be negligible or non-existent. See the Wildlife Biological Evaluation in Appendix B.

Indirect Effects—Consuming Poisoned Animals

Strychnine baiting:

Predators/scavengers can be susceptible to secondary poisoning if they were to prey upon or scavenge a pocket gopher or other small mammal that has been killed by strychnine. Whether secondary poisoning would result from baiting depends on many factors including 1) accessibility of poison-killed animals to predators, 2) number of poison-killed animals available, 3) amount of strychnine residue in each carcass, 4) tolerance of predator species and individual animals to strychnine and 5) the number of strychnine-killed animals actually consumed by an animal.

The tendency for strychnine-killed gophers to die underground reduces the risk of secondary poisoning (Lindsey and Evans 1984). The risk of a non-target mammal ingesting strychnine bait and dying above ground is also low. The Blue Mountain Ranger District found 1 golden mantle squirrel above ground on 2,500 treated acres, the Fort Rock Ranger District found 5 mice and 1 golden mantle squirrel on 3,382 treated acres (Deppmeier 1996). Pocket gophers or other small mammals that die underground still may cause secondary poisoning if an animal such as a badger were to dig up and consume the dead animals or if a snake were to find and consume the carcasses.

Even if a predator were to consume poisoned animals, it would have to ingest a sufficient quantity of strychnine to cause mortality. Strychnine levels found in pocket gopher carcasses varied from 0.11 mg to 0.23 mg with one animal containing 1.34 mg (Barnes et al. 1985). Ground squirrel carcasses contained an average of 0.35 mg of strychnine, ranging from 0.09 mg to2.88 mg (Anthony et al. 1984).

Tolerance to strychnine varies among wildlife species. The potential of acute poisoning of mature raptors consuming poisoned pocket gophers or ground squirrels appears minimal because raptors have a relatively high tolerance for strychnine. Anthony et al. (1984) clinically tested great-horned owls and red-tailed hawks and found lethal doses of strychnine to be 7.7 mg/kg and 10.2 mg/kg respectively. Using the potential low and high amounts of strychnine residue identified in the preceding paragraph, an owl (weighing 1.5 kg) would have to consume 4 to128 grounds squirrels over a short period of time to be killed; a hawk (also weighing 1.5 kg) would have to consume 5 to 170 ground squirrels to be killed. Anthony (1984) reported that sub-lethal doses in raptors caused slight nervousness and loss of coordination to convulsions, seizures and inability to remain perched on limbs. In some cases, regurgitation of contaminated prey occurred before more severe reactions developed. The effects of an adult raptor feeding strychnine-killed prey to its

young are unknown. Given that nestling birds have much less body mass than adults, it is possible that a nestling could be poisoned if its parent fed it a strychnine-killed animal, resulting in death or indirect adverse effect from loss of motor coordination or seizures (for example, it is conceivable that a nestling could fall out of the nest while convulsing). By the time young raptors fledge, they are nearly the same size as adult birds and so chances of secondary poisoning and effects of such poisoning would be the same as those described above for adult birds.

The secondary hazard to predatory mammals is greater than that for raptors because mammals have lower tolerance levels to strychnine. Barnes et al. (1985) determined that mammals such as badgers were likely to die after ingesting .33 mg/kg. A 3.6 kg badger would have to consume 1 to 11 gophers or squirrels to be killed. Anthony et al. (1984) determined that mink were likely to die after ingesting 0.60 mg/kg of strychnine. If this same toxicity level were applied to marten, then a 1 kg marten would have to consume <1 to 5 strychnine-killed animals to be killed. A larger mammal, such as a wolverine, would have to consume 5 to 50 carcasses before ingesting a lethal dose.

There is little information about the secondary affects of strychnine on reptiles and amphibians, but some research indicates that strychnine had no effect on rattlesnakes and that bullfrogs had a relatively high tolerance (toxicity level of 2.2 mg/kg) (Willamette EA).

TES, MIS, and SOI were evaluated for the risk of secondary poisoning using the same considerations discussed for wildlife species in general. Only Canada lynx, pine martin, and nesting raptors have an elevated potential for poisoning. Mitigation measures have been incorporated into treatment design to better protect these species (see Chapter 2, **2.5.6.3.2—Mitigation for Pocket Gopher Control—Pesticide** Use, page 98). For Canada lynx and pine martin, strychnine would be prohibited in the vicinity of identified habitat. For nesting raptors, seasonal restrictions would prohibit strychnine baiting during periods when adults are raising their young. Baiting below ground and following strict handling and storage procedures would also reduce the risks. Therefore, no effects are expected to TES species, MIS, or SOI. See the Wildlife Biological Evaluation in Appendix B.

Risks of secondary poisoning would be minimal given the size of the land base, number of acres recommended for treatment, handling and application procedures, toxicity levels, chemical tolerance of animals and potential exposure levels.

Aluminum phosphide fumigation

The potential for secondary toxicity would be highly unlikely. Phosphine does not accumulate in animal tissue. Due to the mode of action - phosphine reacting within the respiratory system - and the extremely short half-life in target animals following death, residue levels present in animals directly killed by phosphine gas are not high enough to produce the same effect in a predator or scavenger. No adverse effects to predators or scavengers would occur. There would be no risk of secondary poisoning of TES species, MIS, or SOI. See the Wildlife Biological Evaluation in Appendix B.

Worker and Public Health & Safety

Strychnine baiting

The primary exposure route to induce poisoning from strychnine is ingestion. It is unlikely anyone would accidentally ingest strychnine bait; especially once it has been placed in burrows. Bait is dyed for identification, making it obvious when spilled, and it has a bitter taste.

Workers applying strychnine would have the greatest risk of exposure. Strychnine is not normally absorbed through the skin. The workers wear gloves, carry grain in covered containers, and use a respirator surgical mask when filling containers. Strychnine bait is applied in the outdoors and dust from the bait is quickly dispersed. Detailed operating requirements for use of strychnine bait are listed in the Analysis File. Field crews will be overseen by a pesticide applicator licensed by the State of Oregon.

Neither the public nor workers engaged in other activities in treated area (e.g., planting, surveys, tree netting, etc.) are expected to come into contact with strychnine. As an added precaution, treated units would be signed, warning of strychnine presence. Treatment units are located away from developed recreation areas, and consequently receive little use by the general public.

Secondary poisoning to domestic dogs or cats is possible if a pet went into a treatment unit and consumed one or more dead animals. The Malheur National Forest has never reported a dog or cat killed as a result of a strychnine application.

Aluminum phosphide fumigation

Aluminum phosphide tablets react with the moisture in air and decompose into a poisonous phosphide gas called phosphine. The primary exposure route to induce poisoning in humans is through inhalation.

Workers applying the fumigant would have the greatest risk of exposure. The reaction of aluminum phosphide with air, however, is sufficiently slow so as not to endanger an applicator when applying the toxicant outside in open air. A garlic warning odor added to the toxin makes concentrated gas accumulation noticeable. Tablets are carried in tightly sealed containers and workers wear gloves. Tablets are placed below ground and the holes are covered. The tablets are dispensed into the hole through a 4-5 foot long pipe or tube to prevent direct exposure to the gas. Above ground, phosphide gas is quickly dissipated through aeration. Fumigation will be suspended during wet weather to avoid wetting the tablets and accelerating decomposition while workers are applying them. Detailed operating requirements for use of aluminum phosphide are listed in the Analysis File. Field crews will be overseen by a pesticide applicator licensed by the State of Oregon.

No risk to the general public or workers engaged in other reforestation activities is anticipated due to the rapid volatility and decomposition of the gas. The risk of adverse direct effects is low and the probability of human poisoning from aluminum phosphide fumigation would be unlikely due to the toxin's properties, application methods, treatment area locations, and the laws and safety procedures required to protect humans, non-target species, and resources. Treated units will be signed, warning individuals of fumigant use of the sites.

Secondary poisoning to domestic dogs or cats will not occur. Phosphide gas does not accumulate in animal tissues.

Cumulative Effects

Strychnine baiting is included in several other projects located within the Middle Fork John Day sub-basin. The amount of reforestation and pocket gopher treatments in these projects is less than the amount recommended in Southeast Galena, resulting in overall effects that are less than that analyzed for the Southeast Galena project area.

No cumulative effects to soil or water quality are expected from strychnine baiting. Strychnine is not expected to accumulate in the soils between applications based on the poison's low mobility and persistence and its relatively short half-life. Risks to aquatic life are considered low or non-existent. Use of strychnine will not retard or prevent attainment of riparian management objectives. Strychnine baiting will not be conducted in floodplains; consequently, no direct, indirect, or cumulative effects to floodplains are anticipated. No cumulative effects to soil, water quality, or fisheries are expected from aluminum phosphide fumigation. Aluminum phosphide and its residues will not accumulate in the soils between applications since it is a gas and disperses within a short time. Analysis of all chemical applications, herbicides and rodenticides, recommended in the project area is discussed under Cumulative Effects, page 372.

Risks to terrestrial wildlife species would be minimal given the size of the land base, number of acres recommended for treatment, handling and application procedures, toxicity levels, chemical tolerance of animals and potential exposure levels. No adverse cumulative effects would be expected to terrestrial

wildlife, including Threatened, Endangered and Sensitive (TES) species, Management Indicator Species (MIS) and Species of Interest (SOI). See the Wildlife Biological Evaluation in Appendix B.

The total cumulative effects of these projects are not considered to be large enough to cause adverse impacts to aquatic or terrestrial species, nor to public safety or health.

ALTERNATIVE 3—Toxic Chemicals—Animal Damage

Alternative 3 would plant approximately 1,442 acres, of which 1,197 acres would likely require pocket gopher control (see Table 193 and Table 194, page 379). Mechanical trapping would be used to kill pocket gophers. Strychnine baiting and aluminum phosphide fumigation would be prohibited.

Reforestation

The average efficacy rate for mechanical trapping is 70%; this is lower than the average efficacy rates for strychnine baiting (90%) and aluminum phosphide fumigation (85%). Trapping in areas with *low* to *moderate* gopher concentrations would result in reduced gopher damage to conifer seedlings and improved overall stocking in treated units. Minimum required stocking levels would likely be met. Trapping in areas with *high* gopher concentrations, however, would probably not be effective in reducing populations to desired levels. It is expected that most units will require either multiple gopher control treatments over several years or replanting of acres to meet minimum tree stocking requirements. Since trapping is nearly double the cost of strychnine baiting, budgets may limit treatment areas. Replanting may be required in up to 40 percent of the plantations to increase stocking levels. Replanting of stands would cost a minimum of $300 per acre. Delays in reforestation could result in increasing levels of competing vegetation, further exacerbating reforestation problems. Additional vegetation control may be necessary.

Soil, Water Quality, and Fisheries

Effects would be similar to the No Action Alternative (Alternative 1 – No Action), as no rodenticides would be used. The use of mechanical traps would have no direct/indirect impact on water quality or fisheries. Traps are set below ground in existing burrows so disturbance of soils would be minimal. Dead animals would be buried immediately, posing no contamination risk ito waterways.

Wildlife

This wildlife effects discussion reviews the potential direct and indirect effects of pocket gopher control on terrestrial wildlife. Effects are described in regards to 1) pocket gophers and 2) non-target species (species other than gophers).

POCKET GOPHERS

The effects to pocket gopher populations would be reduced compared to Alternative 2, the Recommended Action. Because trapping has a lower efficacy rate than chemical methods, fewer pocket gophers would be killed. Pocket gopher populations would be expected to rebound more quickly than in Alternative 2. In addition, less acres would be reforested under Alternative 3.

NON-TARGET SPECIES

Direct and indirect effects to non-target animals are described below. Direct effects would occur if a non-target animal got caught in a trap set to catch pocket gophers. Indirect effects relate to reduce prey base.

Direct Effects—Pocket Gophers & Non-Target Species

The potential exists for non-target species to be killed or injured anytime kill type traps are used. Trap size is an important factor that determines what species can be caught. The distance between the pan (trigger mechanism) and the jaws (killing mechanism) is slightly greater than 3 inches. This means that animals

with a body length less than 3 inches would not likely be caught. A few of the species that fall into this category include most shrews, pocket mice, deer mouse and white-footed mice. The species with relatively long tails (deer mice, white-footed mice, and pocket mice) could sustain injury to their tails if they were to trigger a gopher trap. The jaw width of the traps is 2.5 inches. These traps are too small to catch many of the larger wildlife species. Considering that these traps, by design, exclude the largest and smallest of species, death or injury from them would be limited to species and individuals that are of comparable size to the pocket gopher.

Even with the size limitation of these traps, other factors would further exclude potential victims. Placement of traps below ground would minimize the possibility of non-target animals coming into contact with the traps. The traps would be set in active gopher burrows with the pan facing into the burrow. This means that only an animal coming out of the burrow can trigger the trap. Small predators that are trying to enter a burrow where the trap is set would only push the trap deeper into the burrow until the trap triggers itself against the burrow walls. Larger predators that attempt to dig up gophers at the trap set would simply trigger the trap in the process of digging. With the jaws down in the burrow and away from the potential predator, the trap would most likely trigger before the predator is exposed to the trap. Bait would not be used at the traps so non-target animals would not be enticed to investigate.

Trapping would have no direct or indirect effect on TES species, MIS, or SOI because most do not enter gopher burrows to search for prey. Wolverines, pine martens and fishers are the only species that might dig into a gopher burrow; the traps to be used and the manner in which they will be set pose no threat to these species. See the Wildlife Biological Evaluation in Appendix B.

Indirect Effects—Pocket Gophers & Non-Target Species

Reductions in prey for predators or scavengers would be incidental. The areas recommended for pocket gopher control likely represent a small portion of the total home range for most predators. About 1,179 acres or 2% of the project areas would be treated. It is unlikely that the reduction in gophers - and non-target, prey species - would result in a decline in any predator populations; rather, a predator is likely to simply shift the use areas within its home range.

Worker and Public Health & Safety

Direct effects to workers are considered minimal. Minor injuries, such as cuts and bruises to hands, could occur from setting traps. Workers are to wear gloves when dealing with dead animals or traps.

Indirect effects to workers are possible. The potential exists for workers to be exposed to parasites or diseases carried by animals when removing dead animals from traps and burying them. To reduce the risk of infection, the Center for Disease Control recommends that workers wear rubber or plastic gloves and respirators when handling traps or dead rodents. Traps and clothing should be washed and disinfected between uses. Field crews are to be informed of the risks and symptoms of plague and hantavirus-related illnesses as well as treatment procedures and be trained in proper application and safety procedures prior to starting work.

No risk to the general public is anticipated. Below ground placement of traps should minimize the risk that a person or pet would come in contact with a trap and set it off. Dead animals removed from the traps would be promptly buried, preventing any potential spread of disease.

Cumulative Effects

The cumulative effects of controlling gophers with trapping would be a delay in reforestation resulting in a lack of future habitat and timber volume across the project area. This is due to lower stocking levels and the loss of 5-20 years growth because of delayed establishment. The function of forest stands as wildlife

habitat and stream shading would be diminished. The intent of NFMA to reforest is unlikely to be met in units where heavy gopher activity persists.

Strychnine baiting is included in several other projects located within the Middle Fork John Day sub-basin. The low proportion of reforestation and pocket gopher treatments in these projects is less than the amount recommended in Southeast Galena, resulting in an overall level that is insignificant. Cumulative impacts to the Middle Fork John Day sub-basin are expected to be similar to the No Action Alternative (Alt. 1).

ALTERNATIVE 4—Pocket Gophers & Non-Target Species

Alternative 4 does not propose reforestation activities, making site pocket gopher control unnecessary. Direct, indirect and cumulative effects would be the same as for Alternative 1 – the No Action alternative. No adverse effects would be anticipated.

ALTERNATIVE 5—Pocket Gophers & Non-Target Species

Alternative 5 would plant approximately 2,843 acres, of which 2,598 acres would likely require pocket gopher control (see Table 193 and Table 194, page 379). Strychnine baiting would be used on about 2,298 acres and aluminum phosphide fumigation would be used on 300 acres to respond to wildlife concerns. See Chapter 2, **2.5.6.3.2—Mitigation for Pocket Gopher Control—Pesticide** Use, page 98.

Reforestation

Alternative 5 would have similar effects to those described for Alternative 2, the Recommended Action. About 909 additional acres would be planted and treated for pocket gophers. Pocket gopher control would result in reduced gopher damage to conifer seedlings and improved overall stocking in treated plantations. Chemical treatment would help land managers meet the purpose and need to reforest plantations and meet stocking certification requirements as required by NFMA.

Water Quality, and Fisheries

Effects would be the same as described for Alternative 2, the Recommended Action. Even though more treatment acres are planned, it is highly unlikely that the chemicals would persist in the soil or move into streams. The effects to fish are expected to be unlikely, due to the low mobility in the soil and by not applying the chemicals within RHCAs.

Table 197 lists the total acres recommended for chemical treatment, the Maximum Allowable Acres (MAA) that could be treated, and the NOEL ratios by subwatershed. For the complete discussion of methods, assumptions, calculations, and results refer to the *Malheur National Forest Noxious Weed Environmental Assessment,* Appendix H (pp. 18-21) and the Soil, Water and Fishereies Reports for this project. For definitions of MAA and Noel Ratio, see text preceding Table 188 page 370 in ALTERNATIVE 2.

Table 197 Alternative 5 - Rodenticide Treatment Acres, Maximum Allowable Acres and Noel Ratio by Subwatershed.

Subwatershed or Drainage	Alt. 5 Acres	Maximum Allowable Acres	NOEL Ratio
Placer Gulch	262	750	0.3493
Davis	212	1500	0.1413
Vinegar Ck.	849	3000	0.2830
Vincent Ck.	398	3000	0.1327
Deerhorn	160	3000	0.0533
L. Boulder	116	3000	0.0387
Murdock	51	750	0.0680
Gorge	35	300	0.1167
Windlass	208	750	0.2773
Butte	307	3000	0.1023
Totals	**2598**	**Not Applicable**	

In no case did the recommended application rates exceed the Maximum Allowable Acres or a Noel Ratio of 1. No adverse effects to freshwater fish or other aquatic species would occur. Low application rates, underground baiting, streamside buffers, spillage mitigation, and the low mobility and persistence of strychnine in soils and water reduce risks to very low levels. No effects to Threatened, Endangered or Sensitive species (TES) would be expected. See the Aquatic Biological Evaluation in Appendix B.

Wildlife

Effects would be similar to those described for Alternative 2, the Recommended Action. Alternative 5 treats 2,598 acres or 5% of the project area. Even though more treatment acres are planned, the difference in acres treated is considered negligible given the size of the project area.

The effects to TES, MIS, and SOI are essentially the same as discussed for Alternative 2, the Recommended Action. Since 909 more acres are planned for treatment, there is a slightly elevated chance for exposure, but it is still considered to be highly unlikely that there would be adverse effects (see the Wildlife Biological Evaluation in Appendix B). .

Worker and Public Health & Safety

Effects would be similar to those described for the Alternative 2, the Recommended Action. Since 909 more acres are planned for treatment, there is a slightly increased chance of exposure. The total effect is still considered to be insignificant.

Cumulative Effects

Strychnine baiting is included in several other projects located within the Middle Fork John Day sub-basin. The low proportion of reforestation and pocket gopher treatments in these projects is less than the amount recommended in Southeast Galena, resulting in overall concentrations that are less than that analyzed for the Southeast Galena project area.

No cumulative effects to soil or water quality are expected from strychnine baiting. Strychnine is not expected to accumulate in the soils between applications based on the poison's low mobility and persistence and its relatively short half-life. Risks to aquatic life are considered low or non-existent. Use of strychnine will not retard or prevent attainment of riparian management objectives. Strychnine baiting will not be conducted in floodplains; consequently, no direct, indirect, or cumulative effects to floodplains are anticipated.

No cumulative effects to soil, water quality, or fisheries are expected from aluminum phosphide fumigation. Aluminum phosphide and its residues will not accumulate in the soils between applications since it is a gas and disperses within a short time.

Analysis of all chemical application in the project area (from the *Malheur National Forest Noxious Weed EA*) is discussed under ALTERNATIVE 5, Competing Vegetation, Cumulative Effects, page 376.

There are no cumulative risks to wildlife since other projects within the rest of the Middle Fork sub-basin treat a small proportion of the area than is recommended in the Southeast Galena project area. The application of strychnine or aluminum phosphide tablets below ground is not expected to cause cumulative effects with respect to public health or safety.

4.3.8.3—Noxious Weeds

CONCERN:

Using herbicides, specifically glyphosate, to control noxious weeds may pose harmful risks to aquatic and terrestrial wildlife and humans using the areas.

BACKGROUND:

Noxious weeds are aggressive, non-native plants introduced from Europe and Asia. These weeds pose a threat to native pant communities and wildlife that depend on them. Because noxious species are not native to the area, natural controls to limit population sizes do not exist, and their competitive advantage allows them to overtake native plant communities. Noxious weeds can increase fire hazards, replace valuable forage with non-palatable or less nutritious forage for both wildlife and cattle, cause economic losses to adjacent farming and ranch communities, and reduce the diversity of native plant and animal communities.

The *2000 Malheur National Forest Noxious Weed Environmental Assessment* identified approximately 200 noxious weed sites on 65 acres in the Southeast Galena project area. These sites are slated for treatment, using both manual and chemical methods.

Ten new noxious weed sites have been identified in Southeast Galena during this analysis. The ten sites are small, totaling only 1.9 acres. Noxious weeds identified are Canada thistle (*Cirsium arvense*), diffuse knapweed (*Centaurea diffusa*), spotted knapweed (*Centaurea maculata*), tansy ragwort (*Senecio jacbea*), St. Johnswort (*Hypericum perforatum*) and common toadflax (*Linaria vulgare*).

Several of these sites occur in quarry sites that may be used as rock sources for road surfacing. Some of the quarries are located in subwatersheds outside of the Southeast Galena area, but the rock from them would be used on roads within the Southeast Galena project area.

RESOLUTION:

Alternative 1, No Action, does not treat the ten new noxious weed sites. Alternatives 2 and 5 use a combination of manual and chemical methods to kill noxious weeds at ten new sites. Alternatives 3 and 4 use manual methods, i.e., non-chemical methods, to kill noxious weeds.

Measures:

- Acres treated with chemicals for noxious weed control.

PROJECT DESIGN

The action alternatives use a combination of manual and/or chemical methods to control noxious weeds on all ten sites (see Table 198, page 394)for treatment acres by alternative). Chemical application typically provides better control efficacy than non-chemical methods.

Manual Removal of Noxious Weeds: Manual methods available include hand pulling, lopping, digging, and grubbing (i.e., using a hoe or similar tool to break the plant free just below the ground surface). Manual methods are most effective where treatment sites are small and existing weeds have shallow or non-persistent roots. Roots of knapweeds, for example, are easily pulled by hand. Certain weeds, such as leafy spurge and Canada thistle, have deep or persistent roots that can sprout new foliage if the entire root is not removed or destroyed.

Control of Noxious Weeds with Herbicides: At the noxious weed sites, herbicide would be applied only on the noxious weeds themselves. Herbicide application would be permitted within RHCAs. Glyphosate is recommended for use. Information about glyphosate is listed in Section 4.3.8.1—Competing Vegetation.

Table 198 Acres of Noxious Weed Control by Alternative and Control Method.

Treatment Acres	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Manual Treatments	0	.4	1.9	1.9	.4
Chemical Treatments	0	1.5	0	0	1.5
Total Control Acres	0	1.9	1.9	1.9	1.9

ALTERNATIVE 1—Toxic Chemicals—Noxious Weeds

Vegetation

As weeds spread, cover vegetation could decrease in diversity as well as in moisture and soil-holding capacity, and run-off and sedimentation rates could increase. As soil horizons are lost following a decrease in root structure, so is the likelihood of restoring the native species.

Lack of effective containment leads to expansion of both numbers and size of infestations, resulting in a "snowball" effect on both expense and inefficacy of future treatments. The time scale of this trend is unpredictable, as it involves numerous variables. Long-term productivity of non-forest lands, as well as biodiversity, will probably decrease as exotic species increase. Failure to eradicate the existing new weed populations within this project area could offset the effects of treatments under the *Noxious Weed EA*, allowing untreated populations to re-infest the treated areas. In the long run, this could offset the effort and expense of eradication efforts within the watershed, and add to the burden of off-forest weed seed that will inevitably initiate new infestations.

Soil, Water Quality, and Fisheries

The only chemical treatment of weeds would occur associated with those listed in the *Noxious Weed EA*. The approximately 1.9 acre of new noxious weed-infestations of diffuse knapweed, spotted knapweed, St. John's Wort, Canada thistle, tansy ragwort and common toadflax would not be treated with this alternative.

Impacts of not controlling weeds can be loss of vegetation species that have better soil-holding characteristics than invading species. This can increase sedimentation and decrease stream bank stability.

Wildlife

None of the 10 new noxious weed sites would be treated. Weed infestations would likely persist, enlarge, and/or spread to new locations. The ten sites are small, totaling only 1.9 acres, a negligible amount in a 49,000-acre analysis area. Direct and indirect impacts to wildlife species would also be negligible or non-existent in the short-term. Nevertheless, noxious weeds tend to spread rapidly in the absence of natural controls. Alternative 1 could result in increased negative effects to wildlife though a decrease in native

vegetation. Over time, there is the potential for loss or degradation of habitat with new and expanding weed locations.

No immediate effects to Threatened, Endangered, and Sensitive (TES) species, Management Indicator Species (MIS) or Species of Interest (SOI) would be expected. See the Wildlife Biological Evaluation in Appendix B.

Worker and Public Health & Safety

There would be no effects to workers, or public health and safety.

Cumulative Effects

Cumulative effects would be as described in section 4.3.8.1.1 – Competing Vegetation, Alternative 1 – Cumulative Effects, page 372. Analysis addressed herbicide treatment of sites identified in the *Noxious Weed EA* and County spraying of highway right of ways.

These herbicide applications were not expected to have adverse effects on aquatic or terrestrial species, or humans.

ALTERNATIVE 2—Toxic Chemicals—Noxious Weeds

Approximately 1.9 acres of noxious weeds would be treated by a combination of manual and chemical methods. Where chemical treatment is prescribed, the herbicide glyphosate would be applied directly to noxious weeds using wick or spot application methods.

Vegetation

The noxious weed populations slated for herbicide treatment will no longer act as seed sources for spread or start of new infestations after 2001. These populations could be eliminated by 2008, or sooner. Because glyphosate is a broad-spectrum herbicide, it has the potential to decrease grass cover. Because the recommended action is for wick or spot application to individual plants, adverse effects to surrounding vegetation would be minimal to non-existent.

Soil, Water Quality, and Fisheries

Glyphosate would be applied to noxious weeds on 1.9 acres, of which 1.5 acres is in RHCAs. There will be no aerial application of chemicals due to the need for site-specific placement. Glyphosate will be applied under dry conditions, when soil water movement is limited. Under these conditions, it is unlikely that the herbicide will be transported to live stream water during its active period when concentrations are near the application rate.

Detailed information on the properties of glyphosate and its potential application effects is described in Section 4.3.8.1.2—Competing Vegetation, Alternative 2—Soil, Water Quality, and Fisheries, page 368. Table 199 displays recommended treatment acres, Maximum Allowable Acres for treatment, and NOEL ratios by subwatershed. Terms are defined in Section 4.3.8.1.2 page 368.

Table 199 Alternative 2 Chemical Treatment (Glyphosate) vs. Max. Allowable Acres and NOEL Ratio.

Subwatershed	Alt. 2 Acres (within RHCAs)	Maximum Allowable Acres	NOEL Ratio
Tincup	0.1(0.1)	420	0.0002
Butte	1.2(1.1)	2100	0.0006
Beaver/Ruby	0.1	38	0.0026
Dry/Sunshine	0.1(0.1)	38	0.0026
Totals	**1.5(1.3)**	**Not Applicable**	

Alternative 2 has some risk associated with spills during application. This is because application rates and location are not expected to have impacts on fish or fish habitat. The main risk is that spills could occur during transport of equipment and chemicals or while filling equipment. Following BMPs listed in Chapter 2 of this document and the *Malheur NF Noxious Weed Environmental Assessment* would minimize these risks.

Wildlife

Effects to wildlife would be as described In ALTERNATIVE 2, page 368. Application of glyphosate on an additional 1.9 acres would have negligible effects.

Glyphosate application would not create any substantial hazard to terrestrial animals, including Threatened, Endangered, and Sensitive (TES) species, Management Indicator Species (MIS) and Species of Interest (SOI). Under prescribed application rates, toxic exposure levels would not likely occur. Chemicals have low to no bioaccumulation rates. Noxious weeds would be reduced. There is some risk that noxious weeds would invade newly disturbed sites, but overall, native species are expected to revegetate most sites. See the Wildlife Biological Evaluation in Appendix B.

Worker and Public Health & Safety

Risks to workers and the general public would be as described in Worker and Public Health & Safety, page 372. Application of glyphosate on an additional 1.9 acres would not increase risks. Glyphosate has low to moderate potential toxic effects. Studies have shown that exposure levels remain far below the toxic levels for workers. Exposure to the public is expected to be much less.

Cumulative effects

Cumulative effects would be as described in section 4.3.8.1.2 Cumulative Effects, page 372. Analysis addressed the following treatments: 1) noxious weed treatment identified in the *Noxious Weed EA*, 2) competing vegetation treatment recommended in this project; 2) noxious weed treatment recommended in this project, and 4) strychnine treatment of pocket gophers recommended in this project.

At the treatment levels recommended , chemicals would be below thresholds for adverse effects. It is unlikely that any chemical would be detected in stream water. Application of site-specific Best Management Practices (BMPs) and mitigation measures (listed in Chapter 2) would further reduce the likelihood of chemicals being detected in stream waters, and the risk to water quality from recommended chemical treatments would be low in all subwatersheds. Risk to water quality, fish and fish habitat would likely be low in the Middle Fork John Day River.

Risks to terrestrial wildlife species would be minimal given the size of the land base, number of acres recommended for treatment, handling and application procedures, toxicity levels, chemical tolerance of animals and potential exposure levels. No adverse cumulative effects would be expected to terrestrial wildlife, including Threatened, Endangered and Sensitive (TES) species, Management Indicator Species (MIS) and Species of Interest (SOI). Cumulatively, the treating of noxious weed sites would have beneficial effects to wildlife by restoring native plant communities in existing noxious weed sites.

The total cumulative effects of these projects are considered to be not large enough to cause adverse impacts neither to aquatic or terrestrial species nor to public safety or health.

ALTERNATIVE 3—Toxic Chemicals—Noxious Weeds

Alternative 3 restricts control of noxious weeds on 1.9 acres to manual methods, i.e., non-chemical methods. Hand pulling, lopping, digging, and/or grubbing would be used to remove noxious weeds on 1.9 acres.

Vegetation

The use of only manual control methods will reduce the ability to control the known noxious weed sites not covered by the *Noxious Weed EA*, compared with the Recommended Action (Alternative 2).

Soil, Water Quality, and Fisheries

No chemicals are recommended for use to control the ten new noxious weed sites. Effects would be the same as for the No Action Alternative (Alternative 1)

Wildlife

All 10 noxious weed sites would be treated by manual methods. Because manual treatment methods are not always effective, some of the weed infestations would likely persist, enlarge, and/or spread to new locations. The 10 sites are small, totaling only 1.9 acres, a negligible amount in a 49,000-acre analysis area. Direct and indirect impacts to wildlife species, including TES species, MIS and SOI, would also be negligible or non-existent. See the Wildlife Biological Evaluation Appendix B

Worker and Public Health & Safety

Manual methods are unlikely to pose any safety risks to workers. There would be no effects to public health and safety.

Cumulative Effects

Alternative 3 would have the same cumulative effects as the No Action Alternative (Alternative 1), the only difference is the additional 1.9 acres of manual treatment which is very insignificant. Ground disturbance is less than the Recommended Action (Alt. 2). Analysis of all chemical application in the project area (from the *Malheur National Forest Noxious Weed EA*) is discussed under Section 4.3.8.1.3 (Alternative 3, Cumulative effects in the Competing Vegetation Section) of this document.

ALTERNATIVE 4—Toxic Chemicals—Noxious Weeds

Noxious weed eradication on 1.9 acres would use manual methods; no herbicides would be applied at these sites. Direct, indirect and cumulative effects would be as described for Alternative 3.

ALTERNATIVE 5—Toxic Chemicals—Noxious Weeds

Approximately 1.9 acres of noxious weeds would be treated by a combination of manual and chemical methods. Where chemical treatment is prescribed, the herbicide glyphosate would be applied directly to noxious weeds using wick or spot application methods. Treatment of these sites is identical to recommended treatment in Alternative 2.

Vegetation

The noxious weed populations slated for herbicide treatment will no longer act as seed sources for spread or start of new infestations after 2001. These populations could be eliminated by 2008, or sooner. Because glyphosate is a broad-spectrum herbicide, it has the potential to decrease grass cover. Because the recommended action is for wick or spot application to individual plants, adverse effects to surrounding vegetation would be minimal to non-existent.

Soil, Water Quality, and Fisheries

Effects are as described for the Recommended Action (Alternative 2), since the same amount of herbicide will be used to control the same noxious weed infestations.

Wildlife

Effects are as described for the Recommended Action (Alternative 2), since the same amount of herbicide will be used to control the same noxious weed infestations.

Cumulative Effects

Cumulative effects would be as described in section ALTERNATIVE 5, Cumulative Effects, page 376 Analysis addressed the following treatments: 1) noxious weed treatment identified in the *Noxious Weed EA*, 2) competing vegetation treatment recommended in this project; 2) noxious weed treatment recommended in this project, and 4) strychnine treatment of pocket gophers recommended in this project.

At the treatment levels recommended , chemicals would be below thresholds for adverse effects. It is unlikely that any chemical would be detected in stream water. Application of site-specific Best Management Practices (BMPs) and mitigation measures (see page 90) would further reduce the likelihood of chemicals being detected in stream waters, and the risk to water quality from recommended chemical treatments would be low in all subwatersheds. Risk to water quality, fish and fish habitat would likely be low in the Middle Fork John Day River.

Risks to terrestrial wildlife species would be minimal given the size of the land base, number of acres recommended for treatment, handling and application procedures, toxicity levels, chemical tolerance of animals and potential exposure levels. No adverse cumulative effects would be expected to terrestrial wildlife, including Threatened, Endangered and Sensitive (TES) species, Management Indicator Species (MIS) and Species of Interest (SOI). Cumulatively, the treating of noxious weed sites would have beneficial effects to wildlife by restoring native plant communities in existing noxious weed sites.

The total cumulative effects of these projects are not considered to be large enough to cause adverse impacts to aquatic or terrestrial species, sensitive plant species, or to public safety or health.

4.3.9— ISSUE 1.4.9—INADEQUATE AMOUNT OF TREATMENT—FOREST SUSTAINABILITY AND RESILIENCY

Current forest stand composition and structure predispose the forest toward a risk of uncharacteristically severe insect infestations, disease infections, and fire. The Agency's recommended action does not manage enough forest stands to adequately meet the purpose of this action of returning this area to the historic range of variability for stand composition and density.

BACKGROUND:

Dry Forests were once forested by open park-like stands of large early seral tree species (ponderosa pine and western larch). Lightning and Native Americans ignited fires that burned frequently; consuming ground fuel, reducing the amount of shade tolerant understory trees, and scorching the lower branches. With little fuel on the ground, the fire intensity was low, and since the height of the bottom of the live crown was high enough to keep the ground fire from reaching the crowns, crown fire occurred infrequently. The thick bark on the trees insulated the cambium from the heat of the frequent, low intensity ground fires that occurred. The low stand densities allowed the trees to grow with good vigor and to withstand bark beetle attacks and to outgrow mistletoe infections. The relative lack of shade tolerant late seral species (Douglas-fir and grand fir) reduced the amount of host species for tussock moth and spruce budworm, maintaining these damaging insects at low levels.

Moist forests were historically a mixture of open park-like stands and denser forests that included both early-seral and late-seral tree species, reflecting the variability caused by a mixture of fire regimes and other disturbances. Fires would burn patches up to 2000 acres in size, of which 80% would be an

underburn, and 20% would be stand replacement intensity. The patchwork of structural stages and the higher proportion of early-seral species reduced the amount and distribution of host species (Douglas-fir and grand fir) for spruce budworm and Douglas-fir tussock moth, restricting the size and intensity of defoliating insect outbreaks. These are the same host species that are susceptible to the more damaging root and stem diseases. The result was that the stands were able to withstand periodic disturbances from fire, insects, and disease; exhibiting good resiliency and long-term sustainability.

RESOLUTION:

The alternatives propose mechanical treatments and prescribed fire designed to reduce stand densities and to shift the species composition towards early seral species. Fuel treatments are included to reduce the amount of fuel on the ground resulting from harvest and thinning activities.

"In pure second-growth pine stands, thinning will reduce the probability of beetle attack." (Johnson et al 1995). The thinning will reduce the stocking levels in the overstory and understory, while prescribed fire will reduce the amount of natural in-growth, reduce dead fuel loading, and scorch the lower live limbs, reducing the torching potential. Thinning the overstocked stands improves tree vigor, which will improve forest resiliency, and burning reduces the fuel loading and crown fire potential, which will reduce fire severity and size. "Active management can help recreate the historical mosaic of stands in different conditions that offers natural firebreaks and less concentrated food sources for insects." (Johnson, et al 1995)

The No Action Alternative (Alt. 1) does not propose any mechanical stand treatment or prescribed fire to alter the present condition. The other alternatives (Alts. 2, 3, 4, and 5) propose differing amounts of mechanical stand treatments and prescribed fire.

Table 200 -Acres of Mechanical Treatment by Alternative

Treatment	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Commercial Thinning	0	5721	4390	0	7062
Comm. Thin in Connectivity Corridors	0	1228	899	0	221
Understory Removal	0	879	552	0	1216
Shelterwood	0	1689	1242	0	2598
Salvage	0	245	245	0	245
Harvest Total	**0**	**9762**	**8207**	**0**	**11342**
Precommercial Thinning	0	2158	1830	2094	3076
Precommercial Thin in Connectivity Corridors	0	948	820	635	38
Precommercial Thin Total	**0**	**3107**	**2650**	**2729**	**3114**
Total Mechanical Treatment♠	**0**	**10641**	**8207**	**2729**	**12221**
♠Total acres treated are less than the sum of the individual treatments because in some areas both commercial and precommercial thinning is prescribed.					

Species conversion will reduce the amount and distribution of late-seral species in the planning area. That will reduce the severity and extent of insect outbreaks, and reduce the incidence and spread of disease. Thinning will reduce the stocking levels in the overstory and understory, improving tree vigor, which will improve forest resiliency. Prescribed fire will reduce the amount of natural in-growth, reduce dead fuel loading, and scorch the lower live limbs, reducing the torching potential and crown fire potential, which will reduce fire severity and size.

Table 201 Acres of Prescribed Fire Treatment by Alternative

Subwatershed	Alt 2 Outside Units	Alt 2 Within HTH, SPC Units	Alt 2 Within Ref Units	Alt 3 Outside Units	Alt 3 Within HTH, SPC Units	Alt 3 Within Ref Units	Alt 4 Outside Units	Alt 4 Within SPC Units	Alt 5 Outside Units	Alt 5 Within HTH, SPC Units	Alt 5 Within Ref Units
Davis Ck/ Placer Gulch	549	1504	79	686	1446	0	1017	451	516	1537	79
Vinegar Ck	1746	1309	172	1794	1309	124	2630	597	1321	1283	623
Vincent Ck	2010	1563	151	2177	1445	102	3503	221	1726	1430	568
Little Boulder/ Deerhorn Ck	5315	1561	282	5100	1032	71	4864	0	5095	1781	282
Tincup/ Little Butte Ck	2585	1450	507	2686	724	253	3553	110	2289	1727	526
Butte Ck	774	540	60	1004	310	60	1066	308	702	612	60
Granite Boulder Ck	1077	0	0	1077	0	0	1077	0	1077	0	0
Total	14056	7927	1251	14524	6266	610	17710	1687	12726	8370	2138
Grand Total		23234			21400			19397		23234	

Note: Outside Units means prescribed burning outside units with mechanical treatment recommended by this EIS.
Within HTH, SPC Units means prescribed burning planned where thinning or precommercial thinning are planned.
Within Ref Units means prescribed burning planned where reforestation is scheduled including understory removal units

Prescribed burning will be done to stands that are stocked with a majority of species including ponderosa pine, western larch, and Douglas-fir and which may contain understories of grand fir or western juniper that have become established as a result of fire exclusion. A low intensity ground fire is planned to meet the objectives of fuel reduction, vegetation treatment and resource protection. Burn intensities should be varied on a site specific basis depending on weather, fuel, topographic, and tree characteristics that would result in no more than 30 percent crown scorch of the dominant and co-dominant trees. The scorching of the lower live branches up to 20 feet above the ground is desirable to reduce ladder fuels and the chance of the trees from being ignited by a future wildfire. Mosaic burning including some unburned areas is desirable in order to have diversity in ground vegetation stages and retain desirable tree regeneration.

Measures:

- Acres of fire hazards that are reduced, including acres treated of ground fuel reduced and acres treated of moderate and high crown fire risk.
- Acres of overstocked stands thinned.
- Acres of late seral tree species converted to early seral tree species.

PROJECT DESIGN

The young "second growth" stands of ponderosa pine, Douglas-fir, and western larch that regenerated following the railroad logging are often overstocked. Those that are overstocked are prescribed for precommercial or commercial thinning, sometimes both, depending on the size of the trees to be removed. Stands that have an overstory of larger early seral tree species and a dense understory of younger trees, either early or late seral species, are prescribed for understory removal to reduce competition and the risk of stand replacement fire. Stands that have a larger proportion of late seral tree species than occurred in the past are prescribed for species conversion by a combination of commercial thinning and shelterwood regeneration.

Prescribed burning was planned in both mechanically treated and untreated stands to reduce fuel levels, increase the lower crown height by scorching, and to remove understory trees. Up to 10% mortality is permissible in the overstory. Burns would be in both the spring and fall to better mimic the effects of natural fire.

Mechanical treatment and prescribed burning were deferred or modified in stands that were deemed necessary for wildlife habitat and to provide connectivity between habitat areas. The Malheur NF Land and Resource Management Plan, *LRMP* Amendment #2, Pac Fish, and other documents address some of the habitat needs that guide project design. In the case of Threatened, Endangered, and Sensitive (TES) species, habitat needs are guided by discussions and agreements with regulatory agencies, (i.e. Canada Lynx Conservation and Assessment and Strategy). Prescribed burning was deferred in some areas where mechanical treatment was deferred, because it cannot be done until the mechanical treatment changes the stand structure to allow safe burning.

The net result is that the area being treated by the Recommended Action (Alt. 2) is approximately half that was diagnosed as needing treatment to improve forest sustainability and resiliency. Table 202 displays the total acres that were diagnosed as needing mechanical treatment and the percentage actually recommended for treatment in each alternative. The areas within Pac Fish designated RHCAs (MA-3b), the Dixie Butte Wildlife Emphasis Area (MA-7), Designated Old Growth areas (MA-13), and the Vinegar Hill-Indian Rock Scenic Area (MA-21) were not diagnosed for treatment, and are not included.

Table 202 Percentage of Acres Needing Treatment vs. Percentage of Area Treated

Treatment	Need Acres	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Commercial Thinning	9249	0%	78%	57%	0%	79%
Pre-Commercial Thinning	3345	0%	93%	79%	82%	93%
Species Conversion	9322	0%	18%	13%	0%	28%
Understory Removal	1614	0%	54%	34%	0%	75%
Total♠	21,493	0%	50%	38%	13%	57%
♠Total acres treated are less than the sum of the individual treatments because in some areas both commercial and pre-commercial thinning is prescribed.						

Table 203 displays the change each alternative is expected to have on the crown fire hazard from the current condition.

Table 203 Effects of Treatments on Crown Fire Hazards

Crown Hazard	Existing	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
DRY FOREST						
High	66%	No Change	44%	50%	61%	40%
MOIST FOREST						
High	60%	No Change	55%	56%	59%	54%
LODGEPOLE PINE						
High	98%	No Change	No Change	No Change	No Change	No Change
COLD FOREST						
High	84%	No Change	No Change	No Change	No Change	No Change

Note: Existing Crown Fire Hazards were determined by using stand densities based on the following assumptions:

- For the Dry Forest and Moist Forest Type's, the stands indicated for treatment plus dense stands that were not recommended for treatment due to other resource objectives such as Dedicated Old Growth stands. However, information was not available on all stands and these stands were not put into the High level. Therefore, the crown fire hazard may be underestimated.
- For the Lodgepole Pine and Cold Forest Type's, the stand initiation stage was rated as low. All other stages were rated as high due to the high densities of the stands based on field observations and aerial photo interpretations.

Alternative 1—Forest Sustainability and Resiliency

Alternative 1, the No Action alternative, does not propose any mechanical stand treatment or prescribed fire to alter the present condition

Direct and Indirect Effects

Overstocked forest stands will continue to slow in growth and decrease in vigor as stand density continues to increase. Late seral species will continue to increase occupancy in mixed conifer stands. The quantity and vigor of grasses and shrubs in the understory will continue to decline due to the shading and competition for nutrients and water.

Insects

Risk of attack by bark beetles will increase as the trees lose vigor and are less able to pitch out the beetles. As more attacks become successful, the population increases to outbreak levels, killing and damaging larger pockets of trees. Risk of outbreaks of defoliating insects would continue to increase as the stand composition continues to shift to more late seral species. Large scale applications of insecticides are felt to be ineffective since the habitat for the insect remains and the natural populations are available to periodically reach outbreak levels (Mason 1998, Powell 1994). Widespread defoliation and mortality would increase the fuel loads greatly. The dense, slow growing stands would remain a high risk for fir engraver attacks; further increasing mortality and fuel loading.

Disease

Dwarf mistletoe infections can be expected to increase as trees slow in height growth and the crowns grow closer together. Stem and root diseases would continue to spread in the host fir trees, causing increasing mortality.

Fire

The primary stand attributes that control fire behavior are surface fuel condition, crown bulk density, and crown base height (Graham 1999).

The increase in stand density in ponderosa pine stands will increase the likelihood of crown fire by increasing the stand crown bulk density. Insect and disease mortality will increase the standing and down fuel loadings, increasing fire intensity and severity. Stands with an understory or live crowns that are currently close to the ground will continue to have a hazard of ground fires moving up into the crowns along the fuel ladder. They will continue to be susceptible to torching from wildfire, increasing the hazard of crown fire. Stands with no fuel treatments burn at a higher severity and with more crown scorch than similar stands that have been treated to reduce stand densities and fuel loads (Pollet 1999).

In stands with a high proportion of fir trees, there would continue to be a high hazard for large scale, high severity fires due to the high flammability of late seral species stands. The increase in stand density will increase the likelihood of crown fire by increasing the stand crown density. Insect and disease mortality will increase the standing and down fuel loadings, increasing fire intensity and severity. Stands with an understory will continue to have a hazard of ground fires moving up into the crowns along the fuel ladder created by these smaller trees.

The crown fire hazard remains at 66 percent of the dry forest type and at 60 percent for the moist forest type. The species mix does not change towards less flammable species, the density is not reduced, and the ladder fuels are not reduced. The area remains at the current high hazard for uncharacteristically large and severe fires. As trees grow and biomass increases, the crown fire hazard will continue to increase. In 50 years, almost all stands will be at a high crown fire hazard without periodic under burning that could maintain stocking where it is now appropriate, mechanical treatment that could reduce stand densities and reduce fire sensitive species or wildfires that could cause stand replacement events.

Cumulative Effects

Similar projects are recommended or are being implemented to improve forest sustainability and resiliency throughout the Middle Fork John Day Sub-Basin. If this alternative is selected, the effect will be to maintain a center of insect and disease activity that could spread outside the Southeast Galena project area. If the fire

risk were not reduced, fires starting in the Southeast Galena area would be more likely to escape initial attack and become large, uncharacteristically severe wildfires.

The forested PVG's cover about 86 percent of the Galena Watershed. About 53 percent of the forested PVG's contains high crown fire hazards with ladder fuels and many patches of moderate to heavy ground fuels. This is after stand replacement fires of 1994 and 1996 burned about 25 percent of the watershed. The North Fork John Day Watershed, on the north side of the Galena Watershed, also has much of the area with dense stands with ladder fuels except about 24 percent of that watershed that was burned in 1996 due to the Tower Fire. The Camp Creek Watershed to the south of the Galena Watershed has higher proportion of dense tree stocking than the above two watersheds because there has been no stand replacing fires since fire exclusion. The cumulative effect is that all of these watersheds have large areas with fuel conditions far outside the historic level of variation that result in large, severe fires that can spread into the adjacent watersheds.

Alternative 2—Recommended Action—Forest Sustainability and Resiliency

Direct and Indirect Effects

Approximately 51% of the area diagnosed for treatment is recommended for thinning and regeneration. Ponderosa pine stands will increase in growth and vigor as the stand density is reduced. The quantity and vigor of grasses and shrubs will increase due to the reduction in shading and competition for nutrients and water. Species composition changes in mixed conifer stands will be towards early-seral species that are more resistant to insects and diseases and are not as susceptible to fire damage and crown fires.

Insects

The additional light and warmth in thinned stands is inhospitable for bark beetles, providing an immediate degree of protection to the trees. As the trees respond over the next several after the thinning, their increased vigor will allow them to withstand attempted beetle attacks by successfully pitching out the invading insects. As fewer attacks are successful, the population outbreaks will decrease to low levels, reducing the amount or size of pockets of mortality. The reduction in the proportion of late-seral species will reduce the extent of defoliation by spruce budworm and Douglas-fir tussock moth (Mason 1998, Powell 1994).

Disease

The increased height growth rates will allow the remaining trees to outgrow dwarf mistletoe infections, gradually decreasing the amount of crown infected. The increased spacing will reduce the lateral spread of mistletoe. The removal of late seral species during the thinning operations will reduce the amount of trees susceptible to root diseases. Eventually allowing the disease to fade to a minor role in the forest.

Fire

The primary stand attributes that control fire behavior are surface fuel condition, crown bulk density, and crown base height (Graham 1999).

The risk of fire will be diminished, as thinning from below will reduce the number of smaller trees in the stand, and will remove many of the late seral species in the understory, reducing the ladder fuels that allow ground fire to climb into the crowns. Thinning and associated slash treatment will significantly lower crown bulk densities and redistribute fuel loads, decreasing fire intensities (Agee 1993, Alexander 1988, Alexander and Yancik 1977) and reducing the crown fire potential (Coulter 1980, Dennis 1983, Rothermel 1991, Schmidt and Wakimoto 1988). Thinning will also eventually increase the diameter and bark thickness, which will reduce the amount of fire damage and mortality. The reduction in insect and disease mortality will reduce the amount of standing and down fuel created, decreasing fire intensity and severity. Live crowns will be higher off the ground as a result of thinning from below and scorching from prescribed burning, reducing the risk of torching and crown fires. Mechanical fuel treatment is the most important component for reducing fire hazard. Sites

with mechanical fuel treatment appear to have drastically reduced fire severity during wildfires compared to sites treated only with prescribed fire only (Pollet 1999).

Species conversion treatments in stands with a high proportion of fir trees will decrease the risk of large scale, high severity fires since the proportion of late-seral species, which are highly flammable, will be reduced. Grand fir and other shade tolerant species tend to have long and heavy crowns, creating stands with high crown bulk densities (Brown 1978, Rothermel 1983). After treatment, it would take extreme weather conditions to sustain a crown fire in western white pine and western larch dominated stands due to their much lower crown bulk densities (Graham 1999). The risk of torching and crown fires due to presence of a fir understory with live crowns close to the ground will be greatly reduced by removing most of the fir understory.

Stands would be dominated by western larch, with lesser amounts of ponderosa pine and western white pine, depending on the site. In stands that resemble shelterwood regenerations, the primary species to be planted are western larch, ponderosa pine, and western white pine. These stands will be quite open with low crown bulk densities that are not likely to support crown fires while the regeneration is short (Graham 1999). As the stand grows, precommercial thinning the understory in the future will reduce the potential for crown fire by lowering the understory crown bulk densities.

The reduction in the amount of thin barked late seral species will reduce the amount of mortality due to bole scorch. The reduction in insect and disease mortality will reduce the amount of standing and down fuel created, decreasing fire intensity and severity.

All sub watersheds, except for Granite Boulder, have treatments that reduce the crown fire hazard in large enough areas to help prevent crown fires and to allow crown fires from adjacent untreated areas to drop back to the ground. Additional thinning will be needed in the future as described in the vegetation effects to maintain the effects of reduced crown fire hazard.

Crown fire hazard is reduced by 22 percent, or one third, for the dry forest and by 5 percent for the moist forest. The treatment areas are large enough to provide conditions where crown fires in untreated areas can become ground fires soon after entering the treated areas. This is because tree crowns are not dense enough to carry fire from crown to crown unless under extreme weather conditions, and ladder fuels are removed from treatment areas through mechanical treatment and prescribed burning. Torching of individuals and groups of trees will still be possible due to species attributes, tree size or ground fuel conditions.

With the increased opportunity for the wildfires to remain on the ground, or return to the ground if a crown fire, there will be increased safety for fire fighters due to less fire intensity and better opportunities for safety zones.

For stands thinned to 60 basal area per acre, high crown fire hazard will be reached again within 50 years. For stands thinned to 80 square feet of basal area per acre (modified thinning) and the pre-commercial thinning outside of harvest units, high crown fire hazard will be reached again within 25 years. The units with the combination thinning and shelterwood prescriptions will reach high crown fire hazard within 50 years assuming a precommercial thinning in 25 years.

Cumulative Effects

Similar projects are recommended or are being implemented to improve forest sustainability and resiliency throughout the Middle Fork John Day Sub-Basin. If this alternative is selected, the effects will be much the same across the sub-basin, with the Southeast Galena area treated more intensively. There will less chance of insects and disease activity that could spread outside the Southeast Galena project area, those that started outside the area would find conditions less hospitable in the Southeast Galena project area. Initial attack on fires starting in the Southeast Galena area would be more likely to be successful and the fires would not be as likely to become large, uncharacteristically severe wildfires.

This alternative reduces high crown, fuel ladder and ground fuel hazards on about 8 percent of the watershed through mechanical treatment and reduces ground fuels and ladder fuels through prescribed burning on an

additional 11 percent of the watershed. If the recommended future Northwest Galena project does a proportionate level of treatment, high crown, ladder and ground fuel hazards would be reduced by a total of about 7 percent through mechanical treatment and another 7 percent of the watershed would have reduced ground fuel and fuel ladders through prescribed burning. The cumulative effect of Southeast Galena and Northwest Galena fuel reduction projects would be a treatment of a total of 33 percent of the watershed of which about 15 percent would be lowering of the crown fire hazard. The distribution of the treated areas would break up the continuity of the high hazard fuels. This will result in fires being lighter in severity over the treated areas, safer to suppress, and more likely to be prevented from spreading between areas of high hazard fuels and spreading between watersheds. Prescribed burning at intervals within the natural cycle for the fire regimes will be needed to maintain treated areas within the historic range of variation. This will reduce the need to use mechanical treatment in the future for fuels reduction.

Alternative 3—Forest Sustainability and Resiliency

Direct and Indirect Effects

Approximately 36% of the area diagnosed for treatment is recommended for thinning and regeneration to improve resiliency and sustainability. Alternative 3 treats about ¾ of the area compared with the Recommended Action (Alt. 2). Ponderosa pine stands will increase in growth and vigor as the stand density is reduced. The quantity and vigor of grasses and shrubs will increase due to the reduction in shading and competition for nutrients and water. Species composition changes in mixed conifer stands will be towards early-seral species that are more resistant to insects and diseases and are not as susceptible to fire damage and crown fires

Insects

The effects would be approximately 25% less than the beneficial effects of the Recommended Action.

Disease

The effects would be approximately 25% less than the beneficial effects of the Recommended Action.

Fire

The risk of fire would be reduced on only about 3/4 of the stands that the Recommended Action would treat. In addition the inability to burn south of the Middle Fork in the Little Butte and Deerhorn drainages would cause a further lack of fire hazard reduction when compared with the Recommended Action.

The crown fire hazard is reduced by 16 percent and that is 6 percent less effective than Alternative 2. Otherwise, the effects are the same as described for alternative 2, except for the Little Butte Creek portion of the Tincup / Little Butte Creek subwatershed which would not be effective for reducing crown fire potential next to the large, high crown fire hazard area of the Dixie Butte roadless area.

Cumulative Effects

The effects of Alternative 3 would be to a lesser degree than Alternative 2 since it doesn't treat as many acres. Similar projects are recommended or are being implemented to improve forest sustainability and resiliency throughout the Middle Fork John Day Sub-Basin. If this alternative is selected, the effects will be much the same across the sub-basin, with the Southeast Galena area treated somewhat more intensively. There will less chance of insects and disease activity that could spread outside the Southeast Galena project area. Initial attack on fires starting in the Southeast Galena area would be more likely to be successful and the fires would not be as likely to become large, uncharacteristically severe wildfires.

The reduction for high crown, fuel ladder and ground fuel hazards through mechanical treatment is about 7 percent of the watershed. If the Northwest Galena project does a proportionate level of treatment, high crown, ladder and ground fuel hazards would be reduced through mechanical treatment by a total of about 5

percent. Prescribed burning treatments outside mechanically treated units would be about the same as with alternative 2. The cumulative effect of Southeast Galena and Northwest Galena fuel reduction projects would be a treatment of a total of about 30 percent of the watershed that would separate areas of high fuel hazards. In comparison with Alternative 2, Alternative 3 would have 3 percent more of the watershed, or 3800 acres, with a high crown fire hazard so it is less effective in reducing the threat of large fires. However, fires would be lighter in severity and safer to suppress over the treated areas. Prescribed burning at intervals within the natural cycle for the fire regimes will be needed to maintain treated areas within HRV. This will reduce the need to use mechanical treatment in the future for fuels reduction.

Alternative 4—Forest Sustainability and Resiliency

Direct and Indirect Effects

Approximately 13% of the area diagnosed for treatment is recommended for thinning to improve resiliency and sustainability. Alternative 3 treats about 1/4 of the area compared with the Recommended Action (Alt. 2). Ponderosa pine stands will increase slightly in growth and vigor as the understory stand density is reduced. The quantity and vigor of grasses and shrubs will increase due to the reduction in shading and competition for nutrients and water.

Effects on Insects

There would be a slight improvement in the resistance to bark beetles in the precommercial thinned stands, but the increase would be small compared to the other action alternatives. Experience has shown that when late seral species make up less than 25% of the stand composition, defoliation is very light with little effect to tree growth or survival. This alternative will not reach that amount in most mixed conifer stands; therefore, defoliation will not be reduced very much. The incidence of fir engraver would be reduced in proportion to the amount of fir that is reduced, and the remaining fir trees would be slightly healthier and less susceptible to attacks.

Effects on Disease

There would be little improvement, related to the amount of late seral species removed during the precommercial thinning. Stem and root diseases may be actually increased, as the cut stumps can serve as infection pathways to the remaining fir trees in the stand. Dwarf mistletoe will not be reduced to any great degree by the precommercial thinning. The burning could show gradual improvement over time, as infected overstory trees are more susceptible to torching. Regardless, infected overstory trees will remain to infect the understory trees and nearby overstory trees.

Effects on Fire

The risk of fire hazard will be slightly diminished, as thinning from below will reduce the number of smaller trees in the stand, and will remove many of the late seral species in the understory, reducing the ladder fuels that allow ground fire to climb into the crowns. The reduction in the amount of thin barked late seral species will also reduce the amount of mortality due to bole scorch. The reduced amount of burning, especially south of the Middle Fork, will result in a higher hazard for large stand replacement fires.

Alternative 4 reduces the crown fire hazard the least of any action alternative by retaining 70 percent of the area in a moderate to high crown fire hazard.

The crown fire hazard is reduced by 5 percent and that is 17 percent less effective than Alternative 2. The crown fire hazard will reach high crown fire hazard within 25 years for all treatment units. Fires would be lighter in severity and safer to suppress over the treated area but not as likely to be prevented from spreading between areas of high hazard fuels and spreading between watersheds as with Alternative 2.

Cumulative Effects

The effects of Alternative 4 would be to a much lesser degree than Alternative 2 since it doesn't include any commercial harvest. Similar projects are recommended or are being implemented to improve forest sustainability and resiliency throughout the Middle Fork John Day Sub-Basin. If this alternative is selected, the effect will be to maintain a center of insect and disease activity that could spread outside the Southeast Galena project area. If the fire risk were not reduced, fires starting in the Southeast Galena area would be more likely to escape initial attack and become large, uncharacteristically severe wildfires.

The reduction for high crown, fuel ladder and ground fuel hazards through mechanical treatment is about 2 percent of the watershed. If the Northwest Galena project does a proportionate level of treatment, high crown, ladder and ground fuel hazards would be reduced through mechanical treatment by a total of about 5 percent. Prescribed burning treatments outside mechanically treated unit would be about 21 percent of the watershed when combined with Northwest Galena which is more than alternative 2 because there is less mechanical treatment. The cumulative effect of Southeast Galena and Northwest Galena fuel reduction projects would be a treatment of a total of about 28 percent of the watershed that would separate areas of high fuel hazards. In comparison with Alternative 2, Alternative 4 would have 11 percent more of the watershed, or about 14,000 acres, with a high crown fire hazard so it is less effective in reducing the threat of large fires. However, fires would be lighter in severity and safer to suppress over the treated area but not as likely to be prevented from spreading between areas of high hazard fuels and spreading between watersheds as with alternative 2. Prescribed burning at intervals within the natural cycle for the fire regimes will be needed to help maintain treated areas within HRV. This will reduce the need to use mechanical treatment in the future for fuels reduction but less than all the other action alternatives. This is because prescribed fire without mechanical treatment will not reduce stand densities enough to move the stands towards the historical range of variation or to reduce the crown fire hazard, other than reduce the opportunity for the fire to jump up into the crowns.

Alternative 5—Forest Sustainability and Resiliency

Direct and Indirect Effects

Approximately 59% of the area diagnosed for treatment is recommended for thinning and regeneration. Ponderosa pine stands will increase in growth and vigor as the stand density is reduced. This alternative treats about 20% more area than the Recommended Action. Thinned ponderosa pine stands will increase in growth and vigor as the stand density is reduced, with more stands thinned to the optimal stocking level. The quantity and vigor of grasses and shrubs will increase due to the reduction in shading and competition for nutrients and water. This alternative treats approximately 50% more of the mixed conifer stands with the species conversion prescription than the Recommended Action. Treated stands will be more vigorous growing due to stocking level control, and the increased percentage of early seral species will be more resistant to insects, disease, and fire damage. The quantity and vigor of grasses and shrubs will increase due to the reduction in shading and competition for nutrients and water.

Insects

The amount of bark beetle damage in ponderosa pine stands would be reduced on an additional 10% compared to the Recommended Action. This would be due to the increased use of the standard thinning rather than the modified thinning prescription. The host tree species for spruce budworm, tussock moth, and fir engraved will be reduced more than in the Recommended Action. Experience has shown that when late seral species make up less than 25% of the stand composition, defoliation is very light with little effect to tree growth or survival. The incidence of fir engraver would also be reduced as the proportion of fir is reduced, and the remaining fir trees would be healthier and less susceptible to attacks. Stands not treated would

benefit from the reduction of host species in nearby stands, which would lessen the severity and size of outbreaks.

Disease

Stem and root diseases will be reduced to a greater degree than the Recommended Action since about 35% more area will be treated to reduce the primary host late seral species. The removal of late seral species during the thinning operations will reduce the amount of trees susceptible to root diseases. Eventually allowing the disease to fade to a minor role in the forest. Thinning will increase height growth rates which will allow the remaining trees to outgrow dwarf mistletoe infections, gradually decreasing the amount of crown infected. The increased spacing will reduce the lateral spread of mistletoe.

Fire

The hazard of stand replacing fire will be diminished on more acres and to a greater degree, compared to the Recommended Action. The amount of mechanical treatment is increased and the amount of burning is the same as the Recommended Action.

The crown fire hazard is reduced by 26 percent and that is 4 percent more effective than Alternative 2. Otherwise, the effects are similar to those described for alternative 2.

Like Alternative 2, Alternative 5 treats all sub watersheds, except for Granite Boulder, to reduce the crown fire hazard in large enough areas to help prevent crown fires and to allow crown fires from adjacent untreated areas to drop back to the ground. A stand replacing event is least likely with this alternative because the stand conditions that reduce fire behavior are improved the most.

Cumulative Effects

The effects of Alternative would be to a greater degree than Alternative 2 since it treats more acres. Similar projects are recommended or are being implemented to improve forest sustainability and resiliency throughout the Middle Fork John Day Sub-Basin. If this alternative is selected, the effects will be much the same across the sub-basin, with the Southeast Galena area treated much more intensively. There will less chance of insects and disease activity that could spread outside the Southeast Galena project area. Initial attack on fires starting in the Southeast Galena area would be more likely to be successful and the fires would not be as likely to become large, uncharacteristically severe wildfires.

The reduction for high crown, fuel ladder and ground fuel hazards through mechanical treatment is about 10 percent of the watershed. If the Northwest Galena project does a proportionate level of treatment, high crown, ladder and ground fuel hazards would be reduced through mechanical treatment by a total of about 9 percent. Prescribed burning treatments outside mechanically treated units would be about 17 percent of the watershed which is less than Alternative 2 but would be more than made up by the increase of mechanical treated acres that are also to be prescribed burned. The cumulative effect of Southeast Galena and Northwest Galena fuel reduction projects would be a treatment of a total of about 36 percent of the watershed that would separate areas of high fuel hazards. In comparison with Alternative 2, Alternative 5 would have 4 percent less of the watershed, or about 5100 acres, with a high crown fire hazard so it is the most effective alternative for reducing the threat of large fires. The wildfires would be lighter in severity and safer to suppress over the treated areas. Prescribed burning at intervals within the natural cycle for the fire regimes will be needed to maintain treated areas within HRV. Prescribed burning at intervals within the natural cycle for the fire regimes will be needed to maintain treated areas within HRV. . This alternative will reduce the need to use mechanical treatment in the future for fuels reduction more than the other alternatives.

4.3.10—ISSUE 1.4.10—INSUFFICIENT PILEATED WOODPECKER HABITAT

The Agency's proposal does not adequately address needed habitat for pileated woodpeckers according to current scientific literature (i.e., according to a 1993 study by Bull and Hothausen).

BACKGROUND

The concern is twofold:

Concern 1: Dedicated old-growth areas (DOGs), replacement old-growth areas[70] (ROGs) and pileated woodpecker feeding areas (PWFAs) in the recommended action are not large enough to meet habitat requirements for pileated woodpeckers (see also Dedicated Old Growth and Connectivity, page 178). Current literature (Bull and Holthausen 1993) indicates that pileated woodpeckers may require a 900-acre home range per breeding pair rather than the 600-acre area recommended in the *LRMP* . The DOGs, ROGs and PWFAs need to be expanded to provide adequate habitat.

Concern 2: The recommended action would not retain a sufficient level of wildlife snags to meet habitat requirements for this species. Pileated woodpeckers typically require higher levels of large snag habitat than many other primary cavity species. Current literature (Bull and Holthausen 1993) recommends that pileated woodpeckers may require at least 4 large snags per acre rather than the 2.4 snags per acre recommended in the *Land and Resource Management Plan*.

CONCERN 1: MODIFYING MA-13 DOGS/ROGS/PWFAS

BACKGROUND:

LRMP , Management Area 13 (MA-13) provides for the management of old growth habitat through a system of dedicated old growth (DOG) units and replacement old growth (ROG) units. Habitat is to be composed of mature/overmature sawtimber (150 years or older). The goal of MA-13 is to provide suitable habitat for old growth dependent wildlife species, ecosystem diversity, and preservation of aesthetic qualities. Replacement old growth (ROG) areas are to be established to counter possible catastrophic damage or deterioration of the DOGs (see also Dedicated Old Growth and Connectivity, page 178).

The *LRMP* directs that pileated woodpecker areas comprise 600 acres, composed of a 300-acre DOG and a 300-acre pileated woodpecker feeding area (PWFA). ROGs are intended to be ½ the size of DOGs, i.e., 150 acres for pileated woodpecker DOGs. ROGs may overlap with the feeding areas. Management requirements are derived from the US Forest Service 1986 Minimum Management Requirements.

In Southeast Galena, four DOG units have been delineated for pileated woodpecker or a combination of both pileated woodpecker and pine marten, totaling 1,576 acres (see Table 204 below). A ROG has been established for 1 of the four DOG's. A PWFA has been established for 1 out of four DOGs Table 204.

RESOLUTION:

Alternative 1 maintains the existing condition. No new ROGs or PWFAs would be designated to meet MA-13 standards. Areas adjacent to existing DOGs/ROGs/PWFAs could be managed under other management area (MA) standards and guidelines.

Alternatives 2, 4 and 5 would result in changes and additions to pileated woodpecker DOGs, ROGs and PWFAs to meet MA-13 standards; i.e., 600 acres for pileated woodpeckers.

Alternative 3 expands DOG/ROG/PWFA areas to meet 900-acre home ranges recommended by Bull and Holthausen (1993).

Measures:

- total acres of DOG, ROG and PWFA
- # of reproducing pairs of woodpeckers DOGs, ROGs and PWFAs could support
- # of reproducing pairs project area could support

ALTERNATIVE 1—Insufficient Pileated Woodpecker Habitat

Existing DOG/ROG boundaries would not be adjusted. No new ROGs or PWFAs are designated to meet MA-13 standards. Areas adjacent to existing DOGs/ROGs/PWFAs could be managed under other Management Area (MA) standards and guidelines, potentially precluding Forest managers the ability to manage for desired levels of pileated woodpeckers.

ALTERNATIVES 2, 4 and 5—Insufficient Pileated Woodpecker Habitat

Table 204 displays the recommended pileated woodpecker DOGs, ROGs and PWFAs. Each pileated woodpecker area is intended to be about 600 acres to meet minimum *Land and Resource Management Plan* (MA-13) standards.

Table 204– Dedicated Old Growth (DOG), Replacement Old Growth (ROG) and Pileated Woodpecker Feeding Areas (PFWAs).

DOG #	Management Requirements Species	Minimum *LRMP* Acre Requirements [1]	Existing DOG Acres	Recommended DOG Acres	Existing ROG Acres	Recommended ROG Acres[2]	Additional Pileated Feeding Acres[2]	Total Recommended Acres
DOG 129	Pileated Woodpecker	600	397	443[4]	0	193 (46)[3]	137	773 (46)[3]
DOG 330	Woodpecker/ And Marten	600	340	337	0	160	173	670
DOG 332	Woodpecker/ And Marten	600	302	298 (6)[3]	0	171	140	609 (6)[3]
DOG 333	Woodpecker/ And Marten	600	366	332 (14)[3]	134	193 (8)[3]	137 (7)[3]	662 (29)[3]
DOG 433	Pileated Woodpecker	600	171	168[4]	0	146	160	474
TOTALS		3,000	1,576	1,578 (20)[3]	181	863 (54)[3]	747 (7)[3]	3,188 (81)[3]

1 Old-growth Management Area (MA-13) Minimum Management Requirements:

Pileated Woodpecker Areas = 300-acre DOG + 300-acre feeding area = *600 acres*. ROGs = 150-acres and overlap with feeding areas.

Pine Marten = 160-acre DOG + 80-acre ROG = *240 acres*

2 ROG acres also contribute towards pileated woodpecker feeding acres. "Recommended ROG Acres" and "Additional Pileated Feeding Acres" fields should total at least 300 acres for each DOG.

3 Non-forested or unsuitable inclusions (acres) are displayed in parentheses.

4 Recommended DOG 433 at 168 acres falls short of minimum size requirements for a pileated woodpecker DOG (300 acres); however DOG 129 is immediately adjacent to DOG 433 and includes 143 surplus acres. Combined, the two DOGS contain 611 acres, a sufficient number of acres to meet requirements (600 acres).

The five DOG/ROG/PWFA areas, as recommended , would meet *Land and Resource Management Plan* MA-13 size standards for pileated woodpeckers; i.e., home ranges of 600-acres for each reproducing pair of woodpeckers.

Home range for a breeding pair has been identified by different sources as ranging from 300 acres (Thomas 1979) to 550 acres (Bull 1987) to 900 acres (Bull and Holthausen 1993). LRMP standards were derived from recommendations Thomas made in 1979. Bull and Holthausen (1993) reported that pileated woodpeckers

appeared to require larger home ranges as habitat quality is reduced. For home ranges 500 acres to 1,200 acres, data suggested that at least 75% of the area be in grand fir forest types; at least 25% be in old-growth with the remainder in mature condition; and at least 50% of the area should have >60% canopy closure. Although, Bull and Holhausen's analysis suggests a range of home range sizes (500 to 1,200 acres), they recommended establishing 900-acre home ranges. Managing for minimum habitat levels of a species may be risky. Table 205 displays stand conditions in the five recommended pileated woodpecker areas.

Table 205 Conditions of Recommended Pileated Woodpeckers Areas. Each area is approximately 600 acres and includes DOG, ROG, and PWFAs.

Recommended stand conditions (Bull, et al. 1993)	*Area 129*[1]		*Area 330*[1]		*Area 332*[1]		*Area 333*[1]		*Area 433*[1]	
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Grand fir Forest Types (75%)	548	71%	653	97%	598	99%	631	66%	327	64%
Old growth (25%) (OFMS, OFSS)	190	25%	462	69%	587	99%	0	0%	241	47%
Mature structure (YFMS) (75%)	456	59%	191	28%	16	1%	436	66%	86	17%
Canopy Closure 60%+ (50%)	8	1%	294	44%	281	46%	0	0%	231	45%
Canopy Closure 40% to 59%	511	66%	259	39%	318	52%	461	67%	281	55%

Pileated Woodpecker Areas 330 and 332 are in Moist Forest types, representing the highest quality habitat. Both areas are slightly below in acres recommended at 60% canopy closure, although stands with canopy closure 55% to 59% likely provide sufficient conditions. These two Areas, even at 600-acres, would each likely support a reproducing pair of woodpeckers.

Pileated Woodpecker Areas 129, 333 and 433 are predominantly in the drier grand fir sites, with inclusions of Douglas-fir and ponderosa pine types. These sites typically represent lesser habitat. Many of the recommended guidelines are not met. The number of acres with canopy closure greater than 60% is notably lacking. In Pileated Woodpecker Area 333, no acres classify as OFMS, although the YFMS stands may provide for some of the woodpecker's life needs. Bull and Holthausen concluded the percentage of forest type in ponderosa pine was the variable best able to predict home range size. As area in the ponderosa pine forest type increases, home range increases, suggesting that the ponderosa pine forest type was poorer habitat. Given Bull and Holthausen's criteria, these three areas as designated may not provided sufficient habitat to support reproducing pairs of woodpeckers. A larger home range is likely needed. Several stands adjacent to the three areas are recommended for timber harvest, further limiting available habitat.

ALTERNATIVE 3—Insufficient Pileated Woodpecker Habitat

Current scientific literature (Bull and Holthausen 1993) indicates habitat needs for pileated woodpeckers may not be adequately met by current *Land and Resource Management Plan* direction. *Land and Resource Management Plan* , Appendix G, p. G-19, recommends reviewing additional data on home range size as it becomes available and adjusting management area size accordingly. Alternative 3 increases the size of pileated woodpecker areas from 600+ acres to 900+ acres to reflect home range size recommended by Bull and Holthausen (see Table 206). MA-13 areas 129, 330, 332, 333, and 433 would be expanded. The additional 300+ acres would not be officially added to DOGs, ROGs or PWFAs, but rather, these acres would be mapped and harvest treatment would be deferred until the next round of LRMP planning determines appropriate management strategies. The 900-acre areas would include acres designated as DOG, ROG, and PWFA plus the additional 300 treatment-deferred acres.

Table 206– Expanded Pileated Woodpecker Areas

DOG #	Desired Home Range Acres	Recommended DOG Acres	Recommended ROG Acres	Additional Pileated Feeding Acres	Total Recommended Acres – Current *LRMP* Direction	Home Range Additions	New Total Acres
DOG 129	900	443[4]	193 (46)[3]	137	773 (46)[3]	302	1,075 (46)[3]
DOG 330	900	337	160	173	670	285	955 (6)[3]
DOG 332	900	298 (6)[3]	171	140	609 (6)[3]	303	912
DOG 333	900	332 (14)[3]	193 (8)[3]	137 (7)[3]	662 (29)[3]	306	968 (29)[3]
DOG 433	900	168[4]	146	160	474	309	783
TOTALS	4,500	1,578 (20)[3]	863 (54)[3]	747 (7)[3]	3,188 (81)[3]	1,505	4,693 (81)[3]

1 Home range size recommended by Bull and Holthausen (1993):

2 ROG acres also contribute towards pileated woodpecker feeding acres. "Recommended ROG Acres" and "Additional Pileated Feeding Acres" fields should total at least 300 acres for each DOG.

3 Non-forested or unsuitable inclusions (acres) are displayed in parentheses.

4 Recommended DOG 433 at 168 acres falls short of minimum size requirements for a pileated woodpecker DOG (300 acres); however DOG 129 is immediately adjacent to DOG 433 and includes 143 surplus acres. Combined, the two DOGS contain 611 acres, a sufficient number of acres to meet requirements (600 acres).

The five DOG/ROG/PWFA areas, as recommended , would exceed *Land and Resource Management Plan* MA-13 size standards for pileated woodpeckers; i.e., home ranges of 900 acres for each reproducing pair of woodpeckers, rather than the 600-acre areas prescribed in the *Land and Resource Management Plan* . Table 207 displays stand conditions in the five recommended pileated woodpecker areas.

Table 207 displays the conditions of the five recommended pileated woodpeckers areas. Each area is approximately 900 acres and includes DOG, ROG, PWFA and deferred acres.

Recommended stand conditions (Bull, et al. 1993)	*Area 129*[1]		*Area 330*[1]		*Area 332*[1]		*Area 333*[1]		*Area 433*[1]	
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Grand fir Forest Types (75%)	810	75%	898	94%	787	86%	874	95%	606	74%
Old growth (25%) (OFMS, OFSS)	452	42%	685	72%	716	79%	0	0%	510	62%
Mature structure (YFMS) (75%)	456	42%	224	24%	126	14%	663	68%	119	14%
Canopy Closure 60%+ (50%)	269	25%	319	34%	521	57%	0	0%	474	58%
Canopy Closure 40% to 59%	511	48%	449	47%	326	36%	489	71%	341	42%

As expanded, the five pileated woodpecker areas likely better meet habitat needs. Although Pileated Woodpecker Areas 330 and 332 meet most criteria in Alternatives 2, 4and 5, this alternative provides additional acre of quality habitat. At 900 acres, Pileated Woodpecker Area 433 would also meet most criteria. Habitat conditions in Pileated Woodpecker Areas 129 and 333 are also improved, although some criteria are still not met. It is likely that at least 3 of the 5 woodpecker areas would support reproducing pairs.

Cumulative Effects—Insufficient Pileated Woodpecker Habitat

The SE Galena project area is expected to support five home ranges for pileated woodpeckers. Given new direction established under Forest Plan Amendment #2, managing for a system of dedicated and replacement old-growth areas may no longer be the best way to provide for the species. By managing forest landscapes for HRV, habitat should be provided regardless of whether or not habitat is specifically set aside in distinct management areas, i.e. MA-13. Currently, SE Galena is within HRV in the moist and Cold Forest types. Large contiguous blocks of OFMS likely support five home ranges, even at the 900-acre areas recommended by Bull and Holthausen.

CONCERN 2: RETAINING ADDITIONAL WILDLIFE SNAGS

BACKGROUND:

The LRMP originally required that wildlife snags be managed to provide for at least 40% of the potential populations of primary excavator species through stand rotations. It was assumed that these snag levels would be sufficient to maintain population viability of those species dependent on dead and defective habitat. Standards required that on average 1 snag be retained per every two acres. LRMP Amendment 2 increased snag retention standards to levels that would support 100% of the potential populations of primary excavator species, or 2.39 snags per acre. A study by Bull and Holthausen (1993) suggested 4.0 wildlife snags per acre.

RESOLUTION:

Under Alternative 1, new management activities are recommended; consequently existing snag densities are not at risk.

Alternatives 2, 4 and 5 strive to meet *Land and Resource Management Plan* standards for wildlife snags, as amended by LRMP Amendment 2. Required levels of snags will be retained where available. Snags in excess of 2.39 trees per acre could be harvested if they still contain merchantable timber. Mitigation is as follows:

- Retain wildlife snags at levels to provide for 100% population levels of primary cavity excavators. Within the ponderosa pine, mixed conifer, and true fir communities, retain a minimum of 2.39 dead trees per acre, 21 inches dbh or greater. If 21 inch dbh trees are not available, retain 2.39 dead trees per acre of the largest representative diameter.

Alternative 3 maintains additional wildlife snags as recommended by Bull and Holthausen (1993). Mitigation is as follows:

- Retain 4.0 wildlife snags 21 inches dbh or greater, where available, to provide additional foraging opportunities for pileated woodpeckers. If 21 inch dbh trees are not available, retain 4.0 dead trees per acre of the largest representative diameter.

ALTERNATIVE 1—Retaining Additional Wildlife Snags

No new management activities would be recommended under this project. Existing levels of snags would likely be maintained.

ALTERNATIVES 2, 4 and 5—Retaining Additional Wildlife Snags

Land and Resource Management Plan standards of 2.39 snags per acres, on average, will be maintained, where available. Snags in excess of 2.39 trees per acre could be harvested if they still contain merchantable

timber. Bull and Holthausen (1993) reported that pileated woodpeckers fed on snags and logs on 76% of their observations. Dead wood habitat may be critical for survival. In the Dry Forest types, many areas do not have the required number of snags and the majority of the available snags are likely in smaller diameter classes. Three of the five recommended pileated woodpecker areas are primarily in Dry Forest types where snags are lacking. In Moist Forest types, snag levels likely meet or exceed standards. The greatest opportunity for snag removal during harvest is in these areas. Less than 10% of the recommended harvest is in these forest types. Pileated woodpeckers may be adversely affected by reducing snag levels, in localized areas. Larger home ranges may be required to meet nesting and foraging needs. Population viability would not likely be reduced.

ALTERNATIVE 3 —Retaining Additional Wildlife Snags

Alternative 3 retains wildlife snags in excess of *Land and Resource Management Plan* standards, at 4 snags per acre rather than the requisite 2.39 snags per acre. Snags would be retained where available. Snag levels would be maintained at levels recommended by Bull and Holthausen (1993). It is likely Southeast Galena would better support nesting and foraging needs of pileated woodpeckers. Larger home ranges may not be needed.

4.3.11—ISSUE 1.3.11–EFFECTS ON CONNECTIVITY FOR WILDLIFE

The Agency's proposal needs to manage wildlife corridors for old growth dependent species (LRMP Amendment #2 connectivity) and the Key Linkage Areas (KLA)s for wide-ranging carnivores more aggressively to reach the forest stand HRV.

BACKGROUND:

The recommended action incorporated design to meet wildlife connectivity across the project area. Wildlife connectivity is being addressed via *Land and Resource Management Plan* Amendment 2 (LRMP2) corridors and Key Linkage Areas (KLAs) (see Map 20 Wildlife Connectivity—for Action Alternatives, Appendix E, this doucment). The definitions of LRMP2 corridors and KLAs are as follows:

- **LRMP Amendment 2 (LRMP2) Corridors:** LRMP2 corridors are also referred to as late and old structural (LOS) stage corridors or old growth corridors. Cover vegetation is to be provided in a quantity and arrangement to provide old growth associated wildlife species sufficient habitat for free movement between distinct old growth areas, interaction of adults, and dispersal of young. *LRMP* standards require that LOS stands be connected by corridors where trees of medium or larger diameter are common and canopy closures are within the top 1/3 of site potential. Standards require that corridors be at least 400 feet wide. Management direction for LRMP2 corridors is included in the *Land and Resource Management Plan*, as amended (USDA 1990 and USDA 1995). Although the main purpose of LRMP2 corridors is to connect blocks of old growth, the corridors also inadvertently provide connectivity for species that are not dependent on old growth.
- **Recommended Key Linkage Areas (KLA)** – The Canada Lynx Conservation Assessment and Strategy (Ruediger et al. 2000) establishes direction to identify Key Linkage Areas to provide landscape connectivity within and between geographic areas. The intent is to provide cover vegetation in quantity and arrangement to provide large, wide-ranging carnivores, such as Canada lynx, California wolverine, and gray wolf, sufficient habitat for dispersal and movement across the landscape. Connected forests allow animals to easily move long distances in search of food, cover and mates.

On the Malheur National Forest, recommended KLAs are approximately 3 miles wide. Within any perpendicular transect to the KLA, at least 1/3 (i.e., 1 mile) should provide movement and dispersal habitat at any point in time. In the project area, a KLA is recommended along the northern boundary. This KLA is intended to connect Lynx Analysis Units (LAUs) on the Malheur National Forest to LAUs on the Umatilla, Wallowa-Whitman and Ochoco National Forests. Although management direction for KLAs is included in the Canada Lynx Conservation Assessment and Strategy (LCAS) (Ruediger, et al. 2000), the LCAS does not provide specific direction on how to implement KLAs. The USFS Regional Office is currently developing a region-wide strategy for KLAs. On the Malheur National Forest, KLAs are only recommended at this time pending further direction.

Direction in the LRMP Amendment 2 and the Canada Lynx Conservation Assessment and Strategy does not specifically address tree densities and canopy structure within wildlife corridors. One could meet the 1/3rd canopy rule without retaining any understory trees. Such stand conditions may not meet the security needs of smaller dispersing animals. Examples might include pine martens, fishers and lynx, species which depend on high levels of ground cover. One study on lynx determined that animals may not cross silviculturally thinned stands that fall below 180 trees per acre (Koehler 1990). In the recommended action, timber harvest and burning prescriptions were modified to retain trees 8 feet in height or greater at a minimum of 180 tree per acre, as well as meet the 1/3 canopy closure rule.

RESOLUTION

Alternative 1 would not implement mechanical tree removal or prescribed fire operations in LRMP2 corridors or KLAs.

Alternative 2, the Agency recommended action, would apply a modified silvicultural prescription (HTH1/SPC1) in both LRMP2 corridors and KLAs by retaining canopy closure within the top 1/3rd of site potential and maintaining at least 180 trees per acre. Modified prescriptions would apply to both mechanical tree removal and prescribed burning operations.

Alternative 3 takes a conservative approach in the LRMP2 corridors; timber harvest and precommercial thinning would not be prescribed. Management would occur in the KLAs, but modified prescriptions would be applied. Prescribed burning activities would be applied in both the LRMP2 corridors and KLAs; burning prescriptions will meet modified canopy closure and tree stocking requirements.

Alternative 4 would only cut smaller trees, likely less than 7" dbh. Modified prescriptions (SPC1) would be applied to both mechanical tree removal and prescribed burning operations

In Alternative 5, greater emphasis is given to restoring stands to HRV. KLAs would receive standard silvicultural prescriptions. FPA 2 corridors would meet the 1/3 canopy rule, but tree stocking requirements of 180 tree per acre would not be required.

Measures:

- Acres treated and type of prescription applied to the KLA.
- Acres treated and type of prescription applied to connective corridors.
- Percent of KLA that meets 1/3 crown closure.

The following discussion addresses the effects of leaving additional trees in the LRMP, Amendment 2 corridors and KLAs.

Table 208 displays the total acres being treated in LRMP, Amendment 2 corridors, the number of acres with modified prescriptions (HTH1/SPC1), and the percentage of treatment acres receiving modified prescriptions.

Table 208 Treatment in LRMP2 corridors by Alternative.

Treatment	Alt 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
LRMP, Amendment 2 acres treated	0	171	0	38	220
LRMP, Amendment 2 acres treated with modified prescription	0	171	0	38	220
Percent of LRMP, Amendment 2 treated acres with modified prescription[1]	---	100%	---	100%	100%[1]

[1] Prescription requires canopy closure remain within the top 1/3 of site potential, but does not require stocking at 180 trees per acre.

Table 209 displays the total acres being treated in KLAs, the number of acres with modified prescriptions (HTH1/SPC1), and the percentage of treatment acres receiving modified prescriptions. The table also estimates the percentage of the KLA which will meet the one third canopy closure and 180 tree per acre stocking guidelines following treatment.

Table 209 Treatment in KLAs by Alternative. Percentage of KLA which meets 1/3rd canopy rule and 180 trees per acre (tpa).

Total KLA acres = 18,369 ac.	Alt 1	Alt. 2	Alt. 3	Alt. 4	Alt.5
Total acres treated in KLA	0	2,833	2,619	847	3,619
Percent of KLA treated	0	15.0%	14.0%	5.0%	20%
Treated acres with modified prescription[1]	0	1,122	1,013	511	0
Percent of treated acres w/modified prescription[2]	0	39.6%	38.6%	60.0%	0%
Percent of KLA which meets 1/3rd canopy rule and 180 tpa	75.3%	66.2%	66.5%	73.5%	55.6%

[1] Prescription requires canopy closure remain within the top 1/3 of site potential, but does not require stocking at 180 trees per acre.
[2] Example calculation for Alternative 2: (2,833/1,122) X 100 = 39.6%

ALTERNATIVE1—Connectivity for Wildlife

Management activities would be limited to ongoing activities. Alternative 1 would not conduct any additional timber harvest or prescribed burning related activities in LRMP2 corridors or KLAs.

Structural Stages

Effects to structural stages would be as described for the no action alternative in Section 4.2.4 Undesired Condition – Vegetation Outside HRV.

Resiliency and Sustainability

Effects to stand resiliency and sustainability would be as described for the no action alternative in Issue 9 – Forest Sustainability and Resiliency. Insect, disease, and wildfire risk would remain elevated.

Wildlife

Tree stocking levels and canopy closures would not be reduced in LRMP2 corridors or the recommended KLA. LRMP2 standards would be met in the LRMP2 corridors. Approximately 75% of the KLA would have stands that are in the top 1/3 of potential canopy closure. Existing dispersal and movement patterns would not be disrupted. In the absence of a major disturbance event, tree density would continue to increase, improving connectivity habitat.

Without management, the project area would remain at high risk for an uncharacteristically severe disturbance event, such as wildfire. Such an event could dramatically reduce or alter connectivity habitat at the landscape level. Fragmentation of habitat could isolate wildlife populations.

ALTERNATIVE 2—Connectivity for Wildlife

In the KLA, 1,122 of 2,833 acres (39.6%) recommended for mechanical treatment would receive the modified prescription. In the LRMP2 corridors, only 171 acres will be mechanically treated, an incidental amount of acres relative to the entire LRMP2 corridor system.

Structural Stages

It is expected that the modified thinning prescription would add approximately 20 to 40 years to the time it takes for stands to grow into the old forest structural stage, if the stands are not thinned again.

Resiliency and Sustainability

Retention of additional trees may result in less than optimal growth and increased risk of insect and disease damage to the stand and reduced risk of uncharacteristically severe wildfire.

Insects

Approximately 40% of the recommended thinning in KLAs would receive the modified prescription, resulting in moderately denser stands than the standard thinning. There would be a reduced benefit from the thinning, and the stands would need to be re-thinned within 40 years to retain a degree of protection from insects.

Disease

The effects on disease would be much the same as the standard thinning, with the main effect being the need to thin again within 40 years to maintain tree vigor and resistance to disease.

Fire

The effects on fire would be primarily the need to retain the additional understory trees that are left for wildlife cover. This may preclude prescribed burning not only the stands with a modified thinning prescription, but also surrounding stands that are in the same logical burning block.

Wildlife

Tree stocking and canopy closure will be reduced in all treatment units, likely reducing the quality of some habitats for wildlife movement and dispersal. Nevertheless, LRMP Amendment 2 standards will be met in the LRMP2 corridors. Harvest on 171 acres within LRMP2 corridors would have negligible effect on the overall corridor system. Lynx movement and dispersal guidelines would be met in the KLA. Connectivity habitat would be sufficient to provide movement and dispersal of wildlife species across the landscape.

Retention of additional trees in the understory may provide some additional protection for smaller animals using these corridors. Approximately 66% of the KLA would have stands that are in the top 1/3 of potential canopy closure, reduced by 9% from the no action alternative.

Management activities would reduce risk of uncharacteristically severe disturbance events that could reduce or alter connectivity habitat and isolate wildlife populations.

ALTERNATIVE 3—Connectivity for Wildlife

In the KLA, 1,013 of 2,619 acres (38.6%) recommended for mechanical treatment would receive the modified prescription. In the LRMP2 corridors, no acres would be treated.

Structural Stages

It is expected that the modified thinning prescription would add approximately 20 to 40 years to the time until it grows into the old forest structural stage, if the stands are not thinned again.

Resiliency and Sustainability

Insects

The approximately 20% of thinning treatments that would receive the modified prescription would result in moderately denser stands than the standard thinning. There will be a reduced benefit from the thinning, and the stands will need to be re-thinned within 40 years to retain a degree of protection from insects.

Disease

The effects on disease would be much the same as the standard thinning, with the main effect being the need to thin again within 40 years to maintain tree vigor and resistance to disease.

Fire

The effects on fire would be primarily the need to protect the additional understory trees that are retained for wildlife cover. This may preclude prescribed burning not only the stands with a modified thinning prescription, but also surrounding stands that are in the same logical burning block.

Wildlife

Tree stocking and canopy closure would be reduced in all treatment units, likely reducing the quality of some habitats for wildlife movement and dispersal. No harvest treatments would be conducted in the LRMP2 corridors. *LRMP* Amendment 2 standards will be met in the LRMP2 corridors. Prescribed burning would likely kill some but not all understory trees. Overall canopy closure would likely remain the same. Tree densities would meet or exceed 180 trees per acres where they currently exist. Lynx movement and dispersal guidelines would be met in the KLA. Connectivity habitat would be sufficient to provide movement and dispersal of wildlife species across the landscape. Retention of additional trees in the understory may provide some additional protection for smaller animals using these corridors. Approximately 66% of the KLA would have stands that are in the top 1/3 of potential canopy closure.

Management activities would reduce risk of uncharacteristically severe disturbance events that could reduce or alter connectivity habitat and isolate wildlife populations.

ALTERNATIVE 4—Connectivity for Wildlife

In the KLA, 511 of 847 acres (73.5%) recommended for mechanical treatment would receive the modified prescription. In the LRMP2 corridors, only 38 acres will be mechanically treated, an incidental amount of acres relative to the entire LRMP2 corridor system. Alternative 4 would not harvest any overstory trees, so canopy closure following treatment would be greater than would be expected under the other action

alternatives. There would be minimal change in the effects on insects, disease, or wildfire, compared to the standard precommercial thinning.

Structural Stages

It is expected that the modified precommercial thinning prescription would add approximately 20 years to the time until it grows into the old forest structural stage, if the stands are not thinned again.

Resiliency and Sustainability

Insects

The approximately 74% of the thinning that would be the modified prescription in this alternative will result in moderately denser stands than the standard thinning. There would be a reduced benefit from the thinning, and most importantly, the stands would need to be re-thinned within 40 years to retain a degree of protection from insects.

Disease

The effects on disease would be much the same as the standard thinning, with the main effect being the need to thin again within 40 years.

Fire

The effects on fire will be primarily the need to protect the additional understory trees that are retained for wildlife cover. This may preclude prescribed burning not only the stands with a modified thinning prescription, but also surrounding stands that are in the same logical burning block.

Wildlife

Treatment will not affect overstory trees; smaller trees would be thinned from below. Canopy closures would likely remain at or above the top 1/3 of site potential. Precommercial thinning and burning would reduce understory tree densities but stocking levels would remain at or above 180 trees per acres where they currently exist. Harvest on 38 acres within LRMP2 corridors would have negligible effect on the overall corridor system. LRMP Amendment 2 standards would be met in the LRMP, Amendment 2 corridors.

Lynx movement and dispersal guidelines would be met in the KLA. Approximately 74% of the KLA would have stands that are in the top 1/3 of potential canopy closure, a 1% reduction from the existing condition. Little change to lynx dispersal and movement would be expected.

Connectivity habitat would be sufficient to provide movement and dispersal of wildlife species across the landscape. Retention of additional trees in the understory may provide some additional protection for smaller animals using these corridors.

Management activities would likely do little to reduce risk of uncharacteristically severe disturbance events that could reduce or alter connectivity habitat and isolate wildlife populations.

ALTERNATIVE 5—Connectivity for Wildlife

In the KLA, no acres would receive the modified prescription. Standard silvicultural prescriptions would be used to increase tree growth rates and reduce insect, disease and wildfire risk. In the *LRMP*, Amendment 2 corridors, only 220 acres would be mechanically treated, an incidental amount of acres relative to the entire LRMP2 corridor system. LRMP2 corridors would be managed to meet the top 1/3rd of canopy closure, but tree stocking could be reduced below 180 trees per acre.

Structural Stages

It is expected that the modified thinning prescription would add approximately 20 to 40 years to the time until it grows into the old forest structural stage, if the stands are not thinned again.

Resiliency and Sustainability

Insects

The small percentage of the thinning that would receive the modified prescription in this alternative would result in moderately denser stands than the standard thinning. There will be a reduced benefit from the thinning, and the stands would need to be re-thinned within 40 years to retain a degree of protection from insects.

Disease

The effects on disease would be much the same as the standard thinning, with the main effect being the need to thin again within 40 years to maintain tree vigor and resistance to disease.

Fire

The effects on fire would be primarily the need to protect the additional understory trees that are retained for wildlife cover. This may preclude prescribed burning not only the stands with a modified thinning prescription, but also surrounding stands that are in the same logical burning block.

Wildlife

Tree stocking and canopy closure would be reduced in all treatment units, likely reducing the quality of some habitats for wildlife movement and dispersal.

LRMP Amendment 2 standards would be met in the LRMP2 corridors. Canopy closure will be maintained in the top 1/3rd or site potential. Prescribed burning would likely kill some but not all understory trees. Harvest on 220 acres within LRMP2 corridors would have negligible effect on the overall corridor system.

In the KLA, canopy closures in harvest units may fall below the top 1/3 of site potential. Tree stocking could fall below 180 trees per acre with understory densities being reduced the most. Koehler (1990) reports that lynx may not use stands that are thinned below 180 trees per acre for movement and dispersal.

Approximately 56% of the KLA would have stands that are in the top 1/3 of potential canopy closure, a reduction 20% from the existing condition.

Management activities would reduce risk of uncharacteristically severe disturbance events that could reduce or alter connectivity habitat and isolate wildlife populations.

4.3.12—ISSUE 1.4.12—EFFECTS OF MANAGING ROADLESS AREAS

Roadless areas provide large, relatively undisturbed landscapes, which are important to biological diversity and the survival of species dependent upon the "undisturbed character," of these areas. Management of the Dixie Butte and Greenhorn Mountain Roadless Areas may alter this character as well as the quality of dispersed outdoor recreation for undisturbed open space and natural settings.

BACKGROUND:

Dixie Butte and Greenhorn Mountain Roadless Areas are both LRMP "Appendix C" designated roadless areas.

The Dixie Butte Roadless Area encompasses approximately 7,865 acres. About 2,870 acres (36%) are in Dry Forest, 3,880 acres (49%) are in Moist Forest, 200 acres are in lodgepole forest, (3%), and 415 acres (5%) are in Cold Forest. The remaining acres are in natural openings, such as meadows, grasslands, shrublands, and talus slopes scattered across the area with the majority in the subalpine areas at the summit of Dixie Butte.

The areas within the Dixie Butte Roadless Area that are recommended for mechanical treatment in Alternatives 2, 4, and 5 have been previously altered by past railroad logging (1910—1940 era) that removed

most of the large trees. The stands have grown back and now support young stands of mixed conifer species. Approximately 200 acres of the area that was railroad logged was precommercial thinned in the 1960s or 1970s, the balance of the area is heavily overstocked.

The Greenhorn Mountain Roadless Area encompasses approximately 6,520 acres. About 1,145 acres (18%) are in Dry Forest, 2,655 acres (41%) are in Moist Forest, 520 acres are in lodgepole forest, (8%), and 1,150 acres (18%) are in Cold Forest. The remaining acres are in natural openings, such as meadows, grasslands, shrublands, and talus slopes scattered across the area.

The areas within Greenhorn Mountain Roadless Area recommended for burning have been previously altered by timber harvest. Logging has been relatively light with a minor amount of railroad and truck logging occurring along the edges of the roadless area, primarily in the Dry Forest types. There are no mechanical treatment activities recommended in the Greenhorn Mountain Roadless Area, some prescribed burning is planned for the Dry Forest.

The areas recommended for treatment are Dry Forests or portions of the Moist Forest that are all considered short fire return interval forests. The objective of treatment is to grow these stands into a condition that resemble and function like as they did before they were altered by harvest and suppression of fire. Objectives include improving the sustainability and resiliency of the stands by reducing stocking, shifting the species composition towards a greater proportion of ponderosa pine and western larch, and reducing fire risk reducing accumulated ground and ladder fuels.

Most of the Dry and Moist Forest types were recommended for mechanical treatment, but other resource concerns and meeting LRMP standards reduced the amount of treatment carried forward in each alternative. Treating these stands would accelerate the development of stands that replicate the historic conditions of large, fire adapted trees. Not treating these young, overstocked stands may result in reduced growth and increased risk of insect and disease damage to the stand and increased risk of uncharacteristically severe wildfire. The alternatives will be evaluated using acres of overstocked stands thinned.

The recommended treatments are consistent with the nationwide Roadless Area Conservation FEIS, which anticipates that of the 14 million acres of the short fire return interval forest type in roadless areas, over half (7.5 million) will require mechanical treatment before using prescribed fire. They are also consistent with the National Fire plan, in which hazardous fuel reduction is a key component to reverse decades of fire exclusion and lack of stocking level control.

RESOLUTION:

The following tables display mechanical and prescribed fire treatment acres within the roadless areas by alternative. None of the alternatives propose building new roads or reconstructing existing roads or railroad grades within the roadless areas. Effects discussions follow these tables.

Table 210—Acres of Treatment Within the Dixie Butte Roadless Area

Treatment	Alt. 1		Alt. 2		Alt. 3		Alt. 4		Alt. 5	
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Commercial Thin	0	0	530	7	0	0	0	0	580	7
Commercial/Pre-commercial Thin	0	0	230	3	0	0	0	0	515	7
Understory Removal	0	0	110	1	0	0	0	0	165	2
Pre-commercial Thin Only	0	0	0	0	0	0	175	2	0	0
Total Mechanical	**0**	**0**	**870**	**11**	**0**	**0**	**175**	**2**	**1260**	**16**
Prescribed Burn	**0**	**0**	**780**	**10**	**295**	**4**	**255**	**3**	**780**	**10**
Note: Both mechanical and prescribed fire acres may overlap. Note: Percentage values were calculated only for those portion of the roadless areas located within the project area. Treatment percentages would be lower if calculations were made over the entire roadless area.										

Table 211—Acres of Treatment Within the Greenhorn Mountain Roadless Area

Treatment	Alt. 1		Alt. 2		Alt. 3		Alt. 4		Alt. 5	
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Commercial Thin	0	0	0	0	0	0	0	0	0	0
Commercial/Pre-commercial Thin	0	0	0	0	0	0	0	0	0	0
Understory Removal	0	0	0	0	0	0	0	0	0	0
Pre-commercial Thin Only	0	0	0	0	0	0	0	0	0	0
Total Mechanical	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Prescribed Burn	**0**	**0**	**715**	**11**	**715**	**11**	**715**	**11**	**715**	**11**
Note: Percentage values were calculated only for those portion of the roadless areas located within the project area. Treatment percentages would be lower if calculations were made over the entire roadless area.										

Measures:

- Acres treated by mechanical treatment within the Roadless Areas.
- Acres treated by prescribed fire.

ALTERNATIVE 1—Roadless Areas

Alternative 1 does not include any mechanical or prescribed fire treatments in roadless areas.

Structural Stages

It is expected that the areas will naturally grow into the old forest structural stages in approximately 110 years without treatment.

Resiliency and Sustainability

Insects

The dense stands will be vulnerable to insect attacks, which can result in mortality and increased fuel loadings. Stands will be recycled into earlier structural stages, increasing the time it takes to grow into the larger sizes.

Disease

The effects on disease will be much the same as for insects, as densely stocked stands are less likely to be able to resist diseases.

Fire

It would be difficult to reintroduce fire into the stands that are not first mechanically treated to reduce the total amount of fuel. The continuous, overly dense stands are at risk for uncharacteristically severe wildfire and a

threat to the nearby settlements of Greenhorn, Bates and Austin, as well as scattered homes and other private property in the vicinity.

Wildlife

Approximately half of the roadless area is in the Dixie Butte Wildlife Emphasis Area, which permits timber harvest if it benefits wildlife habitat. Habitat is minimally fragmented and well connected. About 40% of the roadless area within the project area is in OFMS or OFSS; an additional 40% is in YFMS. In the Greenhorn Mountain Roadless Area, approximately 39% of the roadless area within the project area is in OFMS or OFSS; an additional 27% is in YFMS. Four dedicated old-growth areas (DOGs) have been delineated within the Dixie Butte and Greenhorn Mountain Roadless Area boundaries.

The upper elevation Cold Forest and Moist Forest of Dixie Butte Roadless Area is essentially untouched by timber harvest or road construction. The lower elevation Moist Forest and Dry Forest has been logged; skewing structural stages towards mid- and younger-structural classes, YFMS, UR, SEOC, and SECC. Some older roads extend into the roadless area along its edges, but are currently closed.

The Greenhorn Mountain Roadless Area is bisected by Forest Road 2010, which is used for recreation and mining access. Off the 2010 Road and other Forest roads around this roadless area are a number of old road beds and mining roads that reach into this roadless area. Most are quite primitive. Forest stands are similar to that of the Dixie Butte Roadless Area, but due to the predominately southern aspects of Greenhorn, these stands tend to be more open. However, as with Dixie, due to past management practices, forest stands are skewed towards mid- and younger structural stages.

Large, relatively undisturbed areas are important for species with large home ranges that are sensitive to human activity. Upper elevations of the Dixie Butte and Greenhorn Mountain Roadless Areas provide quality habitat for species that require large contiguous blocks of old-growth forest including such species as pileated woodpeckers, pine martens, and fishers. In the Cold and Moist Forests, snag and large down wood habitat meets or exceeds *LRMP* standards, and provides quality habitat for primary cavity excavators; the Dry Forest is deficient in these habitats. Insects and diseases would continue to kill trees, providing a sustained flow of dead wood habitat. In the Dry Forest, snags and down logs are likely to be of smaller size than is preferred by many cavity excavators.

Species which are particularly sensitive to habitat alteration or disturbance, such as wolverine, marten, fisher and lynx, likely benefit from the area's relatively undeveloped condition (Ruggiero et al 1994). Elk and deer use the area for both summer and winter range; elk, in particular, favor the isolated conditions for security and low level of disturbance.

Both the Dixie Butte and Greenhorn Mountain Roadless Areas may be more important now than in the past in supporting species viability and biodiversity, due to cumulative degradation and loss of other habitat in adjacent landscapes (i.e. Summit Fire area).

Due to the lower, elevation Dry Forests changes from past management, vegetation has resulted in habitat losses for species using OFSS such as the white-headed woodpecker. Conversely, increases in OFMS and YFMS have likely expanded habitats for such species as pileated woodpecker and pine marten to what once existed.

In the Dixie Butte Roadless Area, about 180 acres currently classify as OFSS. Historically, it is estimated that as much as 1,595 acres would have been in an OFSS condition. In the Greenhorn Mountain Roadless Area, about 390 acres currently classify as OFSS. Historically, it is estimated that as much as 1,025 acres would have been in an OFSS condition. Given current vegetation conditions, it is unlikely that habitat for white-headed woodpecker would increase without management.

Increased fuels accumulations raise the risk that large areas of habitat could be lost to wildfire. In the Dry Forests, habitat for pileated woodpeckers and pine martens may not be sustainable.

ATV use on the Davis Creek Trail provides the only motorized access into the Dixie Butte Roadless Area as designated by the LRMP. Wildlife use and dispersal may be altered when the trail is in use.

Recreation

Remoteness, Solitude, and Primitive Recreation Opportunities

Both roadless areas would continue to provide moderate opportunities for solitude and outdoor recreation. There would be no effect on remoteness because the vegetation and topography in the analysis area is such that summertime recreationists in roadless areas are usually not within the road system's noise and disturbance area of influence. Harvest of stands adjacent to the roadless areas may result in indirect, short-term effects on remoteness within the area. Potential effects include increased sights and sounds of helicopter, people, and equipment adjacent to or near these areas during potential harvest activity.

Opportunities for achieving a primitive experience are limited in Dixie Butte by the roadless area's shape and size in relation to existing access outside its boundaries. Greenhorn Mountain has the same concerns along the southern boundary but has better opportunity for a remote, secluded, primitive experience due to its relationship with the North Fork John Day Wilderness on the Umatilla National Forest to the north.

This alternative would not affect existing boundaries or the level of experiencing a the remoteness, solitude, and primitive recreation opportunities as they currently exist.

Natural Integrity

Ecological processes in the roadless areas have been slightly altered by grazing, recreational use, past mining activities, past logging activities, and fire suppression. This alternative would have no effect on the natural integrity of these areas as they exist today..

Apparent Naturalness

Evidence of human use and activities are unnoticeable on the higher elevation portions of the roadless areas except for hiking trails and mining access. Past human impacts are more noticeable and scattered throughout the lower elevations include hiking trails, old railroad grades, isolated cabins, past mining activities, and old stumps. The most visible impacts are from old existing roads, past mining activities, and remains of old railroad grades.

ALTERNATIVE 2—Roadless Areas

Alternative 2 treats about 13% of the Dixie Butte Roadless Area and 11% of the Greenhorn Mountain Roadless Area by mechanical harvest or prescribed fire.

Stage in Structural Stages

It is expected that the areas thinned would grow into the old forest structural stage in approximately 50 years, 60 years sooner than if the stands are not thinned. Species composition would shift to more fire tolerant ponderosa pine and western larch, which would facilitate prescribed burning and more resemble the natural stands that once grew in the Dry Forest Type.

Resiliency and Sustainability

Insects

The dense stands that are thinned would be less vulnerable to insect attacks, reducing future mortality and fuel loadings. Stands would be able to grow into larger structural stages, decreasing the time it takes to develop into the larger sizes, compared to no action.

Disease

The effects on disease would be much the same as for insects, as less densely stocked stands are more likely to be able to resist diseases.

Fire

It would be easier to reintroduce fire into the stands that are first mechanically treated to reduce the total amount of fuel. Thinning and subsequent underburning would reduce the risk for severe wildfire behavior and threat to the nearby settlements of Greenhorn, Bates and Austin, as well as scattered homes and other private property in the vicinity.

Wildlife

Mechanical and prescribed fire treatments are concentrated in the Dry Forests and some in the Moist Forests of Dixie Butte with only prescribe fire in Greenhorn Mountain. No treatments occur in the Cold or Lodgepole Forest types.

In the Dixie Butte Roadless Area, commercial and precommercial thinning treatments on 870 acres would reduce canopy cover and stand complexity. Harvest treatment converts stands from YFMS and UR to younger structural stages, primarily UR and SEOC. Habitat would be degraded or lost for species that prefer high canopy cover and complex structure stands, e.g., pileated woodpecker and pine marten. It should be noted that these stands, even prior to treatment, are considered relatively low quality habitat for these species. Thinning treatments are less fragmenting than other harvest methods.

Treatments were specifically designed to restore habitat for white-headed woodpeckers and other species that prefer open park-like stands of old growth, even at the expense of habitat for species like the pileated woodpecker and pine marten. Following harvest treatments, stand density and canopy cover in SEOC and UR stands would be relatively low, but individual tree growth would be high. Harvest and underburning would accelerate development of large diameter trees. Stands in the SEOC and UR stage would likely take 50 years to develop into old growth versus 110 years under the no action alternative. Species viability for pileated woodpecker and pine marten would still be maintained in the project area; species viability for white-headed woodpecker would improve.

In the Dixie Butte Roadless Area, understory removal would convert 125 acres of OFMS to OFSS to the benefit of species such as the white headed woodpecker. Total acres of OFSS in the roadless area would increase from 180 acres to 305 acres.

The Roadless Area Conservation FEIS (USDA 2000) concluded that thinning from below to reduce fire risk or to enhance old growth has the least impact on fragmentation and connectivity, as compared to various other management activities.

Prescribed fires would be expected to burn in a mosaic mimicking historic patterns. Some cover would be expected to be lost, however, burning prescriptions limit overstory mortality to 10% and understory mortality to 85%. In recent prescribed burns on the Forest, mortality levels have rarely reached these thresholds.

No new roads would be constructed. Disturbance to wildlife would be limited to the times when mechanical and fire treatments are being implemented. Individual animals may be displaced or avoid areas during operations. Animals would likely move to higher elevations during operations; these areas provide the highest quality habitat. Impacts would be minimal.

In the Dixie Butte Roadless Area, logging would be conducted via tractor logging along the periphery of the roadless area and by helicopter logging elsewhere. Management activities do increase the risk of introduction or establishment of nonnative invasive species, which could degrade habitat. Mitigation described in Chapter 2 should keep risks low.

Species which are particularly sensitive to habitat alteration or disturbance, such as wolverine, marten, fisher and lynx, may use treated areas less or not all, and could essentially reduce the size of core areas being used by these species.

Elk and deer are habitat generalists, using a variety of habitats. Forage may be some what limited in the roadless areas due to elevated tree densities and canopy closures. Treatments that create or restore and

maintain a mixture of habitats and a variety of age classes are generally beneficial. The combination of opening canopies and underburning would improve forage.

Connectivity may be reduced in the lower elevation, Dry Forests; however, sufficient wildlife corridors will be maintained to meet connectivity between blocks of old growth habitat as directed by the *LRMP*.

In the Greenhorn Mountain Roadless Area, effects would be limited to those described above for prescribed burning

Mechanical treatments and prescribed fire would reduce wildfire intensity by reducing accumulated fuels in the Dry Forests. Treatments would increase the survivability of large, old growth pines following wildfire, reduce tree mortality from moisture stress, reduce insect and disease outbreaks in stressed stands, help restore fire dependent herbs and shrubs, and restore the local fire regime. The risk of losing large blocks of terrestrial habitat would be reduced.

Even though some timber harvest and prescribed fire activities are intended to mimic the effects of natural disturbances, there is little known about the long-term ecological legacies of such treatments. It is not clear how managed area would compare to areas where natural disturbance processes have played a more dominant role in controlling succession pathways, landscape mosaics, and ecosystem composition (USDA 2000).

ATV use would continue on the Davis Creek Trail. Trail reconstruction is not expected to increase use levels. Effects would be as described in Alternative 1.

Recreation

Remoteness, Solitude, and Primitive Recreation Opportunities

No new roads would be constructed. Timber harvest by thinning would be limited to the Dixie Butte Roadless Area. The increased sights and sounds of people and equipment during helicopter yarding and tractor skidding would result in direct, short-term effects on the qualities of remoteness and solitude. Old forest structure, which is a favored recreational forest type, would develop sooner. Approximately 12 miles of motorized trail is currently located within the roadless area. ATV users, snowmobilers, and some hunters utilize motor vehicles to gain access to the area utilizing closed road, old railroad grades, and associated trails as corridors for their activity.

Natural Integrity

Harvest would reduce the amount of future large woody material. Neither activity is expected to substantially alter the natural integrity of the area. Planting a mix of seral species (grown from locally collected seed) would speed up the process faster than if the area was not planted.

Apparent Naturalness

Noticeable human impacts from helicopter and tractor logging in Dixie Butte Roadless area would include stumps, marking paint, logging slash, and thinner, more open stands on the harvested acres. Following harvest treatment, the area would appear more open and would be visible as a mosaic of openings. Harvested areas would vary in shape and size. A few units may dominate the surrounding landscape, but overall, the treated stands would borrow from the naturally occurring mosaic of trees and non-forested openings visible from higher elevations.

ALTERNATIVE 3—Roadless Areas

Alternative 3 does not include any mechanical treatments in roadless areas but some prescribed fire would be implemented. Prescribed fire would be used in both Dixie Butte and Greenhorn Mountain Roadless Areas as described in the tables above. Treatment acres are reduced from 1,495 acres in Alternative 2 to

1,010 acres in this alternative. About 4% of the Dixie Butte Roadless Area and 11% of the Greenhorn Mountain Roadless Area would be treated.

Structural Stages

Effects are the same as the No Action Alternative (Alt. 1).

Resiliency and Sustainability

Insects

Effects are the same as the No Action Alternative (Alt. 1). The dense stands will be vulnerable to insect attacks, which can result in mortality and increased fuel loadings. Stands will be recycled into earlier structural stages, increasing the time it takes to grow into the larger sizes.

Disease

The effects on disease will be much the same as for insects, as densely stocked stands are less likely to be able to resist diseases.

Fire

In the future, it will be difficult to reintroduce fire into the stands that are not first mechanically treated to reduce the total amount of fuel. The continuous, overly dense stands are at risk for severe wildfire behavior and a threat to the nearby settlements of Bates and Austin, as well as scattered homes and other private property the vicinity.

Wildlife

The effects would be as described for prescribed burning in Alternative 2. ATV use would continue on the Davis Creek Trail. Trail reconstruction is not expected to increase use levels. Effects would be as described in Alternative 1.

Recreation

Effects are the same as the No Action Alternative (Alt. 1).

ALTERNATIVE 4—Roadless Areas

Alternative 4 does not include any commercial harvest treatments; there are 175 acres of precommercial thinning within the Dixie Butte Roadless Area. Prescribed fire would be used in both Dixie Butte and Greenhorn Mountain Roadless Areas as described in the tables above. Treatment acres are reduced from 1,495 acres in Alternative 2 to 970 acres in this alternative. About 5% of the Dixie Butte Roadless Area and 11% of the Greenhorn Mountain Roadless Area would be treated.

Structural Stages

It is expected that the precommercial thinning prescription will reduce approximately 10 years from the time until it grows into the old forest structural stage, if the stands are not thinned again in the future. There will be slight positive change in the effects on structural stages, insects, disease, or wildfire, compared to Alternative 1.

Resiliency and Sustainability

Insects

There will be a minor benefit from the thinning from thinning the understory. The stands will need to be re-thinned in the future to retain a degree of protection from insects.

Disease

The effects on disease will likely be negative, since the overstory is not thinned out. Mistletoe will still be able to spread to adjacent trees and infected trees will not be able to outgrow the upward spread. Root and stem diseases will be able to spread better than in an unthinned stand, since the cut stumps can be infection pathways and the precommercial thinning only not reduce the proportion of late seral species to a low enough level to reduce disease spread.

Fire

The effects on fire will be the retention of the dense overstory and not improving the access. A dense overstory with ladder fuels makes the reintroduction of fire difficult. This alternative does not improve the existing primitive access road; therefore, no prescribed burning is planned since it would be hazardous to attempt without good escape routes. This may preclude prescribed burning not only the stands with only a precommercial thinning prescription, but also surrounding stands that are in the same logical burning block.

Wildlife

By prohibiting commercial timber harvest and road construction, Alternative 4 would provide a greater likelihood that terrestrial species and habitats would be maintained at current levels. Overall effects would be similar to Alternative 3. Individual animals may be disturbed during precommercial thinning operations but effects are limited to a very small area. Thinning smaller trees would remove lower level cover, likely degrading habitat for species such as marten. Effects, however, would be considered negligible.

Alternative 4 eliminates ATV use on the Davis Creek Trail reducing potential disturbance to wildlife. Those species more sensitive to disturbance, such as wolverine, northern goshawk, and rocky mountain elk, would likely benefit. Habitat effectiveness would be greater than under any of the other alternatives including the no-action alternative.

Recreation

The effects of Alternative 4 on recreation are the same as discussed above for the No Action Alternative (Alt. 1).

ALTERNATIVE 5—Roadless Areas

In the Dixie Butte Roadless Area, Alternative 5 treats the most acres, 24% of the roadless area as compared to 13% under Alternative 2, the next most intensive alternative. There would be a proportional increase in effects. In the Greenhorn Mountain Roadless Area, Alternative 5 is identical to Alternative 2 in treatments and expected effects.

Structural Stages

It is expected that the areas thinned will grow into the old forest structural stage in approximately 50 years, 60 years sooner than if the stands are not thinned. Species composition will shift to more fire tolerant early seral species, which will facilitate prescribed burning and more resemble the natural stands that once grew in the Dry Forest Type.

Resiliency and Sustainability

Insects

The dense stands that are thinned will be less vulnerable to insect attacks, reducing future mortality and fuel loadings. Stands will be able to grow into larger structural stages, decreasing the time it takes to grow into the larger sizes compared to no action.

Disease

The effects on disease will be much the same as for insects, as less densely stocked stands are more likely to be able to resist diseases.

Fire

It will be easier to reintroduce fire into the stands that are first mechanically treated to reduce the total amount of fuel. Thinning and subsequent underburning will reduce the risk for severe wildfire behavior and threat to the nearby settlements of Bates and Austin, as well as scattered homes and other private property in the vicinity.

Wildlife

Effects would be similar to Alternative 2. In the Dixie Butte Roadless Area, effects would be proportionately increased based on increased acres treated. This alternative more aggressively manages for OFSS habitat. Species, such as the white-headed woodpecker would benefit at the expense of habitat for such species as pileated woodpecker and pine marten. Species viability for pileated woodpecker and pine marten would still be maintained; species viability for white-headed woodpecker would improve.

ATV use would continue on the Davis Creek Trail. Trail reconstruction is not expected to increase use levels. Effects would be as described in Alternative 1.

Recreation

Remoteness, Solitude, and Primitive Recreation Opportunities

No new roads would be constructed. Timber harvest will be done on 1,366 acres in the Dixie Butte Roadless Area. The increased sights and sounds of people and equipment during helicopter yarding and tractor skidding will result in direct, short-term effects on the qualities of remoteness and solitude. Removing stands of trees will result in short-term loss of vegetation screening, which may reduce opportunities for solitude until new trees become established. Once new tree seedlings and shrubs are established, the area will again provide moderate opportunities for solitude. Old forest structure, which is a favored recreational forest type, would develop sooner. Approximately 12 miles of motorized trail is currently located within the roadless area. ATV users, snowmobilers, and some hunters utilize motor vehicles to gain access to the area utilizing closed road, old railroad grades, and associated trails as corridors for their activity.

Natural Integrity:

Harvest will reduce the amount of future large woody material. Planting may produce slightly different genetic stock into the existing gene pool. Neither activity is expected to substantially alter the natural integrity of the area. Planting a mix of seral species (grown from locally collected seed) will speed up the process faster than if the area was not planted.

Apparent Naturalness

Noticeable human impacts from helicopter logging will include stumps, marking paint, logging slash, and thinner, more open stands on the harvested 1,366 acres in Alternative 5. These effects will become less visible once ground vegetation is re-established, but may continue to impact the apparent naturalness of the area until stumps have decomposed and new stands are well established. Following harvest treatment, the area will appear more open and will be visible as a mosaic of gray, and partially stocked openings. Harvested areas will vary in shape and size. A few units may dominate the surrounding landscape, but overall, the treated stands will borrow from the naturally occurring mosaic of timber and non-forested openings visible from higher elevations.

4.4—SOCIO-ECONOMIC EFFECTS

4.4.1 TIMBER-HARVEST RELATED EMPLOYMENT

Introduction

The primary effect on timber-harvest related employment would occur from recommended commercial harvesting associated with the alternatives over the next several years. Financially viable sales would be necessary to provide opportunities for timber-harvest related employment. Employment opportunities provided by recommended timber harvesting would continue to employ some residents of Grant, Umatilla and Union counties. Based on the current annual mill capacity of 401 MMBF, the mills in these counties would utilize the estimated volume from the project. Levels of harvest volume by alternative would affect employment and income in several ways:

- *Directly*—(effects attributable to employment associated with harvesting, logging, mills and processing plants for saw timber, pulp, chips, veneer and plywood)
- *Indirectly*—(effects attributable to industries that supply materials, equipment, and services to these businesses)
- *induced*— (effects attributable to personal spending by the business owners, employees, and related industries).

Employment effects from recreation and domestic-livestock grazing activities were not analyzed because the level of use was not expected to change measurably by alternative. For a comparison of the financial viability of the harvest proposals by alternative, refer to the section below on "Financial Viability of Timber Harvesting".

ALTERNATIVE 1—Timber-Harvest Related Employment

No harvest related activities would occur and therefore, no contribution to direct, indirect, or induced employment and income associated with timber harvesting would result from the project. Declining trends in timber harvesting from NFS lands would continue in the future and contribute to declines in wood products employment over the next two decades. Changes in the economic base and wood products infrastructure for the impact area would also continue to be influenced by fluctuations in market prices, international market conditions, changes in technology and industry restructuring.

ALTERNATIVE 2—Timber-Harvest Related Employment

Alternative 2 would provide 45 MMBF and support approximately 251 direct jobs associated with harvesting, logging, mills and processing plants for saw timber, pulp, chips, veneer and plywood and $7.0 million (2001$) in income over the next three years of the project. Alternative 2 would contribute four percent (15 MMBF) toward the annual mill capacity and support four percent of the lumber and woods products employment (84 jobs) annually for the next three years. Including indirect and induced effects would support 402 total jobs and $11.2 million total income over the duration of the project.

The overall employment and income effect would continue to support the wood products manufacturing component of the economic base of the impact area. The magnitude of the economic effects would be limited to three years associated with the harvesting activities. Any individual county or community in the impact area could experience greater benefits in the short-term (2-3 years) particularly the communities very highly specialized in wood products manufacturing such as John Day. For example, the annual average direct employment effects (84 jobs) would support about 26 percent of the annual average employment in the lumber and wood product manufacturing in Grant County if the local processors were successful in acquiring the majority of the offered volume.

Several factors would influence the ability of any one county or community to experience the largest extent of the harvest-related employment and income effects. Among those factors are, the financial viability of the timber sale proposals, market conditions, quality and quantity of the volume offered for sale, timing of the offerings, and financial conditions of local firms.

Additionally, Alternative 2 proposes harvesting about 31 percent of the volume with helicopter logging systems. No helicopter- based contractors currently reside in the impact area and associated equipment and skills would potentially have to be acquired outside the impact area. This would potentially reduce total employment to 277 jobs.

The distribution of economic impacts would depend on the location of the timber purchaser awarded the contracts at the time of the sale, the availability of equipment and skills in the impact area, and the location and availability of the wood processing facilities and related infrastructure. Processors outside of Grant, Umatilla and Union counties would potentially bid on the sales and distribute the jobs and income effect to other counties in the Blue Mountains or outside of the area entirely. The same factors would influence all action alternatives proportionately.

ALTERNATIVE 3—Timber-Harvest Related Employment

Economic impacts in Alternative 3 from timber harvest related employment and income would be approximately 25 percent less compared to Alternative 2. Alternative 3 would provide 34 MMBF and support approximately 188 direct jobs associated with harvesting, logging, mills and processing plants for saw timber, pulp, chips, veneer and plywood and $5.2 million (2001$) in income over the next three years of the project. Alternative 3 would contribute three percent (11 MMBF) toward the annual mill capacity and support three percent of the lumber and woods products employment (63 jobs) annually for the next three years. Including indirect and induced effects would support 301 total jobs and $8.4 million total income over the duration of the project.

ALTERNATIVE 4—Timber-Harvest Related Employment

Alternative 4 would not harvest any timber and therefore, would have similar effects as Alternative 1. Effects associated with other restoration work in the project are described below under “Restoration Opportunities for Local Communities”.

ALTERNATIVE 5—Timber-Harvest Related Employment

Economic impacts from timber harvest related employment and income would be approximately 26 percent more compared to Alternative 2. A combination of commercial thinning, shelterwood, salvage, understory removal and small tree thinning under Alternative 5 would provide 56 MMBF and support approximately 317 direct jobs associated with harvesting, logging, mills and processing plants for saw timber, pulp, chips, veneer and plywood and $8.8 million (2001$) in income over the next three years of the project. Alternative 5 would contribute five percent (19 MMBF) toward the annual mill capacity and support six percent of the lumber and woods products employment (106 jobs) annually for the next three years. Including indirect and induced effects would support 507 total jobs and $14.1 million total income over the duration of the project.

Refer to the following table for an illustration of employment and income effects from timber harvesting by alternative.

Table 212 Timber-harvest Related Employment and Income by Alternative

	ALT. 1	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Employment					
Direct	0	251	188	0	317
Total direct, indirect and induced	0	402	301	0	507
Per cent change	0%	0%	-25%	-100%	+26%
Income					
Direct	$0	$7.0 million	$5.2 million	$0	$8.8 million
Total direct, indirect and induced	$0	$11.2 million	$8.4 million	$0	$14.1 million
% change	0%	0%	-25%	-100%	+26%

4.4.2 RESTORATION OPPORTUNITIES FOR LOCAL COMMUNITIES

Introduction

The primary effect on local communities would be in terms of employment provided by preparation, implementation and administration of restoration and enhancement activities by alternative. The alternatives provide a variety of activities that would require widely varying equipment and skills. The level of benefit to local communities would depend on the capacity of existing contractors residing in the area in terms of skills and equipment, the labor force available to these contractors, the amount of existing work they have under contract, their desire to acquire larger contracts, new contractors seeking opportunities, and other contracting requirements such as programs for small businesses. The level would also depend on the amount of funding received for activities over the next 10 years.

The cost of the anticipated activities by type of work provides a relative proxy for comparing total potential benefit by alternative over the next ten years. The estimated benefit to local communities in Grant County was determined based on the cost of the work associated with road maintenance, reconstruction and construction, culvert replacement, grapple piling, roadside brushing, fish passage, thinning, pruning, cone surveys, fencing, hand piling, and stand exams or activities requiring similar type skills and equipment.

ALTERNATIVE 1—Restoration Opportunities for Local Communities

No restoration or enhancement related activities would occur under the no-action alternatives and therefore, no employment and income in local communities would be supported.

ALTERNATIVE 2—Restoration Opportunities for Local Communities

Alternative 2 would provide for a variety of aquatic, vegetation and infrastructure activities totaling $5.8 million.

Hydrology and fisheries restoration and enhancement activities such as streamside/riparian hardwood protection, planting, channel and streamside activities, improving existing structures, and riparian planting would require hand placement of materials and planting which would be very labor intensive. These opportunities totaling $1.7 million would likely be completed with 50-70 percent volunteer labor as in the

past, however, the activities would enhance efforts to train residents in these needed skills locally for potential opportunities in the next five years. Purchasing of materials such as fencing supplies would likely benefit local businesses in Grant County.

In the next five years, some small equipment would be utilized to construct new instream structures. Channel and floodplain rehabilitation would require larger heavy equipment such as excavators, backhoes, and bulldozers to complete the work. Culvert removal would potentially require a combination of both large and small equipment. Equipment and skills are already available in the area and these activities would support continued employment in these areas.

Vegetation associated activities such as precommercial thinning, fire line construction by hand and machine for prescribed burning, hand piling and burning, subsoiling, conifer planting, gopher control measures, competing vegetation control by chemicals, yarding tops, snag protection, and aspen enhancement would require a combination of labor intensive hand work and equipment. Aspen enhancement work would provide small contracting opportunities for building fence. Noxious weed control would occur under Alternative 2 by a combination of manual and chemical treatment methods. Skilled, certified applicators would be required for this work. Some of these skills and necessary equipment are available in communities in the impact area to accomplish these opportunities totaling $1.0 million. Local efforts to train residents for stewardship restoration work would also be enhanced.

Infrastructure activities for road construction, reconstruction and decommissioning would require heavy equipment that would support locally available skills and equipment over the next 10 years. Beyond 10 years, there would be a decrease in road maintenance work due to repairing roads and reducing total road miles. Trailhead/trails/dispersed camp development would potentially provide training opportunities for local residents to become better skilled as contractors. Opportunities for potential employment related to infrastructure activities would total $2.4 million.

Approximately $4.4 million or 76 percent of the total restoration and enhancement activities would be available to maintain or enhance local skills and equipment to support local employment over the next 10 years. On an annual basis, Alternative 2 would contribute 117 percent of the average annual value acquired by local contractors in Grant and Harney counties.

ALTERNATIVE 3—Restoration Opportunities for Local Communities

Alternative 3 would reduce total aquatic, vegetation and infrastructure activities by 10percent compared to Alternative 2 for a total of $5.2 million.

Aquatic related opportunities would be reduced under Alternative 3 to $1.5 million total. The channel/floodplain rehabilitation project and new instream structures would not occur under Alternative 3. Opportunities to support small and heavy equipment and associated skills would not occur. Other opportunities to support labor intensive, handwork would continue as described for Alternative 2.

Opportunities for employment associated with vegetation activities would be reduced by 30 percent primarily due to reductions in precommercial thinning and treatment of the slash, and a lesser amount of prescribed burning. Aspen enhancement would be the same as Alternative 2 and require small opportunities for fence construction. Chemical treatment of noxious weeds would not occur under Alternative 3 and eliminate the need for certified applicators. Vegetation opportunities would total $780,000.

Infrastructure activities for road construction, reconstruction and decommissioning would be slightly reduced by 3 percent, but would continue to support locally available skills and equipment over the next 10 years. Trailhead/trails/dispersed camp development would be the same as Alternative 2 and would

potentially provide training opportunities for local residents to become better skilled as contractors. Opportunities for potential employment related to infrastructure activities would total $2.3 million.

Approximately $4.1 million or 78 percent of the total restoration and enhancement activities would be available to maintain or enhance local skills and equipment to support local employment over the next 10 years. On an annual basis, Alternative 3 would contribute 107 percent of the average annual value acquired by local contractors in Grant and Harney counties.

ALTERNATIVE 4—Restoration Opportunities for Local Communities

Alternative 4 would reduce total aquatic, vegetation and infrastructure activities by 22 percent compared to Alternative 2 for a total of $4.5 million. Aquatic related opportunities would be the same as Alternative 3.

Opportunities for employment associated with vegetation activities would be reduced by 28 percent primarily due to reductions in precommercial thinning, treatment of the slash, and a lesser amount of prescribed burning. Aspen enhancement would be the same as Alternative 2 and require small opportunities for fence construction. Chemical treatment of noxious weeds would not occur under Alternative 4 and eliminate the need for certified applicators. Vegetation opportunities would total $800,000.

Infrastructure activities for road construction, reconstruction and decommissioning would be reduced the most compared to Alternative 2 by 32 percent, but would continue to support locally available skills and equipment over the next 10 years. Trailhead/trails/dispersed camp development would also be reduced the most by 16 percent but would continue to provide opportunities for local residents to become better skilled as contractors. Opportunities for potential employment related to infrastructure activities would total $1.7 million.

Approximately $3.5 million or 76 percent of the total restoration and enhancement activities would be available to maintain or enhance local skills and equipment to support local employment over the next 10 years. On an annual basis, Alternative 4 would contribute 94 percent of the average annual value acquired by local contractors in Grant and Harney counties.

ALTERNATIVE 5—Restoration Opportunities for Local Communities

Alternative 5 would provide a similar level compared to Alternative 2 for aquatic, vegetation and infrastructure activities totaling $5.8 million.

Aquatic related opportunities would be the same as Alternative 2. Vegetation related activities would be greater in terms of total amount of work to be completed but at a lesser cost reducing the overall opportunities by 23 percent primarily associated with pre-commercial thinning, slash treatment and prescribed burning. However, road construction, reconstruction and decommissioning and opportunities associated with recreation would offset this reduction by a 10 percent increase compared to Alternative 2.

Approximately $4.4 million or 76 percent of the total restoration and enhancement activities would be available to maintain or enhance local skills and equipment to support local employment over the next 10 years. On an annual basis, Alternative 5 would contribute the same level as Alternative 2 (117 percent) of the average annual value acquired by local contractors in Grant and Harney counties.

Refer to the following Table 213 for an illustration of local restoration and enhancement activities by alternative.

Table 213 Estimate of Local Restoration and Enhancement Activities by type of work

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Hydrology	0	$891,950	$891,950	$891,950	$891,950
Fisheries	0	$101,520	$101,520	$101,520	$101,520
Vegetation	0	$846,839	$590,546	$609,770	$654,950
Roads	0	$1,964,000	$1,907,000	$1,333,000	$2,163,500
Recreation	0	$385,500	$385,500	$325,500	$385,500
Aspen Enhancement	0	$178,505	$178,505	$178,505	$178,505
Total	0	$4,368,314	$4,055,021	$3,440,245	$4,375,925

4.4.3 POPULATION CHANGES

Introduction

Assuming residents gainfully employed would continue to reside in the area, the primary effect on population in Grant County would be from potential changes in timber-harvest related employment and restoration-related employment from project related activities. Refer to the sections on "Timber-Harvest Related Employment" and "Restoration Opportunities for Local Communities" for further description of these effects.

ALTERNATIVE 1—Population Changes

For the No-Action alternative, no additional employment opportunities would be created

Population would continue to increase for northeast Oregon counties at various rates depending on location to population centers, transportation routes, employment opportunities and amenities.

Overall population density and trends would continue. Population growth in Grant County would likely continue at a slower rate than other areas of the state over the next 10 years.

ALTERNATIVES 2, 3, 4 and 5—Population Changes

Alternative 2 contributes timber-harvest related employment that supports four percent of the lumber and woods products employment annually for the next three years and would contribute 117 percent of the average annual value acquired by local contractors in Grant and Harney counties.

Alternative 3 contributes timber-harvest related employment that supports three percent of the lumber and woods products employment annually for the next three years and would contribute 107 percent of the average annual value acquired by local contractors in Grant and Harney counties.

Alternative 4 would not support lumber and woods product employment and would contribute 94 percent of the average annual value acquired by local contractors in Grant and Harney counties.

Alternative 5 contributes timber-harvest related employment that supports five percent of the lumber and woods products employment annually for the next three years and would contribute the same level as Alternative 2 (117 percent) of the average annual value acquired by local contractors in Grant and Harney counties.

Employment opportunities under all action alternatives would contribute toward sustaining population levels in the short-term (three years). Opportunities for restoration and enhancement work provided over the next 10 years by all the action alternatives would have a long-term effect on maintaining populations.

Seasonal increases in timber-harvested related employment and restoration activities would not be likely to create increases in population due to the high level of unemployment in counties with wood processing facilities.

4.4.4 RECREATION USE

Introduction

People expressed concern about how the recommended activities would affect recreational pursuits such as hunting and fishing, pleasure driving, and horn hunting in the area and corresponding social and economic effects. Changes in road access, trail access, harvesting activities, and wildfires may affect user access, settings and quality of the experience.

The project may affect recreation use by affecting access, settings, and quality of experience. Changes in access by type causes proportional changes in use by type. Wildfires displace users from areas due to closures and travel restrictions. Effects to recreation use from burning depends on fall or spring burning, duration and intensity of burns. This analysis focuses on changes in capacity for motorized and nonmotorized access, camping, vegetation treatment areas, fire hazard ratings and roadless areas.

ALTERNATIVE 1—Recreation use

Motorized and Nonmotorized Access

Current demand for recreation opportunities in the project area would continue in the next five to ten years although traditional use patterns and opportunities would be impacted. No improvements to roads would occur and overall road conditions would continue to degrade.

Safety concerns associated with the use of the Davis Creek Trail by ATVs would continue causing potential conflicts and hazards with other users. Stream crossings along this trail would continue to cause sediment concerns. Access to Blackeye Trail would continue to be limited due to the washed out road accessing the trailhead.

Camping

Continued loss of access to dispersed campsites in this area would create new sites or resource impacts on other existing sites. Dispersed camping at sites within RHCAs would continue to impact water quality and fisheries, soils, vegetation and wildlife. Deerhorn Campground would continue to degrade in condition and reduce the quality of experience for users of this site.

Vegetation Treatment

No vegetation treatment would occur and no harvesting activities would occur to displace recreation use.

Fire Hazard Ratings

Crown fire hazard would continue at a high rate on 66 percent of the area with Dry Forest and 60 percent of the Moist Forest area. Wildfires would continue to occur in the project area and potentially damaging recreation facilities, causing hazardous conditions for users, and potentially affecting the character of the roadless area. Wildfire in overstocked stand conditions would reduce quality and quantity of forage and cover, and increase the risk of losing riparian habitat potentially reducing the opportunity for recreational hunting and fishing. No management activities would occur that would change the visual quality or recreational quality of the area.

Roadless Areas

No changes in road access would occur in the roadless areas. Long-term following the sale, the area would continue to provide opportunities for remoteness and solitude.

ALTERNATIVE 2—Recreation use

Motorized and Nonmotorized Access

In the first five years, use would continue on existing roads. Road conditions would be improved by brush and tree encroachment removal by the end of ten years but would not cause increases in access to the area or draw new users due to the dispersed nature of existing use. Over the long-term (following completion of sale activities), reconstruction of existing roads would improve access for hunting, viewing scenery, fishing and other uses and improve safety on the roads. Decommissioning of existing roads would decrease motorized access for dispersed driving and camping and increase hunting experience for hikers and other users seeking nonmotorized experiences. Open road miles would be reduced by 31 percent. Average daily traffic (ADT) numbers on roads that remain open would be higher, as a result of reduced open road density and a predicted moderate increase in the amount of recreational use.

Improvements in the safety and quality of the trail conditions and facilities associated with the Davis Creek trail and increases in access to the Blackeye Trail and other adjoining trails in the Scenic Area, would increase the quality of the dispersed recreation experience for hiking, wildlife viewing, personal mushroom collection, horn hunting, and ATV use.

Camping

Relocation of dispersed campsites or converting these sites to day use would displace some users but improvements to existing sites and new alternative campsites would reduce resource impacts and provide users a desirable setting. Some users would potentially be displaced due to the change in location and their perception of the need for change. Dispersal of current and increased use in the area would increase social encounters and decreases in quality of semi-primitive experience. Some use would potentially be displaced from the area due to this perception of change in quality. Improvements to the Deerhorn campground would discourage use of dispersed sites along the Middle Fork John Day River and reduce impacts to riparian vegetation.

Vegetation Treatment

Stands selected for treatment would include 50 percent of the area identified. In the short-term (1-6 years), harvesting and prescribed burning activities would potentially displace recreational hunters, personal use firewood gathering, pleasure driving, snowmobile use, ATV use, and dispersed camping. The appearance of the area and the recreational experience will change in short-term due to sight and sounds of harvesting activities and prescribed burning. Users of the Blackeye, Tempest, Princess, Tipton, and Mine trails would experience changes in their perception of the visual quality of the experience due to stumps, logging slash, and removal of potentially hazardous trees along the corridor. The effects to users and potential changes in their use would vary depending on the season of the activity, the amount and location of the activities. Harvest activities could temporarily displace big-game populations causing short-term changes in recreational hunting success. Due to the dispersed nature of these activities, substitute sites would be available to accommodate the existing uses in the project area. A reduction in hiding and thermal cover would potentially displace some big game populations, but the effects would likely be mitigated by road closures or decommissioning.

Prescribed burning would increase opportunities for mushroom collection for personal and subsistence uses. Prescribed burning would potentially displace users in the spring or fall depending on the season of burning. To minimize potential displacement, local notification, road signing, and announcements would be used to inform the public. Camps would be avoided to prevent effects to dispersed camping for big game hunting.

Aspen restoration would increase stands of big aspen trees and increase viewing opportunities. Treatment of noxious weeds would enhance visuals on a spot basis primarily along roadways.

Streamside fencing, riparian planting, improvement and construction of instream structures would improve and restore hydrologic conditions and fisheries habitat. Removal of roads in RHCAs would improve habitat

and reduce sediment to streams. Fish populations would improve and benefit threatened and endangered populations and enhance the quality and opportunity for recreational sport fishing.

Streamside fencing would increase forage adjacent to streams and increase turkey habitat, elk forage, increase pools in the streams and thereby create increased opportunities for small and big-game hunting and fishing, and day use wildlife viewing. Prescribed burning, and a combination of harvesting or precommercial thinning under all the action alternatives would increase transitional upland browse for both shrubs and grasses, improve forest stand health, and improve cover and stand composition. Improvements in cover, snags, and old-growth habitat would maintain and enhance populations of small and big-game species and enhance recreational opportunities and increase the quality of the experience for hunting and wildlife viewing.

Fire Hazard Ratings

Crown fire hazard would continue at a high rate on 44 percent of the area with Dry Forest and 55 percent of the Moist Forest area. A stand replacing wildlife would be less likely and would reduce the risk of potentially damaging recreation facilities, causing hazardous conditions for users, and potentially affecting the character of the roadless area.

Roadless Areas

No changes in road access would occur in the roadless areas. Harvesting 880 acres under would increase sights and sounds of helicopter logging systems, people and equipment and reduce remoteness and solitude during the sale activities (3-5 years). Long-term following the sale, the area would continue to provide opportunities for remoteness and solitude. Harvesting activities and associated planting activities would reduce the amount of standing and down logs, increase the number of stumps, marking paint, and slash. More open stands would reduce the short-term natural appearance of the area. Long-term, the area would appear as part of a naturally occurring mosaic of forest and nonforested openings.

ALTERNATIVE 3—Recreation use

Motorized and Nonmotorized Access

Similar to Alternative 2 except construction of a new OHV trail would eliminate resource damage on creek crossings, enhance safety and provide a loop experience to decrease cross-country use.

Camping

Same effects as Alternative 2.

Vegetation Treatment

Effects would be similar to Alternative 2 except only 37 percent of the total area in need of treatment would be treated. No effect to recreation users would occur from treatment activities in the untreated areas,

Fire Hazard Ratings

Crown fire hazard would continue at a high rate on 50 percent of the area with Dry Forest and 56 percent of the Moist Forest area. Wildfires would continue to occur in the project area and potentially cause damage and changes to recreation facilities and conditions for users as described for Alternative 2. Conditions would remain hazardous for crown fires in the Little Butte and Deerhorn drainages of the Middle Fork.

Roadless Areas

No changes in road access or harvesting activities would occur in the roadless area and the area would continue to provide outstanding unroaded settings although remoteness and solitude would be affected by potential increased sights and sounds of helicopter logging systems, people, and equipment in adjacent areas during harvest activities, precommercial thinning, and prescribed burning. Scenic integrity and the apparent naturalness of the area would be unchanged due to management actions. The unroaded character would not be affected.

ALTERNATIVE 4—Recreation use

Motorized and Nonmotorized Access

Use would continue on most or all of the roads that remain open, and a few roads would close as a result of encroaching vegetation and little use. Overall, open road conditions will probably have at least a slight downward trend. While conditions on the roads that have been reconstructed would improve, on many of the other roads, brush and tree encroachment would result in decreased sight distance, and road surface and drainage conditions would degrade. For these roads, the results would increase adverse impacts to water quality and riparian habitat. The magnitude of hazards to road users would increase along with the potential liability to the Forest Service. Open road miles would be reduced by 33 percent. ADT numbers on roads that remain open would be higher, as a result of reduced open road density and a predicted moderate increase in the amount of recreational use.

Closing the Davis Creek Trail to Off Highway Vehicles (OHV) use under Alternative 4 would eliminate motorized use of the area and displace ATV users. Nonmotorized use would be enhanced for hikers, horseback riders and mountain bikers. These activities would have no effect on cross-country skiers or snowmobilers.

Camping

Same effects to recreation users as Alternative 2.

Vegetation Treatment

Commercial harvesting would not occur under Alternative 4, but visual changes would occur due to precommercial thinning and prescribed burning activities. Users would potentially be displaced depending on their tolerance and preference for changes in the visual setting.

Fire Risk Ratings

Crown fire hazard would continue at a high rate on 61 percent of the area with Dry Forest and 59 percent of the Moist Forest area. Effects to recreation users would be 30 percent less than described for the No-Action alternative.

Roadless Areas

Same effects as described for Alternative 3.

ALTERNATIVE 5—Recreation use

Motorized and Nonmotorized Access

Use would continue on all of the existing open roads in the first five years. Overall road conditions have a significant upward trend. Brush and tree encroachment removal would improve sight distance on most open roads. Road surface and drainage conditions

on most roads would improve and result in a significant reduction in road related impacts to water quality and riparian habitat. The hazards to road users would be reduced along with the potential liability to the Forest Service. Open road miles would increase by 24 percent. Average Daily Traffic (ADT) numbers on roads that remain open would be slightly lower despite a predicted moderate increase in the amount of recreational use, because the miles of open roads have increased significantly.

Trail access would be similar to Alternative 2 except construction of a new OHV trail would eliminate resource damage on creek crossings, enhance safety and provide a loop experience to decrease cross-country use.

Camping

Effects to recreation users would be the same as described for Alternative 2.

Vegetation Treatment

Stands covering 58 percent of the area in need of treatment would be treated similar to Alternative 2 that treats 50 percent of the area. Effects to recreation users would be similar as described for Alternative 2.

Fire Hazard Ratings

Crown fire hazard would continue at a high rate on 40 percent of the area with Dry Forest and 54 percent of the Moist Forest area. A stand replacing wildfire event is less likely under this alternative because vegetation treatments improve stand conditions the cause wildfires the most.

Roadless Area

No changes in road access would occur in the roadless area. Harvesting 1,370 acres and increased sights and sounds of helicopter logging systems, people and equipment and reduce remoteness and solitude during the sale activities (3-5 years) would be 55 percent higher than Alternative 2. Long-term following the sale, the area would continue to provide opportunities for remoteness and solitude. Harvesting activities and associated planting activities would reduce the amount of standing and down logs, increase the number of stumps, marking paint, and slash. More open stands would reduce the short-term natural appearance of the area. Long-term, the area would appear as part of a naturally occurring mosaic of forest and non-forested openings.

Landscape Aesthetics

Visual Quality Objectives

The visual quality objective would be met by any of the alternates recommended . Areas of concern such as the Vinegar-Hill-Indian rock Scenic Area would not be affected by recommended alternatives. The objectives of the recommended harvests would meet the visual quality.

Scenic Integrity

The suppression of fire has allowed the once open park like stands of large fire resilient trees to disappear, being choked by encroaching fir and spruce species (see 3.2.4 Vegetation by Forest Type, beginning on page 139 and 1.2.1.4 Undesired Condition: Vegetation Outside Historical Range of Variability, page 14). This has reduced the scenic integrity to moderate.

The effects to scenic integrity are initially minimal, thus maintaining the existing condition of moderate. However the indirect effects show improvement to scenic integrity where efforts to move the fore toward a sustainable, fire resilient landscape. Where minimal efforts are made to move toward HRV, the indirect effects degrade the scenic integrity by allowing existing trends to continue.

Table 214—Effects to scenic integrity

	Direct (1-25 years)	Indirect (25+ years)
Alt 1	Moderate	Low to Very Low
Alt 2	Moderate	High
Alt3	Moderate	High
Alt 4	Moderate	Low to Very Low
Alt 5	Moderate	High

Ecological Integrity

Ecological integrity is an indication of the sustainability of a landscape, which affects the long term conditions of landscape aesthetics. The existing ecological integrity is determined by considering the current condition of key resources and the current trends that exist (see 3.2.4 Vegetation by Forest Type, beginning on page 139 and 1.2.1.4 Undesired Condition: Vegetation Outside Historical Range of Variability, page 14).

Table 215 is used in determining ecological integrity based on silvicultural treatments.

Table 215 Levels of Ecological Integrity

Ecological Integrity	Forested Area Outside HRV/High Risk
Very High (VH)	0-10%
High (H)	11-20%
Moderate (M)	21-30%
Low (L)	31-40%
Very Low (VL)	41-50%
Unacceptably Low (UL)	51-60%

The effect to ecological integrity by alternatives that propose efforts to move vegetation toward HRV in a successful manner would improve the ecological integrity of the project area. Alternatives 2, 3, and 5 make an effort to change the existing trends. Therefore, these alternatives would allow the ecological integrity to continue to improve proportionate to the level of treatment. Alternatives 1 makes no effort, and Alternative 4 makes minimal effort to change the existing trends that are detrimental to the sustainability of the forest landscape. Therefore, the ecological integrity would continue to be degraded under these alternatives.

Table 216—Effects to ecological integrity by Alternative

	Direct (1-50 years)	Indirect (50+ years)
Alt 1	Unacceptably Low	Unacceptably Low
Alt 2	Moderate	Moderate to High
Alt3	Low	Low to moderate
Alt 4	Very Low	Very Low
Alt 5	Moderate	Moderate to high

4.4.5—HERITAGE RESOURCES

Direction for this analysis is provided by a corpus of authorities that deal with historic preservation, archaeology, and Native American cultural values. In addition to the National Environmental Policy Act (NEPA) which requires this present document, the National Historic Preservation Act (NHPA) as amended, the Archaeological Resources Protection Act (ARPA), and the American Indian Religious Freedom Act (AIRFA), and executive orders such as Executive Order 13007 (Indian Sacred Sites) are also applicable. Direction that is more specific can be found in the Code of Federal Regulations (36 CFR 800), the Malheur National Forest Land and Resource Management Plan (1990), and the Programmatic Agreement between Region 6 of the US Forest Service, the Advisory Council on Historic Preservation (ACHP), and the Oregon State Historic Preservation Officer (SHPO) Regarding Cultural Resources Management on National Forests in the State of Oregon [NFS No. 94-06-59-16].

4.4.5.1—Heritage Resources

The Southeast Galena Watershed Analysis area of Potential Effect (APE) for cultural elements of the environment is restricted to the area that is within the perimeter of the project area. That is to say, the effects of potential activities on cultural resource properties (CRP's) situated outside of the boundaries of the project area are not analyzed. Based on data collected from the Forest to this point, the activities that are being planned under this analysis do not have the potential to directly or indirectly alter social, visual, auditory, or biophysical aspects of CRP's that are located external to the planning area.

ALTERNATIVE 1—Commercial Thinning

If no action is taken to address overstocked stand conditions in the planning area the historic and archaeological resources of the planning area will not face the risks of disturbance associated with industrial logging operations. However, CRP's within the planning area and in adjacent areas would continue to be in jeopardy of damage or destruction by catastrophic wildfire. An example of the destructive

effect that catastrophic wildfire can have upon cultural resources can be found at the Summit Fire. The Summit Fire of 1996 destroyed or severely damaged 19 of 29 (66%) eligible or potentially NRHP eligible historic sites identified within its perimeter(see Appendix E, Map 2—Large Fire History).

ALTERNATIVES 2, 3, 4, & 5—Commercial Thinning

Activities associated with commercial thinning, such as road construction, log deck construction, and log skidding pose a minimal risk to archaeological properties with scientific values and historic sites with associative values if appropriate project design criteria are employed. It is possible that timber harvest operations could directly impact the scientific or scholarly value of archaeological deposits by disrupting the patterning present in surface or subsurface deposits of artifacts, ecofacts, and archaeological features.

Commercial thinning may directly result in visually intrusive scars on sites or landscapes that convey an association with important patterns of history such as the development of the western mining frontier or railroad logging. The value of these sites as symbols of important historic events, themes, or patterns may be diminished if these qualities are not recognized and protected.

The cultural resource properties of the Southeast Galena watershed will realize substantial benefit from thinning activities that produce forest stands that are resilient to wildfire. Reducing the accumulations of fuels through commercial thinning in the watershed will make catastrophic wildfire less likely to occur, and will therefore enhance the long-term stability of significant cultural resource properties CRPS's.

Table 217 Cultural Resource Sites in Commercial Thinning Harvest Units by Alternative.

Subwatershed	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Placer/Davis	5	3	2	6
Vincent	7	5	1	7
Vinegar	6	6	4	6
Tincup/Little Butte	4	4	0	4
Butte	2	2	0	2
Little Boulder/Deerhorn	1	1	1	1
Total	**25**	**21**	**8**	**26**

Alternative 1—Prescribed Fire

If no action is taken to address overstocked stand conditions in the planning area the historic and archaeological resources of the planning area will not face the risks of disturbance associated with prescribed fire. However, as stated in the commercial thinning effects analysis, if no action is taken to reduce the accumulation of fuels, CRP's within the planning area and in adjacent areas will face the increasing likelihood of damage or destruction by uncharacteristically severe wildfire.

Alternatives 2, 3, 4, and 5—Prescribed Fire

The deployment of prescribed fire within or near historic and archaeological sites poses negligible to minimal risks to site data potential and/or associative values. If prescribed fire is deployed without appropriate design criteria or monitoring, fire-sensitive historic sites such as structures, buildings, and remnants of such occupations may be damaged or destroyed. Excessive fire intensities may reduce the scientific data potential of lithic oriented archaeological sites by affecting rhyolitic (volcanic glass) artifacts located at or near ground surface. Indirectly, excessive fire intensities within or near an archaeological site may induce or accelerate erosion of site deposits.

In combination with forest stand thinning, the use of prescribed burning treatments will serve to alleviate the threat of stand-replacement wildfire. The archaeological record of the Southeast Galena watershed will be less likely to sustain the severe damage witnessed by the record of the adjacent Summit Fire.

4.4.5.3 Heritage effects In-Stream Hydrological Projects

ALTERNATIVE 1—In-Stream Hydrological Projects

If no action is taken, there will be no effect on significant cultural resource properties in the Southeast Galena watershed.

ALTERNATIVES 2 and 5—In-Stream Hydrological Projects

Alternatives 2 and 5 propose to restore hydrologic function within the analysis area using heavy equipment in-stream to construct channels among mining tailings. Other in-stream projects would emplace large logs within channel banks using heavy equipment. These activities would affect the lower 2-3 miles of Vincent Creek, the lower ½ mile of Caribou Creek, as well as a stretch of the Middle Fork of the John Day River that is 1/4 mile below Caribou Creek. Emplacement of logs in stream channels would occur on Vinegar, Butte, Granite-Boulder, and Davis Creeks.

Numerous mining related historic properties, including vernacular landscapes, are positioned along margins of waterways in the Southeast Galena planning area. A historic property that is eligible for inclusion to the NRHP is located within the area recommended for in-stream hydrological restoration on Vincent Creek. The historic property is related to late 19th century and early 20th century hydraulic placer mining operations and it covers an area of approximately 200 acres along both sides of Vincent Creek. Under alternatives 2 and 5 a maximum of 10 acres (roughly 5% of the total site area) within the historic property would be impacted or modified by heavy equipment as the stream channel and floodplain are rehabilitated. The District will resolve effects under Section 106 of the National Historic Preservation Act with the Oregon SHPO and the Advisory Council on Historic Preservation (ACHP). All agreements with SHPO regarding mitigation of Section 106 effects will be addressed in the Southeast Galena FEIS.

4.4.6 NON-TIMBER FOREST PRODUCTS

Introduction

Changes in access by type causes proportional changes in use by type. Wildfires displace users from areas due to closures and travel restrictions. Effects to nontimber products habitat from burning depends on fall or spring burning, duration and intensity of burns.

This analysis focuses on changes in capacity for motorized and nonmotorized access, and vegetation treatment effects on nontimber forest products to assess people's ability to continue to enjoy social and economic benefits from the collection of nontimber forest products.

ALTERNATIVE 1—Non-Timber Forest Products

Motorized and Nonmotorized Access

No new road construction or reconstruction activities, timber harvesting, or prescribed burning would occur under Alternative 1 and would have no effect on nontimber forest products.

Vegetation Treatments

Some nontimber forest products would benefit from changes in ecological conditions such as overstocked stands that would be susceptible to increased risk of wildfires. Morel fruiting abundance would be affected by fire, fire intensity, different burning seasons, levels of tree mortality, and weather patterns depending on the severity of the conditions. Nutrient flushes to soil chemistry and microorganisms from tree mortality following fires would occur benefiting reproduction. Increases in recreational and commercial picking

following these fires would deplete the resource by over-harvesting although limited data exists on long-term fruiting levels (Parks and Schmitt 1997). Based on previous episodes following large wildfires in eastern Oregon, user conflicts would likely continue between commercial and recreational interests diminishing the social values associated with cultural and recreational gathering.

Depending on wildfire effects and distribution across the landscape, huckleberry picking from reproduction of bushes following fire, firewood gathering and post and poles as salvage products could be enhanced. The quality of the products would depend entirely on fire severity and ecological conditions following the fire. High severity fires would consume nontimber forest products and associated habitat rather than provide an opportunity for increased collection.

ALTERNATIVES 2, 3, 4, and 5—Non-Timber Forest Products

Motorized and Nonmotorized Access

In the short-term (five years) all newly constructed roads or newly opened roads for project activity, that will be closed at the end of the activity will not be open to public travel between the time they are opened and closed. This eliminates the false sense of security travelers may have, or assume, that the road will be a permanent open travel way for motor vehicles.

In the long-term (10 years) Alternatives 2, 3, and 4 would decrease total open roads miles and access for collection of non-timber products by 31-33 percent miles compared to Alternative 1. Alternative 5 would increase open road miles and access for collection by 24 percent. Road construction would degrade or eliminate populations of non-timber forest products in the area of newly constructed roads.

Trail improvements would enhance safe access to populations of wild edible mushrooms and huckleberries along these routes. Pressure from over harvesting of mushrooms, berries, or snags for firewood along travel routes would be the greatest under Alternative 5 which has the highest level of overall access by open roads and trails. Alternative 5 would provide the greatest benefit to elderly populations that need motorized access to directly harvest these products for subsistence use.

Vegetation Treatments

Timber harvesting and prescribed burning would alter habitat conditions and opportunities for collection of mushrooms and huckleberries. Effects on mushrooms and huckleberry bushes from timber harvesting and prescribed burning depends on disturbance of the sites, comparative changes with natural disturbance and successive stages of plant succession. Some mushrooms like sites associated with cool, moist mature forests. Other species prefer open, drier sites. The alternatives would harvest timber and prescribe burn to achieve a variety of habitat types that would maintain or enhance non-timber forest products.

No effect to wild edible mushrooms or huckleberries from chemical treatment of noxious weeds or competing vegetation would occur due to limited wick or spot application by hand on specific sites that have been surveyed. Mitigation measures such as signing the area, local radio announcements and on-site patrols following the application would minimize any potential effects to human consumption. Opportunities for people to collect species from disturbed and non-disturbed sites would be maintained by all alternatives.

4.4.7 Special Use Permits and Claims

ALTERNATIVE 1—Special Use Permits and Claims

No changes to permitted livestock numbers would occur. The permittee's economic and social values would not change due to management actions from the project.

No changes would occur to facilities, water rights and mining claims.

ALTERNATIVE 2, 3 and 5—Special Use Permits and Claims

Improvements or increases in motorized access would provide more convenient access to the allotments possibly decreasing the amount of time needed by the permittee to access the allotment. Trail improvements would provide improved access for checking on the allotment by the permittee. Decommissioning roads used by livestock for driveways would slow herding and increase the permittee's time managing and moving livestock..

Road improvements would benefit power line right-of-ways maintenance activities, but decommissioning would potentially reduce access to some sites. Alternatives 2 and 3 would reduce overall access by 31 percent. Alternative 5 would increase open road miles by about 9 percent and benefit right-of-way access.

No roads recommended for decommissioning access any existing water rights or mining claims and therefore would not affect any existing rights or claims.

Harvest activities would cause livestock to congregate in smaller areas causing the permittee to spend more time and resources to prevent overuse. Traditionally used salting and watering areas would not be available during harvest activities also requiring more time spent by the permittee on the allotment managing livestock to ensure meeting standards for protection of endangered and threatened fish species. Disruptions in the permittee's operations would occur due to trees falling on fences from harvesting, gates being left open, and placement of helicopter landings across fence lines along ridge tops.

Reforestation activities would have minimal effects to the livestock operations. Chemical treatments for competing vegetation would occur by spot application during periods not being used by livestock. Available forage would be reduced by 35 percent for the first five years due to the area associated with reforestation sites, but in the long-term forage would increase. Alternative 3 would not reduce short-term forage because herbicides would not be used for treatment of competing vegetation. Aspen enclosures would reduce available forage but would also provide a benefit to the permittee by fencing out key areas within RHCAs to keep livestock away from stream banks.

Prescribed burning would occur in certain pastures of the allotment and improve quality of forage. There would be enough flexibility in size and distribution of burned areas to mitigate any effects to the permittee's use. Fire would decrease amounts of downed woody debris facilitating better distribution of livestock and easing the permittee's herding operations and time. During the burn periods and immediately after, forage would be reduced or unavailable for grazing causing temporary needs by the permittee to move livestock to adjacent areas of the allotment. In the long-term, forage would be improved comparably on Alternatives 2 and 5, followed by Alternatives 3 and 4. Economic and social benefits to the permittee's operations and family would occur under all action alternatives.

ALTERNATIVE 4—Special Use Permits and Claims

Effects to livestock special use permits for Alternative 4 would be similar to Alternatives 2, 3 and 5 except harvest operations would not occur and would not therefore, cause disruptions to livestock movement.

Fences or gates are less likely to be torn down or removed and not cause problems with cattle moving into other areas.

Road improvements would benefit power line right-of-ways maintenance activities, but decommissioning would potentially reduce access to some sites. Alternative 4 would be similar to Alternatives 2 and 3 by reducing overall open roads by 32 percent. No roads recommended for decommissioning access any existing water rights or mining claims and therefore would not affect any existing claims.

4.4.8 RANGELAND

ALTERNATIVE 1—Rangeland

The alternative would allow current rangeland management practices to continue with existing numbers of permitted livestock. Therefore, future grazing in the watershed would not have substantial effects on improving or worsening conditions.

No additional ground disturbance would occur, so grasses and grass-like vegetaton are not as likely to be disturbed by noxious weeds. Aspen stands would continue to degrade, as grazing would retard new growth.

If resources are left to continue within the analysis area at the present regression (no action), forage production would decline due to continued ungulate pressure and conifer encroachment, reducing the quantity of primary and secondary rangeland.

Upland forested areas would loose forage production over time if over stories are left to their present successional progressions. Lack of grazing opportunities in upland areas would likely increase the livestock pressure on the riparian areas.

No action may result in a denser tree canopy cover, which could inhibit growth of ground vegetation. This may decrease growth of grasses, which would then reduce forage for ungulate use.

ALTERNATIVES 2, 3, 4 & 5—Rangeland

Alternatives 2, 3 and 5 would increase the quantity and quality of rangeland vegetation by timber harvest and prescribed fire. Alternative 4 would do the same through the use of primarily prescribed fire. Therefore each of these alternatives can be expected to decrease the impacts of cattle grazing on riparian zones by providing cattle more suitable rangeland to use. Any road building may also tend to reduce the amount of time livestock spend in riparian zones by providing better access to suitable rangeland away from streams.

The primary effect of forest stand treatments and associated road construction on range vegetation resources is the removal and the disturbance of herbaceous cover. This affects the diversity of the herbaceous layer and the quantity and quality of available forage and depends on the location, stand prescription, fuels prescription, and current condition of the herbaceous vegetation in the recommended units.

Following commercial thinning, forest stands would open up releasing the under story vegetation that would become available as forage for big game and livestock. This vegetation is available until the tree canopy closes again and shades out the lower growing vegetation. In the short-term, harvest units would provide transitory range. Transitory range should provide more forage than occurred before the timber harvest or with the no action alternative; however, livestock grazing capacities are not based on transitory range.

Removal and thinning of trees would produce slash that would impede livestock movement and inhibit growth of ground vegetation. However after treatment of the slash through hand piling, “track-macking” and burning (usually within 5 years after harvesting) the overall ground vegetation should increase in stands that have been thinned. Livestock movement would improve with these treatments, with the exception of units that are only mechanically treated.

Reduction of, or increases in forage caused by forest stand treatments are difficult to measure. While tractor logging and feller-buncher logging may cause the most ground disturbance to a site, quantifying loss of forage without actual on the ground before and after measurements is pointless. For the most part, these units in need of silvicultural treatments receive limited use by livestock. After treatment, these units are more apt to attract livestock as the forage and access are increased. However, if far from water sources these units may not receive any use. Because of the large size of the grazing pastures in the planning area, the staggered and varied treatments of this transitory range would not have a measurable influence of the carrying capacity of the range. However, forest stand treatments that open up stands previously not accessible to livestock would redistribute the grazing pressure in a more uniform scope across the pasture.

Harvest activities, if during the grazing season, may impact the grazing system by concentrating livestock away from the activities and causing overuse of an area of the allotment. Harvest activities (if during the grazing season) would disrupt the ability of the permittee to herd cattle off of the allotment or unit that is required to maintain use standards. This is critical to the success of the grazing system in order to meet the requirements of the Grazing Biological Opinion for Steelhead and Bull trout. Also traditional salting locations in the uplands may not be available do to harvest activities.

In addition, there are a number of harvest and thinning units, which are adjacent to or include fences and create a potential conflict if directionally felled trees break the fence or the fence is cut to skid trees. The more a fence is spliced, the less effective it becomes because splices weaken the wire so it is more likely to break at a splice. This is especially a concern if harvest operations are conducted during the grazing season (theses fences need to remain intact from June 1 through October 15 in order to maintain the livestock grazing system). Another concern is the haul routes and helicopter landings that use collector roads which frequently cross unit and allotment, fence lines commonly resulting in gates being left open. Several of the helicopter landings may be located on ridge tops and may require temporary removal of sections of fence.

Reforestation activities schedule to follow timber stand treatments would not have major effects on range resources. Livestock grazing may offer reduction of competition to tree seedlings by grasses and other vegetation. There is the potential for conflicts with possible damage by livestock on the seedling through crushing and trampling. Herbicide treatments to reduce competing vegetation would reduce 35% of the forage in treated units for 3-5 years (Wunz 2001).

The aspen enhancement project would take approximately 28 acres out of livestock grazing by fencing out the stands many which are in primary range. This is acceptable do to the overall benefits to the clones and the removal of grazing from key areas within the RHCA's. Caging may be used to protect some individual plants, these often are damaged by livestock (rubbing and pushing) and may not be effective when used in areas that cattle frequent.

Under Alternatives 2, 3, 4, and 5, the non-forested rangelands would be expected to show continued improvement at a slightly higher rate than Alternative I.

Forest stand treatments have an indirect effect of promoting better livestock distribution due to improved quality of forage. Indirect effects related to management of grazing permits include loss of control if gates are left open or fences are logged over. This in turn causes loss of control of livestock, and resultant loss of effective management of the rangeland vegetation.

Table 218 Acreage available to forage production, acreage of disturbance

ALTERNATIVES	HARVEST ACRES	PRESCRIBED BURNED ACRES♠	FENCED ASPEN ACRES	FENCED RIPARIAN ACRES	EST. FORAGE IMPROVEMENT ACRES
2	9760	11370	30	28	23,825
3	7330	10640	30	28	22,825
4	0	17230	30	28	17,710
5	11340	10180	30	28	24,105

♠ Outside mechanically treated acres

4.4.9 ATTITUDES, BELIEFS AND VALUES

Introduction

People who prefer passive management approaches to restoration would generally prefer less acres of harvesting and burning compared to people who prefer active management to achieve restoration objectives. Restoration and enhancement measures for fish, wildlife and native plant species generally increase people's perceptions of the value of the resource.

This analysis focuses on the potential effects to ecological and non-commodity values based on changes in timber harvesting, prescribed burning, and road construction and reconstruction by alternative. Effects to commodity values, recreation values, and scenic quality are discussed in other sections of the Social and Economic report, and in the other environmental consequences sections of the DEIS.

ALTERNATIVE 1—Attitudes, Beliefs and Values

No timber harvesting, prescribed burning or road construction/reconstruction would occur under Alternative 1. People who believe that passive management is an appropriate response to ecological restoration would prefer this alternative. Ecological values associated with fish, terrestrial and plant habitats and associated populations of species, water quality, vegetation and fire regimes would continue in an undesirable condition. Opportunities for spiritual renewal, geographic place attachment, and existence values would be diminished by changes in the short-term and long-term due to increased risk of wildfires from overstocked stand conditions.

Road conditions would not be improved and trail conditions would continue to contribute toward degradation of water quality. Most of the unroaded areas in the roadless area would continue to provide moderate opportunities for solitude due to existing topography and vegetative screening.

Potential increases in risk of wildfire would diminish ecological, spiritual and aesthetic value of the roadless area. As a result, people who benefit from noncommodity values may experience diminished water quality, scenic quality, and sense of place attachment to the Scenic Area and the roadless area. People would experience changes in life values associated with preserving and protecting endangered species, and a reduced feeling of conserving the area for future generations would take place.

> Forest conditions which increase the risk of costly catastrophic wildfires and insect attacks threaten human values and later forest ecosystems. The forests of eastern Oregon provide a wide variety of goods and services that humans value highly including wood products, recreation, water, aquatic habitat, and the general quality of life in the region. Threats to these forests are in turn, threats to these values. **Forest Health and Timber Harvest on National Forests in the Blue Mountains of Oregon**, A Report to Governor Kitzhaber (Johnson et al, 1995)

ALTERNATIVES 2, 3, 4, and 5—Attitudes, Beliefs and Values

Under all alternatives, improvements in roads and trail conditions would increase water quality and fish habitat and would benefit people who want to protect plant and animal species. In the long-term (10 years+), the re-vegetated appearance of decommissioned roads and improvements in fish habitat and water quality would increase people's perception of the ecological value of the area.

People who prefer more primitive uses and nonmotorized settings would be negatively affected by increases in the quantity or quality of motorized access. Their perceptions of the natural appearance of the landscape and their sense of attachment would be altered by increases in prescribed burning, harvesting, and other modifications to the landscape. Moving campsites away from water would decrease people's perception and sense of value associated with a particular camping area they would have used traditionally for years.

Commercial timber harvesting and precommercial thinning would reduce the risk of high fire hazard and would lower people's perception of risk to fish and wildlife populations. Harvesting activities would decrease scenic quality in the short-term (3-5 years) due to the sights and sounds of logging equipment and activity on the landscape, but would provide long-term benefits due to more big trees and opening up view area to existing big trees. Some loss of cover to wildlife would occur but within standards. Longer-term results would be resilient stands, more future large snags, and increase in age classes which would increase noncommodity values for people who prefer active management approaches to protecting terrestrial species. Alternative 4 would not have these effects because it would not use timber harvesting as an active management approach.

Prescribed burning would create short-term negative effects for people who don't want to see scorched trees. Some people view this as burning up the future forest and would feel their existence values for protecting forests for future generations were diminished. Some people don't want to see stumps burned up, they feel these represent connections with history and uses of the land. Their spiritual and aesthetic association with a sense of renewal through tradition and history would be diminished. Alternative 2 and 5 would have the greatest effect on these values since these alternatives provide for the most acres of prescribed burning which would potentially affect more stumps.

Streamside fencing, planting and streamside improvements would decrease short-term (5 to 7 years) visual quality due to the appearance of disturbed areas and manmade materials and in the long-term would increase visuals due to growth and restoration of habitat. Perceptions of risk to threatened and endangered species associated with riparian zones would be increased by restoration activities for fish, wildlife, and water quality.

Aspen enhancement and noxious weed treatments in the long-term (10 years) would increase visual quality, improve water quality, and restore native populations increasing ecological value for people who regard ecosystem restoration as a priority. Some people hold spiritual values and sense of place attachments with unique ecosystems such as aspen and would benefit by these activities. Noxious weed treatment of rock pits would improve visual quality and increase people's perceptions of these sites as part of the landscape.

People who feel passive management approaches should be allowed to take their natural course would feel their ecological and non-commodity values were diminished as a result of the active management approaches for restoration. Based on the surveys cited above about public opinions regarding natural resource management, their sense of spiritual renewal, and preserving the area for future generations would be reduced the most by Alternative 5 would results in an increase of open road miles and treats the largest number of acres (58 percent of the project area). Alternative 2 would be similar in levels of active

management (50 percent of the project area), followed by Alternative 3 (37 percent) and Alternative 4 (13 percent).

Management approaches for restoration of aquatic, other associated vegetation activities, and recreation would be comparable for Alternatives 2, 3, and 5 and would have similar effects on people's values regarding preferences for passive management.

4.4.10 HUMAN HEALTH AND SAFETY

ALTERNATIVE 1—Human Health and Safety

Threat of Wildland Fire to Public Safety and Property

The high fire hazard area south of the Middle Fork is not treated and the poor roads in the same area are not improved to provide adequate access for fire fighting equipment. This fire hazard is adjacent to privately owned lands and structures in Bates, Austin, and Austin Junction areas.

The high fire hazard area located in the upper Vinegar Creek drainage that was the result of the 1998 blowdown consists of several hundred acres of down timber. This area would not be treated by this alternative. A fire burning in these fuels would be difficult and dangerous to control and could easily become a large fire threatening private property and structures in the vicinity of the town of Greenhorn.

Air Quality

The no treatment alternative would have the least immediate impact on air quality, as there is no prescribed burning. However, all biomass remains available for consumption by wildfires and it will continue to accumulate, increasing the potential for large amounts of smoke during the summer months, when diurnal inversions can concentrate smoke at low elevations. These smoke concentrations can have high particulate levels that can cause health problems, or violate summertime Class I air quality visibility standards for Wilderness areas.

Herbicides

There is no use of herbicides for sod control in this alternative; therefore there is no risk to human health or safety.

Rodenticides

There is no use of rodenticides for pocket gopher control; therefore there is no risk to human health or safety.

ALTERNATIVE 2—Human Health and Safety

Threat of Wildland Fire to Public Safety and Property

The high fire hazard area south of the Middle Fork is treated with a combination of treatments and the poor roads in the same area are improved to provide adequate access for fire fighting equipment. This greatly reduces the high fire hazard adjacent to privately owned lands and structures in the Bates, Austin, and Austin Junction areas.

The high fire hazard area located in the upper Vinegar Creek drainage that was the result of the 1998 blowdown consists of several hundred acres of down timber. This alternative would treat the area by salvaging the wind thrown timber. The high hazard of a catastrophic fire destroying the private property and structures in the vicinity of the town site of Greenhorn would be greatly reduced.

Air Quality

Slash produced by commercial thinnings on tractor and skyline yarded units will be brought to landings and can be made available for chipping for fiber or as fuel for cogeneration plants. Both options have a positive effect on air quality as the smoke from burning slash on site is greater than in a clean burning power plant or when used as fiber. Slash resulting from harvesting on other units is planned to be either broadcast

burned or piled and burned and the burning will be under weather conditions that will meet air quality standards. Prescribed burning will be done in areas not harvested to reduce existing natural fuels, and will also be done in weather conditions that allow air quality standards to be met.

This alternative will reduce the total fuels in the planning area, reducing the amount available for consumption in future wildland fires. This would reduce the amount and duration of pollutants produced by a wildland fire; as well as reducing the fire intensity, allowing for faster control. The amount of smoke produced during the summer months and during inversion periods would be reduced, improving visibility and reducing health problems. The summertime Class I air quality visibility standards for Wilderness areas are more likely to be met.

Herbicides

Risks to workers are associated with exposure to chemicals, and the application process. Hand application carries many of the same risks as manual methods. Herbicide application, by law, will be under the direct supervision of a trained and licensed applicator, who must follow the label directions. Label directions prescribe the proper application rates and conditions, personal protection methods for workers, spill protection and response, and disposal procedures. When followed, these directions reduce risk to humans and the environment to acceptable levels. The public may be exposed to herbicides through spray drift, an accident in transit, or dermal contact with treated plants. Spray drift would be very limited with the use of backpack sprayers. Treatment areas would be signed.

The two herbicides recommended for possible use in the project area have low to moderate potential toxic effects. Studies have shown that exposure levels remain far below the toxic levels for workers. Exposure to the public is expected to be much less.

Rodenticides

Strychnine baiting

It is unlikely anyone would accidentally ingest strychnine bait, especially once it has been placed in burrows. Bait is dyed for identification, making it obvious when spilled, and it has a bitter taste.

Workers applying strychnine would have the greatest risk of exposure. Strychnine is not normally absorbed through the skin. The primary exposure route to induce poisoning from strychnine is ingestion. Field crews are to be trained in proper application and safety procedures prior to starting work; they are also to be informed of the risks and symptoms of accidental strychnine poisoning and treatment procedures.

The public and workers engaged in other activities in treated area (e.g., planting, surveys, tree netting, etc.) are not expected to encounter any strychnine. As an added precaution, treated units would be signed, warning of strychnine presence on the sites. Treatment units are removed from developed recreation areas, and consequently receive little use by the general public.

The application of strychnine below ground is not expected to cause cumulative effects with respect to public health or safety. Strychnine will not accumulate in the soils between applications, based on the toxin's low mobility and persistence and its short half-life.

Aluminum phosphide fumigation

The primary exposure route to induce poisoning in humans is through inhalation. Workers applying the fumigant would have the greatest risk of exposure. The reaction of aluminum phosphide with air, however, is sufficiently slow so as not to endanger an applicator when applying the toxicant outside in open air. A garlic warning odor added to the toxin makes concentrated gas accumulation noticeable. Tablets are carried in tightly sealed containers and workers wear gloves. Tablets are placed below ground and the holes are covered. Above ground, phosphide gas is quickly dissipated through aeration.

Workers engaged in other activities in treated areas would have a low probability of encountering any phosphide gas. Treated units will be signed, warning workers of fumigant use of the sites.

No risk to the general public is anticipated due to the rapid volatility and decomposition of the gas. The risk of adverse direct effects is low and the probability of human poisoning from aluminum phosphide fumigation would be unlikely due to the toxin's properties, application methods, treatment area locations, and the laws and safety procedures required to protect humans, non-target species, and resources.

The application of aluminum phosphide tablets below ground is not expected to cause cumulative effects with respect to public health or safety. Aluminum phosphide and its residues will not accumulate in the soils between applications, based on the toxin's low mobility and persistence and its short half-life.

ALTERNATIVE 3—Human Health and Safety

Threat of Wildland Fire to Public Safety and Property

Alternative 3 provides most of the hazard reduction that Alternative 2 does in the area south of the Middle Fork, reducing the high fire hazard adjacent to privately owned lands and structures in the Bates, Austin, and Austin Junction areas.

Alternative 3 provides the same degree of fire hazard reduction as Alternative 2 does in the upper Vinegar Creek area.

Air Quality

The effects are similar to Alternative 2, except the amount of area treated is approximately 75% of that treated by Alternative 2. Therefore, the air quality benefit of Alternative 3 is expected to be only 75% of that provided by Alternative 2.

Herbicides

Herbicides are not used with this alternative; therefore the effects on human health would be the same as No Action.

Rodenticides

Rodenticides are not used with this alternative; therefore the effects on human health would be the same as No Action.

ALTERNATIVE 4—Human Health and Safety

Threat of Wildland Fire to Public Safety and Property

Alternative 4 provides only a small portion of the hazard reduction that Alternative 2 does in the area south of the Middle Fork. There is no thinning of larger trees and the access is not improved. The high fire hazard adjacent to privately owned lands and structures in the Bates, Austin, and Austin Junction areas is only slightly reduced compared to No Action.

Alternative 4 provides no fire hazard reduction in the upper Vinegar Creek area that was the result of the 1998 blowdown. The high hazard of a catastrophic fire destroying the private property and structures in the vicinity of the town site of Greenhorn is not reduced, and is identical to No Action.

Air Quality

The amount of fuels reduced through mechanical treatment and burning is the least of all the action alternatives. Only about 25% of the area treated by Alternative 2 is thinned by this alternative, and only smaller, noncommercial sized trees are cut. Prescribed burning is reduced to 84% of that planned for Alternative 2. Therefore, the air quality benefit of Alternative 4 is expected to be only 25% of that provided by Alternative 2.

Herbicides

Herbicides are not used with this alternative; therefore the effects on human health would be the same as No Action.

Rodenticides

Rodenticides are not used with this alternative; therefore the effects on human health would be the same as No Action.

ALTERNATIVE 5—Human Health and Safety

Threat of Wildland Fire to Public Safety and Property

Alternative 5 provides more hazard reduction than Alternative 2 does in the area south of the Middle Fork, reducing more of the high fire hazard adjacent to privately owned lands and structures in the Bates, Austin, and Austin Junction areas.

Alternative 5 provides the same degree of fire hazard reduction as Alternative 2 does in the upper Vinegar Creek area. This alternative would treat the high fire hazard area that was the result of the 1998 blowdown area by salvaging the wind thrown timber. The high hazard of a catastrophic fire destroying the private property and structures in the vicinity of the town site of Greenhorn would be greatly reduced.

Air Quality

The effects are similar to Alternative 2, except the amount of area treated is approximately 16% more than that treated by Alternative 2. Therefore, the air quality benefit of Alternative 5 is expected to be 16% more than that provided by Alternative 2.

Herbicides

Effects would be the same as described for the Recommended Action alternative, but to a greater extent, as more 47% acres of competing vegetation would be treated.

Rodenticides

Effects would be as described for the Recommended Action, but to a greater extent, as 54% more acres of treatment are planned.

4.4.11 AMERICAN INDIAN TRIBES

Introduction

Motorized access is important for tribal elders to hunt, fish and gather berries. The potential effect to tribal treaty rights and interests is analyzed in terms of effects to motorized access and fish, wildlife and plant habitats.

ALTERNATIVE 1—American Indian Tribes

Under the No-Action alternative, motorized access would not change and have no effect on motorized access to traditional sites for hunting and gathering.

Aquatic habitat variables such as high water temperatures and high sediment delivery, low sinuosity, lack of woody debris and associated low frequency of pools, bank instability and lack of shade would continue and potentially affect fish populations. Reduced catch rates could have short-term and long-term effects on treaty fishing rights and subsistence fishing. Reduced consumption of fish could cause negative health effects to American Indians and subsequent effects to culture and economy of the tribes.

Cover for deer and elk would remain relatively well distributed except in the Summit Fire area and to a lesser degree the east side of the analysis area(see Appendix E, Map 2—Large Fire History). Elk and deer populations would remain out of proportion with available forage for the short-term. Native grasses, forbs and shrubs that require open, Dry Forest environments are not as numerous or vigorous as in the past and would continue to decline due to fire suppression. Noxious weed populations would continue untreated and spread to adjacent areas reducing the diversity of native plant and animal communities. These effects could potentially reduce habitat quality for sustaining treaty rights and resources.

ALTERNATIVES 2 and 3—American Indian Tribes

Improvements in motorized access would provide more opportunities for tribal members to access the area to participate in treaty rights for hunting and gathering. Reconstruction of roads and would improve fisheries resources by fixing problem areas contributing to degraded habitat conditions. Decommissioning of roads would likely eliminate motorized access to some traditional tribal hunting and gathering areas although information is not known about the location of these sites. Alternatives 2 and 3 would reduce open road access by 31 percent compared to the existing condition

Moving dispersed campsites away from riparian zones would improve fisheries and wildlife habitat and improve treaty resources. Streamside fencing, riparian planting, streamside protection measures, channel rehabilitation, and culvert removal would improve fish habitat and fisheries resource, and chokecherry habitat for berry gathering. Alternative 3 would rehabilitate the channel and floodplain only using hand crews but would not install new instream structures and would have a lesser effect on improvement of fisheries resources.

Timber harvesting would create short-term (5 years) impacts to berry crops, but improve overall habitat by creating openings in stands and reducing overstocked conditions to reduce the risk of large-scale fires and further resource impacts. Tribal members could potentially be displaced from these crops in the short-term.

Prescribed fire would potentially enhance or degrade some cultural plants that tribes collect for religious and subsistence uses depending on the extent, severity and intensity of the burn.

Spot application of chemicals on planting sites would affect shrubs, berries and roots used for food, medicine and religious practices. Three sites identified for noxious weed treatment occur near known populations of edible plants. Two sites occur within riparian areas and would be treated with direct wick or spot application that precludes any drifting of chemicals to adjacent sites. Chokecherry stands are more than 300 feet from this area and would not be affected. The other site supports biscuitroot and possibly yampah. The site would be treated by spot application and the main concentrations of edible root crops are several hundred feet from the site. Alternative 3 would not apply chemicals to any sites and would have no effect on tribal gathering of shrubs, root and berries.

ALTERNATIVE 4—American Indian Tribes

The effects to motorized access would be similar as described for alternatives 2 and 3 for road access, fisheries and wildlife habitat improvements. Timber harvesting would not occur under this alternative, and prescribed burning effects would be reduced from Alternative 2. Planting sites and noxious weed sites would not be treated by chemicals under this alternative and would have no effect on tribal gathering of berries.

ALTERNATIVE 5—American Indian Tribes

Open road access under Alternative 5 would increase by 24 percent in the long-term (10 years). The presence of more roads could potentially reduce subsistence productivity due to effects from road building. Increased competition between recreational and subsistence users would potentially create conflicts between people desiring to harvest traditionally collected species and recreational or commercial gatherers.

Habitat improvement activities for fisheries and wildlife would be similar as Alternative 2 and have the same potential to improve fisheries and wildlife resources for fishing and hunting to support subsistence and religious practices. Timber harvesting associated effects to fish and wildlife species would be the greatest under Alternative 5 due to the largest number of acres harvested. Alternative 5 would have the greatest effect on potential shrubs, roots and berries that could be sprayed by chemicals during reforestation activities to control competing vegetation as a result of the most acres identified for planting. Effects from noxious weeds spraying would be mitigated by spot application as described for Alternative 2.

4.4.12 ENVIRONMENTAL JUSTICE

Introduction

The analysis focuses on potential effects from the project to minority populations, disabled persons and low-income groups. The effects on American Indian populations are described above under "American Indians". Reference the above sections on "Nontimber Forest Products", "Human Health and Safety", and "Restoration Opportunities for Local Communities" for further discussions of effects.

ALTERNATIVE 1—Environmental Justice

All current uses of the National Forest System lands would continue including recreation, grazing, harvesting of nontimber forest products, special use permits, subsistence uses, and spiritual/aesthetic uses. Effects to minority populations, disabled persons and low-income groups would not be disproportionate with other users of the National Forest System lands.

ALTERNATIVES 2, 3, 4 and 5—Environmental Justice

The action alternatives provide a variety of opportunities for potential contracts. Refer to the discussion of "Local Communities" above for the comparison between alternatives. The alternatives would have no impact on the contracting process or the USDA Small Business Administration program for reserving contracts for minority groups for tree planting, precommercial thinning, and fire suppression to support employment and income would be available to all groups of people subject to existing laws and regulations for set asides, contract size, competition factors, skills and equipment, etc.

Set-asides for Small Business Administration Contracting opportunities would not be affected. Employment by firms that have hired Hispanic workers or other minority groups or low-income workers associated with reforestation or other potential contracting needs would not differ from those employed in the sectors as a whole. In the short-term (3-5 years) reforestation needs would potentially benefit this group due to the size of the potential need. Alternative 5 would have the greatest amount of planting (over 4,626 acres), following by Alternative 2 (over 2,264 acres), and Alternative 3 (over 2,039 acres). Alternative 4 would not reforest any acres and would not contribute toward employment of minority groups.

Changes in access due to increased improvements in road conditions and decreases in open road miles would occur in about 10 years. Alternative 5 would have the greatest increase (24 percent) and would potentially benefit disabled people, or low-income groups that require motorized access to participate in recreational activities such as hunting, dispersed camping, subsistence firewood gathering, or collection of non-timber forest products. Improvements to Deerhorn Campground would improve access for all people at that site. Universally accessible toilets at Deerhorn Campground and accessible toilets and parking sites at the Middle Fork Campground would not be affected.

Access for these groups to experience personal renewal, solitude, and visit places of importance to them would also be similarly affected. Increases in motorized access improve opportunities for mushroom collection, horn hunting, and firewood gathering which have been pursuits by lower income people. Some minority populations of Asian Americans have previously participated in commercial mushroom gathering following large fires in the area and would experience economic benefits due to increases in road access. Decommissioning of roads would limit these opportunities to potential user groups.

Alternatives 2, 3, and 4 would decrease overall open road access by 31-32 percent and would reduce accessibility for disabled or elderly populations to previously used dispersed campsites, or restrict firewood gathering for subsistence use. These effects would occur for all users of the project area and would not have a disparate impact on any particular minority groups.

A combination of timber harvesting and/or prescribed burning would alter habitat conditions and opportunities for collection of wild edible mushrooms and huckleberries depending on disturbance of the sites, similar changes with natural disturbance and successive stages of plant succession. The alternatives would maintain or enhance nontimber forest products through harvesting timber and prescribed burning to achieve a variety of habitat types. Chemical treatment of planting sites or noxious weeds would occur under all alternatives (except Alternative 4). No effect to wild edible mushrooms or huckleberries from chemical treatment of noxious weeds or competing vegetation would occur due to limited wick or spot application by hand on specific sites that have been surveyed. Mitigation measures of signing, posting bilingual information about sites affected and duration of effects, and patrolling of affected areas immediately following application would occur to ensure all forms of communication convey the appropriate information to minority populations. Opportunities for all groups of people to collect species from disturbed and non-disturbed sites would be maintained by all alternatives, and no disproportionate effect is anticipated to subsets of the general population.

None of the alternatives would have disproportionately high and adverse environmental effects on minority populations, low-income populations, or Indian tribes. The order directs federal agencies to focus attention on the human health and environment effects to ethnic minorities (American Indians, Hispanics, African Americans, and Asian and Pacific Islander Americans), disabled people, and low-income groups.

4.4.13 Financial Viability Of Timber Harvesting

Alternatives Comparison

All alternatives that harvest timber were analyzed in seven analysis areas (Tin Cup II, Blue, Austin, Bates, Gold, Ruby, and Gem). Each of the action alternatives would produce positive tentative advertised bid rates indicating that they would receive bids on the timber sale portion of the project.

Based on this analysis, Alternative 3 produces the highest tentative advertised bid rate overall at $59/ccf followed by Alternative 5 ($57.58/ccf) and Alternative 2 at $52.49/ccf. The Austin and Bates analysis areas would provide the highest bid rates and the most value per cubic foot removed whereas the Ruby and Gem analysis areas would provide the lowest value per unit. These two areas would harvest approximately 50 percent of the volume by helicopter contributing to the lower advertised bid rates. The no-action Alternative (Alternative 1) and Alternative 4 would not have bid rates since they do not propose timber harvest removal.

Revenue generated from the harvest proposals sold at tentative advertised bid rates would be the highest under Alternative 5 ($6.4 million) corresponding to the highest level of volume (56 MMBF). Alternative 2 would provide the next highest level of revenue at $4.7 million (45 MMBF) followed by alternative 3 with $3.9 million (34 MMBF).

Alternative 1 and Alternative 4 would not harvest any timber and therefore, would not produce any revenue or benefits to wood products industries.

Estimates for tentative advertised bid rates for the action alternatives fall within the range of rates experienced by the three Blue Mountain forests (Malheur, Umatilla, and Wallowa-Whitman) within the last several years (Analysis File USDA Forest Service 2002). Advertised bid rates have fluctuated over the last few years reflecting the volatility of the market for timber. Changes to prices would likely occur in the future at the time of the appraisal depending on actual market conditions at that time Table 219 illustrates the tentative advertised bid rate by alternative.

Table 219 Tentative Advertised Bid Rates in dollars per ccf. (hundred cubic feet)

Potential Sale	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Tin Cup II	0	$75	$69	0	$70
Blue	0	$58	$54	0	$58
Austin	0	$84	$79	0	$74
Bates	0	$115	$115	0	$115
Gold	0	$51	$45	0	$48
Ruby	0	$36	$70	0	$54
Gem	0	$27	$36	0	$28

Table 220— Tentative Advertised Bid Rates and Volumes

ITEM	ALT. 1	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Bid Rate	0	$52.5/CCF	$59.0/CCF	0	$57.6/CCF
Revenue	0	$4.7 million	$3.9 million	0	$6.4 million
Cubic Ft. Volume	0	85,460 CCF	63,940 CCF	0	107, 920 CCF
Board Ft. Volume	0	45 MMBF	34 MMBF	0	56 MMBF
NOTES: ALT. = Alternative **CCF =** hundred cubic feet **MMBF =** million board feet					

4.4.14 ECONOMIC EFFICIENCY

Alternatives Comparison

Measurable and quantifiable economic market benefits identified in the Southeast Galena Restoration Project include discounted revenue from timber volume recommended for harvest. Revenue is derived from the tentative advertised bid rate for the timber multiplied by the total cubic-feet recommended for harvest and discounted to the present. Refer to the section "Financial Viability". Other nonmarket benefits that may occur as a result of the recommended activities include changes in recreational fishing through reductions in sediment and improvements to fisheries habitat, improvements in the quality of the recreation experience, and increases in forage to wildlife species.

In addition to use values, existence values otherwise referred to as passive, nonuse or preservation values may capture important economic value to the public (Swanson and Loomis 1996). Although these benefits are important components of the ecosystem services provided to humans, the production relationship between ecosystem functions and ecosystem services (such as changes in recreation visitor days, fishing days, animal units months, or fish population) is not well defined or measurable at the project level in terms that provide meaningful comparisons of commensurate dollar values. Refer to the previous discussion in this section on noncommodity and passive use values.

Measurable and quantifiable costs at the project level include costs to the Forest Service for preparing and administering the commercial timber and implementing other restoration activities for hydrology, aquatic, vegetation, recreation, access and noxious weeds by alternative. Some examples of activities by alternative that were included in the cost comparison include streamside hardwood plantings, channel and floodplain rehabilitation, instream fisheries structures, precommercial thinning, aspen enhancement, prescribed burning, road decommissioning, trails reconstruction, and improving dispersed campsites. The costs of these items are discussed under, Restoration Opportunities For Local Communities, page 216 and displayed in Figure 12 page 217. Refer also to Chapter 2 - Comparison Summary of Alternatives, for a complete list of activities.

All action alternatives illustrate a negative present net value based on discounted revenue received from the project compared to the discounted total dollar-quantified costs for the project. The no-action Alternative (Alternative 1) and Alternative 4 would not harvest timber and would not produce quantified

benefits due to the data limitations described for quantifying economic benefits and costs beyond those identified at the project level. Alternative 1 would have no costs associated with harvesting although ongoing costs associated with management of the area would continue. Planning costs associated with the project are treated as "sunk costs" which have already been incurred regardless of the alternative and are not shown in the table.

Because present net values are negative, the comparison of alternatives is an illustration of the figures bearing in mind that the highest numbers demonstrate the greatest overall costs compared to benefits. Alternative 3 would produce the greatest present net value (-$2.7 million), followed by Alternative 5 (-$3.7 million) and Alternative 4 (-$3.8 million). Alternative 2 would produce the smallest present net value (-$4.0 million). . Figure 10 illustrates the discounted benefits and costs, and present net value by alternative.

Figure 13 Present Net Value

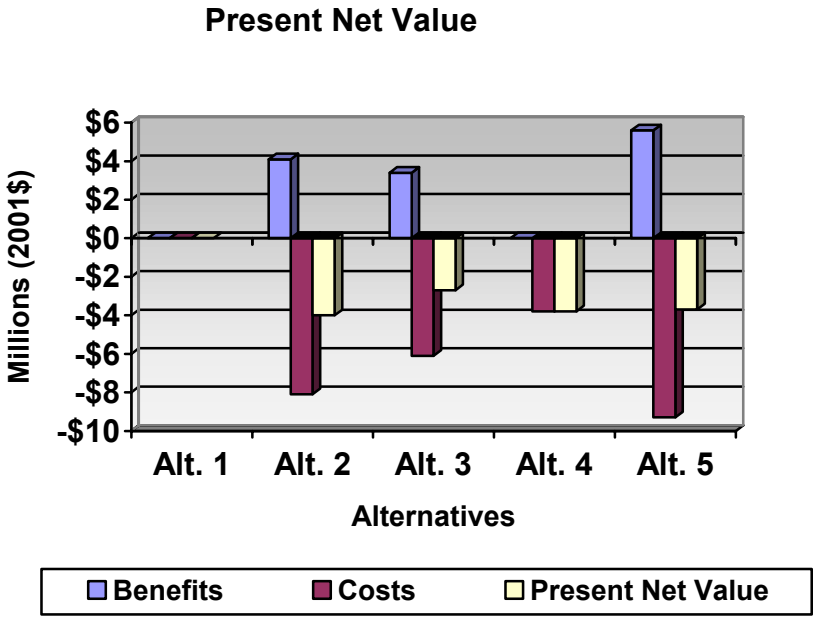

Table 221 Present Net Value

	ALT. 1	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Benefits	$0	$4.1 million	$3.4 million	$0	$5.6 million
Costs	$0	$8.1 million	$6.1 million	$3.8 million	$9.3 million
Present Net Value	$0	-$4.0 million	-$2.7 million	-$3.8 million	-$3.7 million
Per cent change	0%	0%	+32%	+5%	+7%

Alternative 5 has the highest discounted costs of the action alternatives due primarily to the larger amount of volume harvested and associated sale preparation and harvest administration costs (25 percent) and higher (18 percent) road costs associated with harvested volume compared to Alternative 2. Alternative 3 discounted costs would be 24 percent lower than Alternative 2 due to the lower amounts of volume harvested and associated sale preparation and harvest administration costs (25 percent) and elimination of the channel floodplain rehabilitation and new instream structures (approximately $250,000). Alternative 4 would have the lowest costs of the action alternatives due to no timber harvesting and no associated sale preparation and harvest administration costs ($3 million in Alternative 2), elimination of the channel floodplain rehabilitation and new instream structures, and reduction of approximately $300,000 costs for

prescribed burning and precommercial thinning costs. Alternative 1 would have no project-associated costs for comparison to the action alternatives.

Potential benefits that were not quantified in economic terms due to the limitations of measuring the production relationship between ecosystem functions and ecosystem services at the project level include improvements to soil productivity, reduced erosion, water quality improvements in temperature, terrestrial and aquatic habitat improvement. Potential improvements in fish habitat would subsequently increase smolt survival rates, overall fish population levels and increase commercial and recreational fishing opportunities. Two measures of potential economic effects would be changes in the value of commercial and sport fishing harvests.

Sport values quantified for fish range from an average net value per fish (the economic trade-offs an angler would make for access to a given fishing experience) of $55 for salmon and $160 (1999$) for steelhead in the Columbia River Basin depending on the location and size of the catch (Olsen et al. 1991). Depending on the level of change from the restoration activities in the project area, the net economic value of fish for example, would or would not be affected. Changes in sport fishing would also have an effect on recreation expenditures and potential economic impacts. Refer to the Aquatics section of this DEIS for further discussion of effects to fish habitat.

Other potential qualitative economic benefits or costs from the alternatives include changes to the diversity, quality and quantity of wildlife habitat for both game and non-game terrestrial species. With respect to big-game populations, the economic value of hunting would depend on how changes in population levels and spatial distribution of game animals affect either the quality or intensity of the hunting experience. Consequently, the overall level of hunting would change with corresponding economic impacts from hunting-related expenditures. Changes in non-game population levels and diversity would affect wildlife viewing, photography and other non-consumptive uses of the area. Refer to the Recreation and Terrestrial sections of this DEIS for further discussion of effects to these resources.

Other opportunity or externalized costs that would potentially occur include damage to soils from harvest operations resulting in long-term losses in soil productivity and potential timber harvest, losses in wildlife habitat as a result of reduced large snags or increases in wildfire risk, or increases in sedimentation to downstream fish habitat and public drinking water from erosion in the fire area. These costs are not well defined or measurable at the project level in terms that provide comparison of commensurate dollar values. Refer to the other social, economic and environmental consequences sections in this DEIS for a discussion of effects to ecological and human elements for a relative comparison between alternatives.

4.4.15 Farmlands, Wetland, and Floodplains

There are no prime farmlands within the project area on National Forest System Lands. All alternatives are in keeping with the intent of Secretary of Agriculture Memorandum 1927 for prime farmland, rangeland, and forestland.

Impacts on wetlands and floodplains from projects described in Chapters 1 and 2 are anticipated to have short-term adverse impacts with expected long-term benefits as described throughout this chapter. Design and measures recommended in the alternatives would minimize risk of flood loss; restore, enhance, and preserve floodplain values; and protect and enhance wetlands. Subsequently, recommended projects identified in the alternatives meet the intent of Executive Order 11990-Protection of wetlands and Executive Order 11988-Floodplain management. Those areas discovered during project activities would be protected as directed by Forest-Wide Standard #56.

4.5 SYNERGISTIC EFFECTS

Introduction

Effects of past, present, and foreseeable future actions for individual resources are discussed earlier in this chapter. The resource and human use trends and assumptions made in this analysis have also been discussed earlier. Those sections also disclose the pertinent direct/indirect, cumulative, irreversible/irretrievable effects anticipated in varying degrees and depending upon the magnitude and intensity of each effect.

This section presents the "synergistic interaction of different effects,"[71] disclosed under the resource sections that quantitatively and, where necessary, qualitatively interact with each other, using benchmark dates of approximately 5, 10, 50, and 125 years from project completion. While the physical character of resources and management direction may change—these changes would be speculative at best, therefore are not discussed.

Examination of the cumulative impacts of the recommended and alternative projects, show that the two greatest influences on most of the resources and uses of the project area are:

- The **transportation system**, due to amount and location of roads needed for the management of the resources and access for forest users, and
- **Vegetation condition**, due to existing composition, structure, and density being out of sync with historic ranges primarily influence by past harvest, fire suppression, and grazing.

Transportation System

The recommended projects of decommissioning roads, relocation of roads, reconstruction of roads, and closures of roads within the project area, all have a direct influence on recreational uses, as well as the protection of resources. About 18% of the total transportation system would be reduced in action Alternatives 2 and 3, with Alternatives 4 and 5 reducing total miles by 24% and 15% respectively. The majority of these projects would be completed in the next 5 to 10 years from the time of project initiation. Some reconstruction and decommissioning in Alternative 4 would probably have some work remaining beyond 10 years. In Alternative 1, roads would contine to degrade due to lack of monies to maintain the amount of roads left open.

Socio/Recreation

Recreation and the related transportation system uses are expected to increase slightly as people continue to discover the beauty of this area's resources and the offered solitude of Dixie-Butte and Greenhorn Roadless Areas, which includes the Vinegar Hill-Indian Rock Scenic Area. Demands for a safe, accessible transportation system will increase as demands for public and management uses continue.

Fewer dispersed campsites would be available in all action alternatives due to the decommissioning of roads within RHCAs, possibly reducing direct road access to favorite, traditional camping sites and fishing opportunities. However, in each alternative, a network of roads would remain open for recreation and management uses. The major difference among the alternatives is that Alternatives 2, 3, and 4 would decommission the transportation system located in the Little Butte and Deerhorn Subwatersheds, whereas Alternative 5 these subwatersheds would be reopened. The increase in open road miles in Alternative 5 would increase access for recreational uses, land management activities, and fire fighting response time over Alternatives 2, 3, and 4.

[71] Footnote to CEQ 1997 "Considering Cumulative Effects Under the National Environmental Policy Act" p.8.

Roadless Character

Because of decommissioning projects, Alternatives 2, 3, and 4, could potentially add about 1200 acres in Little Butte and Deerhorn Creeks to the northeast boundary of Dixie Butte Roadless Area in the next round of Forest planning. Roadless character would be enhanced due to the decommissioning of the transportation system. Under Alternative 5, this area would remain roaded. Likewise, in the Placer Gulch drainage, as roads are decommissioned under Alternatives 2, 3, 4, and 5, roadless character would be enhanced and could potentially be added to the east side of the Dixie Butte Roadless Area. Both of these areas have been substantially modified due to past activities such as placer mining and railroad logging, but despite the substantial alteration of these areas, road access to these areas would be reduced, enhancing a sense of solitude.

Some concerns have been expressed that by implementing recommended infrastructure projects of road closures and decommissioning, more traffic would be concentrated on fewer open road miles increasing road bed impacts. It's understood that more use on fewer miles in itself may be detrimental, but the expected dollars can be expected to better cover maintenance needs due to less miles remaining open in Alternatives 2, 3, and 4. Alternative 5 would leave an additional 50 miles open compared to the previous action alternatives.

Aquatic/Fisheries

Many roads affect hydrologic function and fish habitat across the project area. Hydrologic function, particularly stream channel morphology, is slowly improving, which correlates to the slow improvement of fish habitat. Projects recommended to accelerate this improving trend include decommissioning of roads, reconstruction of roads, relocation of roads, and the closure of roads along with improved fish passage by replacing or removing culverts that are impassible by fish. These projects would have long-term impacts of stabilizing old roadbeds reducing sediment delivery to nearby drainages. Risk of erosion, sedimentation, channel alteration, intensified peak flows, and reduced base (summer) flows would gradually decrease in about 5 to 10 years. Greater improvements would be noticed within 50 years primarily due to established riparian and conifer vegetation. This trend would result in the long-term benefit of providing habitat, which supports viable fish populations. Riparian areas that are currently occupied by a road to be decommissioned would be re-vegetated creating more shade helping maintain cooler water, creating hiding cover protecting fish from predation, and stabilized stream banks reducing sediment delivery for fish. Concentrated water flows caused by roads would be reduced in all action alternatives allowing overland flows to absorb into the local water tables improving late season flows. Alternative 1 would see continued degradation of the transportation system increasing sediments being delivered to near by drainages degrading fish habitat and continuing to intercept overland flows reducing water infiltration to local aquifers reducing the availability of water for late season flows.

Terrestrial Wildlife

Due to the many RHCA enhancements and improvements previously discussed, a benefiting resource is the wildlife that uses this area. Hiding cover would be increased and potential fawning/calving areas would be better dispersed across the project area. Improving riparian vegetation would also provide increased opportunity for migratory bird use for their protection from predation. Miles of open road, correlated to big game disturbance, would be reduced in Alternatives 2, 3, and 4 by about 31% over the current condition with Alternative 5 increasing open roads by about 20%. This change would occur in about 10 years from the time of the decision to implement these projects.

In Alternatives 2, 3, and 4, the decrease in open road densities would decrease access compared to Alternatives 1 and 5 decreasing possible wildlife harassment. Alternative 5 would keep about 73 miles more roads open than Alternatives 2, 3, and 4. The Little Butte and Deerhorn Subwatershed transportation system would be reopened with Alternative 5 improving access to this area, unlike Alternatives 1, 2, 3, or 4.

Vegetation Conditions

A key component of most of the restoration projects are to manage vegetation toward a more sustainable, resilient condition. Vegetation has a far-reaching influence on other resource and human needs and therefore has an important role in the ecosystem across the entirety of the landscape. Part of the purpose of this analysis is to show how shifting forested stands toward the historical Range of Variation (HRV) would reduce the risk of infestations, infections, and large-scale uncharacteristically severe wildfire, such as the Summit Fire (see Appendix E, Map 2—Large Fire History). The Summit Fire occurred adjacent to this project area, which is a part of the same greater watershed. The recommended mechanical and prescribed fire projects would reduce the risk of infestation, infections, and another uncharacteristically severe wildfire and would have short- and long-term impacts on wildlife habitat, hydrologic function, and socio/economic impacts.

Watershed Function

In determining watershed concerns and how the alternatives differ in responding to those concerns a model to identify potential watershed concerns was used. An equivalent roaded area (ERA) model displaying cumulative effects of the watershed resource conditions helped to accomplish *Land and Resource Management Plan* direction in that a model will be applied to identify potential situations. (*Land and Resource Management Plan* pp. IV-48). This model is intended to show trends and not to be interpreted as an absolute for potential significant impacts.

The ERA model incorporates possible impacts from roads, logging, upland cattle grazing, and fires. Values applied to these potential impacts are compared to a threshold of concern (TOC), which is an index of the potential hazard that ground disturbing activities may adversely affect streams.

It is recognized that there would be some short-term increases in disturbance even with mitigation reducing that risk from the recovery project activities in the first 1 to 5 years. Reversal of some adverse watershed condition trends and escalated recovery of others are expected to start overall watershed improvement within 5 to 10 years. Establishment of riparian vegetation and development of functional pools are two key improvements in this recovery effort that includes the additional recovery of beaver habitat. Once vegetation is recovered, opportunity to re-introduce beaver would exist, setting the foundation for long-term maintenance in pool structure that the beaver population would provide. Rehabilitation is likely to take 25 or more years to be fully effective with the establishment of vegetation on the eroded areas. Long-term benefits establishing fish and wildlife uses and late season availability of water across the landscape is expected in 50 to 125 years.

Vincent drainage is the one exception where the results peak over the TOC in both Alternatives 2 and 5 primarily due to the amount of tractor skidding. However, Alternative 2 would once again recover below the TOC about two years with Alternative 5 recovering in about five years. Long-term recovery and improvement of riparian vegetation and stream meander is anticipated.

Hydrologically, a number of isolated areas of accelerated surface erosion caused from past activities would be reduced, following initial project implementation in all action alternatives. Risks of events similar to the Lemon Creek debris torrent would be reduced in a manner proportional to the percentage of the area treated, and would gradually decline over time and is expected to be recovered in 125 or more years with the restoration of vegetation on these areas. Subsequently, the risk of reducing quality or quantity of fish habitat including pools, riffles, and shade, due to debris torrents would be reduced.

Vegetative recovery across the uplands coupled with the road recovery project previously discussed, is expected to reduce runoff and concentrated flows, which would limit sediment movement. As concentrated flows decrease, sediment accumulates over time, and then vegetation recovers resulting in long-term water storage increase improving late season flows for fish and wildlife habitat.

HRV

Currently, forest stand structural balance is not meeting the desired condition of a resilient, sustainable, fire adapted condition. The largest discrepancy in the project area's forest structural stages exist in the OFSS.

In Alternative 2, development of old forest stand structures in recommended thinned stands, with the increased growth rates, would take about 50 years. The modified thinning prescriptions would take an additional 20 to 40 years to develop old growth characteristics. This compares with the 110 years that a stand without treatment is expected to take to develop old growth characteristics. Species conversion treatments are expected to result in old forest structural stages in 20 years, compared with 60 years with not treatment. Due to these recommended treatments, there is a decreased risk of large-scale disturbances such as insect defoliators, disease infections, or stand-replacing fires that would set back structural stage development, both for the treated stands and surrounding stands. This lowers the risk of loosing wildlife habitat and preserves recreational values and out year product potential.

In Alternative 3, approximately 75% of the stands would be treated compared to that treated by Alternative 2. Development of old forest stand structures in the commercially thinned stands would be the same as in Alternative 2. There is also a proportionate decreased risk of uncharacteristically severe wildfire that would set back structural stage development, both for the treated stands and surrounding stands.

There is currently a lack of old forest stand structures due to timber harvest, fires, and other disturbances. Only a small portion of the stands treated by Alternative 2 would be treated by Alternative 4, and those that are treated would be only pre-commercially thinned rather than treating the medium sized trees. Development of old forest stand structures in the thinned stands would realize only a slight increase in growth rates over a short time. It would take about 100 years for old growth to be developed in this alternative, very similar to Alternative 1 – No Action. There is a slightly decreasing risk of large-scale stand-replacing fires that would set back structural stage development, but it is essentially the same as the No Action alternative.

There is currently a lack of old forest stand structures due to timber harvest, fires, and other disturbances. In Alternative 5, development of old forest stand structures in the thinned stands, with the increased growth rates would take about 50 years as displayed under Alternative 2. There is a decreasing risk of large-scale stand-replacing fires that would set back structural stage development, both for the treated stands and surrounding stands.

Stands treated would be, or would be growing toward, the expected range of variation (ERV) for stand structure.

Table 222 Expected Dry Forest % Structural Stage in 125 years per Alternative

ALTERNATIVE	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5-15%	5-25%	5-10%	5-10%	5-15%	30-55%	5-15%
1 Existing	5	42	35	7	30	1	12
2	5	20	2	7	24	34	9
3	5	25	3	7	26	23	11
4	5	42	3	7	28	3	12
5	5	19	2	7	20	38	8

NOTE: *This table is for comparison only* and only shows the future effects of the treatments in this alternative, not the changes due to future growth or stand structure altering disturbances.

Table 223 Expected Moist Forest % Structural Stage in 125 years per Alternative

ALTERNATIVE	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	10-30%	5-10%	10-20%	10-20%	15-20%	5-15%	15-40%
1 Existing	6	6	4	6	39	5	34
2	6	3	4	6	35	11	34
3	6	5	4	6	36	8	34
4	6	6	4	6	38	6	34
5	6	4	4	6	34	12	34

Beyond the acres mechanically treated, small tree thinning, and fuel reduction of harvest and thinning produced slash, prescribed fire would be applied to an additional 11,0370 acres in Alternative 2, 10,640 acres in Alternative 3, 17,230 acres in Alternative 4, and 10,780 acres in Alternative 5. The acres varied due to amount of areas treated mechanically prior to applying prescribed fire, and lack of accessibility to safely burn in the Little Butte and Deerhorn drainages.

Prescribed fire would also benefit the project area by reducing the number of smaller trees, removing many of the less tolerable trees to fire, and reducing fuel accumulations all of which reduce the ladder fuels that allow ground fire to climb into the crowns of the over story.

A forest stand's crown-fire hazard rating is assigned by evaluating their current uncharacteristic condition of species mix (species less resistant to fire), smaller age class (more ladder fuels), and overstocking (more fuel to burn). In this project area, 66% of the forested acres have a high rating. The changes displayed on the following table are primarily in response to the recommended mechanical treatments.

Table 224 Percent of Fire Hazard per Alternative

CROWN HAZARD	ALT. 1 EXISTING	ALT. 2	ALT. 3	ALT. 4	ALT. 5
DRY FOREST					
High	66%	44%	50%	61%	40%
MOIST FOREST					
High	60%	55%	56%	59%	54%
LODGEPOLE PINE					
High	98%	No Change	No Change	No Change	No Change
COLD FOREST					
High	84%	No Change	No Change	No Change	No Change

NOTE: Crown hazards were determined by using stand densities based on the following assumptions:

- For the Dry Forest and Moist Forest Type's, the stands indicated for treatment plus dense stands that were not recommended for treatment due to other resource objectives such as Dedicated Old Growth stands. However, information was not available on all stands and these stands were not put in the high level. Therefore, the crown fire hazard may be underestimated.
- For the Lodgepole Pine and Cold Forest Type's, the stand initiation stage was rated as low. All other stages were rated as high due to the high densities of the stands based on field observations and aerial photo interpretations.

These mechanical and prescribed fire projects are designed to reduce chance of fire reaching tree crowns; however, the results of this effort is not enough to slow down a crown fire once fire has reached the overstory crowns. An exception may be the HSH mechanical treatments, which substantially reduces the forest stand crown cover.

The more overstocked forest stands treated equates to less risk of losing habitat to large uncharacteristic severe wildfire and the more the area would embrace periodic fire without experiencing the devastating results such as experienced with the Summit fire (see Appendix E, Map 2—Large Fire History). In addition, specifically in the Dry Forest types, areas of open park like conditions, the more forest stands treated within a given alternative, the less fuel there would be to burn. Therefore, when a fire does occur, there would be

less fuel to burn proportionately with the given alternative, which equates to less particulates being released into the air resulting in reduced impacts visually to our air sheds and for people with breathing problems.

In applying a combination of mechanical and prescribe fire help to reduce the risk of fire, which equates to less chance of adverse affects occurring on other resource needs across the project area. Wildlife habitat would be more resilient and better balanced for multiple species needs. Recreation opportunities would continue to be available and uses enhanced for roaded and unroaded experiences. However, there would still exist a high risk for an uncharacteristic large event in occurring to the majority of forest stands located in the wildlife emphasis area, Vinegar Hill/Indian Rock Scenic Area, and both the Dixie-Butte and Greenhorn Roadless Areas, as expressed under Alternative 1.

Aspen

Quaking aspen stands under Alternative 1 would continue to be encroached on by conifers, leading to decline in vigor and numbers. Lack of protection from grazing by cattle and wildlife would reduce the numbers of suckers that are able to grow into trees, in many cases almost eliminating reproduction. The few stands presently remaining would continue to decline and disappear.

Under all action Alternatives, aspen stands would be released from competition by conifers, leading to an increase in vigor and numbers. The only difference among the alternatives is that in Alternative 4, the encroaching conifer would be dropped and not removed. Protection from grazing by cattle and wildlife would increase the numbers of suckers that are able to grow into trees, increasing the size of aspen patches.

After about 5 years, most aspen stands would be fenced, and suckers would be growing without being browsed. Some may be up to 1 inch diameter and 8 to 12 feet tall. The genetic diversity of aspen clones across the landscape would be maintained. In about 10 years, regeneration would be well established, and many stems would be large enough to resist ungulate browsing as fences deteriorate. If the stand is regenerating vigorously, there may hundreds to thousands of stems present. In 25 to 50 years, on most of the aspen sites stems would have self-thinned and survivors exhibit rapid growth making them relatively immune to ungulate damage and contain root systems capable of sustaining vigorous re-growth of suckers. The established stands would be 30 to 60 feet tall and showing expansion of the stand.

The establishment of these aspen stands have benefits for wildlife dependent on this diverse environment, recognized by the *LRMP* as a unique habitat, and for the casual recreationists enjoying the intrinsic values that aspen provides over the project area.

Wildlife

The spectrum of harvest treatments across the range of alternatives has varying impacts on the vegetation, which has direct shot-term impacts and long-term benefits on wildlife habitat. This includes the improvement of forest structure particularly moving forest stands toward the old growth structure, of old forest single story (OFSS) character. This old forest type is lacking in the project area, which typically are open park like, with large ponderosa pine and western larch dominating the overstory. Keying in on Alternative 2 and on OFSS, the recommended mechanical treatments would increase this structure from the existing 2% to 4% in 10 years; up to 15% by year 50, 18% by year 75, and 22% by year 125. Wildlife would benefit by having a more historically balanced fire adapted forest regime across the project area. Habitat for wildlife species dependent on OFSS would increase while habitat on a short-term basis would decrease for species that are dependent on old growth multi-story (OFMS) structure, however, OFMS would still be within HRV. Viable populations would reside in a more historic condition across the project area.

The table below displays specifically the expected % change of the OFSS and OFMS structure. For a perspective across all structural stages, see HRV above.

Table 225—Project Percentage of Change for OFSS and OFMS in Dry Forest Types in 125 Years:

STRUCTURE	HRV	ALT. 1 EXISTING	ALT. 2	ALT. 3	ALT. 4	ALT. 5
OFSS	30-55	1	+33	+22	0	+37
OFMS	5-15	12	-3	-1	0	-7

Table 226—Project Percentage of Change for OFSS and OFMS in Moist Forest Types in 125 Years:

STRUCTURE	HRV	ALT. 1 EXISTING	ALT. 2	ALT. 3	ALT. 4	ALT. 5
OFSS	5-15	5	+6	+3	0	+7
OFMS	15-40	34	0	0	0	0

Alternatives 2, 3, and 5 would benefit wildlife by year 50 due to large trees being more available for potential large snags that are currently lacking predominantly in the Dry Forest types across the project area. Many species would benefit by this increase, especially snag dependent woodpeckers for cavity nesting and foraging.

Under Alternative 1 and to a lesser extent Alternative 4, other wildlife preferred vegetation such as mountain mahogany would continue to be encroached on by conifers, leading to decline in vigor and numbers. Other shrubs, which were adapted to sprout after frequent fires and need sunlight, would continue to decline as the stands become more closed. Pinegrass, and other ground vegetation, would continue to decrease in vigor and forage quality with increasing shade and lack of nutrient cycling provided by burning. Under Alternative 4, pre-commercial thinning would reduce the number of smaller conifers encroaching on mountain mahogany, slightly increasing the shrub vigor and numbers as compared to Alternative 1. Other shrubs, which were adapted to sprout after frequent fires and needing sunlight, would increase as the stands are burned and become more open. Pinegrass, and other ground vegetation, would slightly increase in vigor and forage quality with decreasing shade and increased nutrient cycling provided by burning. There would be no benefit in the Little Butte and Deerhorn drainages due to no burning recommended in these areas.

For stands recommended for treatment under Alternative 2, thinning prescriptions would reduce the conifers encroaching on mountain mahogany, increasing the vigor and numbers of plants. Other shrubs, which were adapted to sprout after frequent fires and needing sunlight, would increase as the stands become more open. Pinegrass, and other ground vegetation, would increase in vigor and forage quality with decreasing shade and increased nutrient cycling provided by burning. Alternative 3 would benefit shrubs and grasses to lesser degree than Alternative 2. There would be no benefit in the Little Butte and Deerhorn drainages due to no burning. The effects of Alternative 5 would be similar to Alternative 2, but to a proportionately larger degree since more stands would be treated.

Table 227—Percent of Areas Treated Per Alternative Needing Treatment

TREATMENT	ACRES NEEDING TREATMENT	ALT. 1	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Commercial Thinning	9249	0%	75%	57%	0%	79%
Pre-commercial Thinning	3345	0%	93%	79%	82%	93%
Shelterwood	9322	0%	18%	13%	0%	28%
Understory Removal	1614	0%	54%	34%	0%	75%

This improved understory vegetation would benefit the range program as well by having more browse in the uplands, dispersing ungulates more evenly across the project area taking pressure off RHCAs. Subsequently, RHCA habitat would improve due to reduced ungulate pressure on the riparian vegetation, which would benefit fish and other wildlife dependent upon this habitat. Cumulatively with other RHCA

improvements, fish populations and wildlife use would increase; consequently, human uses such as fishing and wildlife viewing and hunting would improve.

Socio-economic

Of the approximate 50,000 acre Southeast Galena Restoration Project Area, about 21,500 acres of forested stands were identified as in need of treatment, due primarily to stand structure (size variance), composition (species mix), and density (stocking). Of the 21,500 acres, 51% would be treated in Alternative 2, 36% in Alternative 3, 13% in Alternative 4, and 59% in Alternative 5. These treatments would provide numerous wood products including timber products estimated at about 44 million board feet (MMBF) from Alternative 2, 33 MMBF from Alternative 3, 0 MMBF from Alternative 4, and 55 MMBF from Alternative 5. Within these recommended tractor harvest units, other wood products that may be utilized include post and poles, fire wood, and chips that could add an additional 69 MBF from Alternative 2, 14 MBF from Alternative 3, 0 MBF from Alternative 4, and over 100 MBF from Alternative 5. These various projects would help to provide numerous opportunities for large and small contracts including mills that process merchantable material for dimension lumber to the treatment of slash that would be available for chipping for fiber or as fuel for cogeneration plants. All of these opportunities help to accomplish the desired outcomes of many of these restoration projects.

Many of the 21,500 acres identified as needing to be managed are not being mechanically treated due other management objectives and standards for roadless areas, scenic areas, wildlife winter range, RHCAs, and strategies for lynx. These objectives, standards, and strategies do not necessarily maximize forest stand resiliency and sustainability. Depending on the situation and need, an area may be better off leaving in its current condition while other surrounding conditions are allowed to recover..

Under Alternative 1, existing dwellings and the small communities of Austin, Bates, and Greenhorn are in an interface with forestlands. These areas are vulnerable to loss of life and property from wildfire. Suppression efforts could be increasingly hazardous and expensive depending on the extent of the fire, whereas, under the action alternatives, this risk is lowered proportionately depending on the amount of both mechanical and prescribed fire recommended .

Demographic changes in terms of total numbers of people would continue to directly and indirectly affect the ecosystem. As a result of expected national population growth along with higher standards of living, demand for wood products, minerals, and water to support larger houses, increasing use of technology and energy demands would continue.

Effects may negatively or positively affect private property values depending on the event and the location. In examples where forest management activities benefited the environment, and improved the local natural amenities, property values increased (Niemi and Whitelaw 1997). Adjustments in terms of local or regional effects to forest products businesses from private and industrial lands would depend on timing and local employment conditions. For example, wildfires would potentially benefit certain species such as wild edible mushrooms that are commercially harvested in large quantities following fires thereby providing increased employment locally. Effects to tourism and recreation employment that relies on amenity values and scenic values produced in the area would likely decrease in the short-term until recovery or activities mitigated negative effects.

Economic changes in terms of the types of industries supporting the economy in the region would continue to evolve due to greater national and global demands for resources. Changes in definitions and composition of ecosystem management industries, pricing structures and market mechanisms that reward certification of sustainable products would affect the economic diversity and socioeconomic resiliency. Changes in environmental and economic policy and law would continue although predictions about possibilities for change are speculative.

Demographic changes would also influence employment skills needed for the future. The Hispanic ethnic group in Oregon more than doubled from 1990 to 2000, and demonstrates the reason a quarter of Oregon's

private sector employers were not satisfied with the Spanish language skills of a majority of their current workers (Oregon Employment Department 2000).

Changes in ecological and social values would continue to emphasize restoration of aquatic, terrestrial and botanical habitats and species. Increased opportunities for stewardship activities would support non-commodity values and mitigate negative socio-economic effects with increased opportunities in restoration. Subsequently, social values that prefer protection of clean water, air quality, and scenic integrity for example would increase relative to economic values for commodities such as timber and forage production. Cumulative effects to local communities as a result of broader scale changes would potentially cause the need for greater adaptability at the local scale. The ability of local communities to adapt fast enough to change would be difficult without new employment opportunities for rural communities with a low potential for diversity.

Cultural changes in involvement by local communities, growing use of partnerships and collaborative efforts between local, state, federal agencies, tribal governments, partners and the public would continue to be emphasized in the future. Public perceptions about the efficacy of these efforts and results would continue to be subject to controversy and debate. Tribal governments will increasingly seek to exercise their treaty rights on public lands and elevate awareness of the United State's trust obligations for meaningful consultation with the tribes to provide for natural resources that are important to tribal self-government.

Cumulatively, greater numbers of people would increasingly exert adverse pressure and effects on the biophysical environment, therefore, these greater numbers would cumulatively affect the social and economic environment.

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X

Y

Z

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303(d) list— State of Oregon, Department of Environmental Quality's 1998 Section 303 (d) for stream temperature and minimum flow requirements. The 1972 Federal Clean Water Act (CWA) in Section 303 (d) requires each State to identify those waters for which existing required pollution controls are not stringent enough to achieve that State's water quality standards. Within the Southeast Galena project area this section of the Middle Fork John Day River is currently listed in Oregon's 1998 Section 303(d) list for exceeding both stream temperature standards and summer flow minimums.

A

accelerated erosion: Erosion much more rapid than normal, natural, or geologic. Erosion primarily as a result of the influence of the activities of man, or, in some cases, of other animals or natural catastrophes that expose base surfaces.

adit: A horizontal passage driven from the surface for working or un-watering a mine (Noble and Spude, 1992).

affected environment: The biological, social, economic, and physical aspects of the environment that will or may be changed by recommended actions.

air quality: The composition of air with respect to quantities of pollution therein; used most frequently in connection with "standards" of maximum accept-able pollutant concentrations.

allotment (grazing): Area designated for the use of a certain number and kind of livestock for a prescribed period of time.

alpine meadows: Meadows that occur above timberline**.**

archaeological Site: A type of cultural resource property (CRP) that has the potential to yield information important to scientific or scholarly studies of history or prehistory.

Area of Potential Effect (APE): The area that contains cultural resource properties (CRP's) that may reasonably be expected to be impacted by an undertaking. Effects may be physical, visual, auditory, or socio-cultural. (cf. King 1998)

anadromous fish: Fish that hatch in fresh water, migrate to the ocean, mature there, and return to fresh water to reproduce; for example, salmon and steelhead.

ash (recent volcanic ash): Silt and very fine sand-size volcanic ejecta as used in this report. The volcanic ash that is the surface soil material of some of the land types are considered to have been laid down in recent geologic times.

ATV: All Terrain Vehicle

B

bankful stage: The elevation of the water surface of a stream flowing at channel capacity. Occurs about every 5 years average.

bankfull width/depth ratio: The ratio of stream width to deepest stream depth at bankful stage. A measure used with others to classify streams. A higher ratio is normally associated with lower gradient, more meandering streams. A lower ratio is associated with steeper, naturally straighter streams.

basal area: (1) In forests, the cross-sectional area of a tree trunk measured at breast height (4.5 feet), usually expressed in square feet per acre. (2) On rangeland, the cross-sectional area of the stem or stems of a plant or of all plants in a stand. Herbaceous and small woody plants are measured at or near the ground level; larger woody plants are measured at breast or other designated height.

Best Management Practices (BMPs): Practices designed to prevent or reduce water pollution.

GLOSSARY

biodiversity or biological diversity: The variety and variability among living organisms and the ecological complexes in which they occur.

biophysical environment or bioenvironment: The interaction of climatic factors (moisture and temperature) and soil conditions on the expression of vegetation types and associated habitats. Climatic and soil conditions that result in similar successional pathways, disturbance processes and associated vegetative/habitat characteristics are referred to as a biophysical environment

board foot (bd ft or bf): The amount of wood contained in an unfinished board 1 in. thick, 12 in. long, and 12 in. wide (2.54 x 30.5x 30.5 cm), abbreviated bd ft—*note*, in trees or logs , board food volume is a measure of merchantability, and therefore the number of board feet in a cubic foot depends on tree diameter, amount of slab, and saw kerfs; commonly, 1,000 bd ft is written as 1MBF and 1,000,000 BF is written as 1MMBF..

broadcast burn: Burning forest fuels as they are, with no piling or mechanical treatment.

C

canopy: In a forest, the branches from the upper-most layer of trees; on rangeland, the vertical projection downward of the aerial portion of vegetation.

canopy closure: The ground area covered by the crowns of trees or woody vegetation as delimited by the vertical projection of crown perimeters and commonly expressed as a percent of total ground area. *Synonym*-crown cover. (*Dictionary of Forestry,* Society of American Foresters, 1998.)

clarno soil type: Clayey surface soils from ancient volcanic ash deposits that range in depth from 4-15 in. generally with higher erosion risk, absorbs less water, and holds water longer increasing road, trail and ground-based skidding problems.

channel (stream): The deepest part of a stream or riverbed through which the main current of water flows.

channelize/ channelization: Human-caused alterations to a stream channel that cause the channel to be fixed in place, such as levees, dikes, trenching, and riprap.

channel degradation or down cut: Extension of the drainage network by headward migration of head cuts by which the channel is lowered, thereby creating a terrace. (Leopold et al. 1992)

compaction: Making soil hard and dense, decreasing soil pore space which decreases the soil's ability to support vegetation. The soil can hold less water and air and roots have trouble penetrating the soil when pore space is decreased.

connectivity: The arrangement of habitats that allows organisms and ecological processes to move across the landscape; patches of similar habitats are either close together or linked by corridors of appropriate vegetation or unbarrered streams. The opposite of fragmentation.

corridor (landscape): Landscape elements that connect similar patches of habitat through an area with different characteristics. For example, streamside vegetation may create a corridor of willows and hardwoods between meadows or through a forest.

cover: (1) Trees, shrubs, rocks, or other landscape features that allow an animal to partly or fully conceal itself. (2) The area of ground covered by plants of one or more species.

crown: The part of a tree containing live foliage; tree tops.

crown fire: A forest fire that burns in the crowns of trees.

Cultural Resource Property (CRP): A specific place on the physical landscape, natural or built, that has significant cultural value to a particular socio-cultural group. (cf. Lipe 1984)

culturally significant vegetation: Species of vegetation that are traditionally significant to regional tribes such as, alliums, bitterroot, and chokecherry.

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cumulative effects: Impacts on the environment that result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time. In this EIS, potential cumulative effects include those that were assessed for all ownerships, including lands administered by other federal agencies and non-federal lands, especially regarding terrestrial and aquatic species.

D

dbh or DBH: see diameter breast height

decommissioned roads: Roads that are considered permanently removed from service and the Forest Transportation System, either because there is no reasonably foreseeable need for the road, or because its continued use is not compatible with other resource protection needs. The goal is to leave them in a condition that will not require custodial maintenance. All stream crossing structures are removed and the stream crossing areas are reshaped to resemble a natural condition. All culverts, roadside ditches, and ruts are removed. The road surface is shaped so that no segments provide a continuous surface flow path to a stream channel. This is typically accomplished by out sloping the road surface, constructing frequent cross ditches, or a combination of both. Revegetation of decommissioned roads can occur naturally or may be accomplished by other methods to get cover within ten years after the last activity, as required by the *National Forest Management Act.*

density (stand): The number of trees growing in a given area, usually expressed in terms of trees per acre or square feet of basal area per acre.

developed recreation: Recreation that requires facilities that in turn result in concentrated use of an area; for example, a campground.

direct effects: Impacts on the environment that are caused by an action and occur at the same time and place.

dispersed recreation: Recreation that does not occur in a developed recreation site; for example, hunting or backpacking.

disturbance: Events that alter the structure, composition, or function of terrestrial or aquatic habitats. Natural disturbances include, among others, drought, floods, wind, fires, wildlife grazing, and insects and diseases. Human-caused disturbances include, among others, actions such as timber harvest, livestock grazing, roads, and the introduction of exotic species

dominant:: A group of plants that by their collective size, mass, or number exert a primary influence on other ecosystem components.

downed wood: A tree or part of a tree that is dead and laying on the ground.

duff: The partially decomposed organic material of the forest floor that lies beneath freshly fallen leaves, needles, twigs, stems, bark, and fruit.

diameter breast height:: The diameter of these stem of a tee measured at breast height (4.5 ft. or 1.37 m) from the ground—*note* 1. on sloping ground the measure is taken from the upper hillside—*note* 2. (DBH) usually implies diameter outside bark (DOB) but can be measured as inside bark (DIB).

E

ecofact: Biological specimens that are constituents of archaeological sites, usually modified by human behavior, such as the remains of plants and animals.

ecology: the science of the interrelationships between organisms and their environment; from the Greek *Oikos* meaning "house" or "place to live."

ecosystem: A complete, interacting system of living organisms and the land and water that make up their environment; the home places of all living things, including humans.

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ecosystem health: A condition where the parts and functions of an ecosystem are sustained over time, and where the system's capacity for self-repair is maintained, such that goals for uses, values, and services of the ecosystem are met.

endangered species: An animal or plant species listed under the Endangered Species Act (1973) that is in danger of extinction throughout all or a significant portion of its range.

endemic: (1)Indigenous to (native) or characteristic of a particular restricted geographical area. (2)A disease constantly infecting a few plants throughout an area. (3)a population of potentially injurious plants, animals, insects, or viruses that are at low levels. (*Dictionary of Forestry*, Society of American Foresters, 1998.)

environment: The combination of external physical, biological, social, and cultural conditions affecting the growth and development of organisms and the nature of an individual or community.

ephemeral draw: Draw bottoms that carry stream flow only as a direct response to rainfall or snowmelt events. They generally have no base flow or defined channel with evidence of annual scour or deposition.

ephemeral draw (mapped): Mapped ephemeral draws are those that are generally at least one-quarter mile in length, or possess another feature that would contribute to the concentration of ephemeral flows.

epidemic (outbreak): The rapid spread, growth, and development of diseases or insect populations that affect large numbers of a host population throughout an area at the same time.

erosion: The wearing away of the land surface by running water, wind, ice, gravity, or other geological activities; can be accelerated or intensified by human activities that reduce the stability of slopes or soils.

evaluation: Transforming data into useable knowledge, which measures progress toward achievement of desired conditions.

F

fines (sediment): Sediment particles smaller than 0.2 inch. Excessive fines can trap newly hatched fish and decrease the amount of water percolating through spawning gravels. High fine sediment loads slow plant growth and reduce available food, oxygen, and light.

fire regime: The characteristics of fire in a given ecosystem, such as the frequency, predictability, intensity, and seasonality of fire.

fire return interval: The average time between fires in a given area.

fire: See uncharacteristically severe wildfire(dry forest):

fire-intolerant: Species of plants that do not grow well with or die from the effects of too much fire. Generally these are shade-tolerant species

fire-tolerant: Species of plants that can withstand certain frequency and intensity of fire. Generally these are shade-intolerant species.

Fish Bearing Streams: Stream segments that support fish during all or a portion of a typical year (Cat. 1 on MNF PACFISH).

Floodplain: The portion of river valley or level lowland next to streams that is covered with water when the river or stream overflows its banks at flood stage. Dissipates stream energy.

Fluvial: Relating to, or inhabiting a river or stream.

Fluvial fish: Fish that live and migrate throughout streams of various sizes and then rearing in larger rivers in winter and spring.; rearing and spawning in smaller tributary streams in fall and summer.. (As opposed to resident or anadromous fish.)

Forage: Vegetation (both woody and non-woody) eaten by animals, especially grazing and

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browsing animals.

Forbs: Broad-leafed plants; includes plants that commonly are called weeds or wildflowers.

Forest health: The condition in which forest ecosystems sustain their complexity, diversity, resiliency, and productivity to provide for specified human needs and values. It is a useful way to communicate about the current condition of the forest, especially with regard to resiliency, a part of forest health that describes the ability of the ecosystem to respond to disturbances. Forest health and resiliency can be described, in part, by species composition, density, and structure

Forest Plan (*Land and Resource Management Plan*) Amendment No. 2: Interim Management Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales, Also referred to as *Regional Forester's Eastside Forest Plan Amendment No. 2 Alternative 2, as adopted.*

Forest Plan or LRMP: Malheur National Forest Land and Resource Management Plan, 1990.

forest stand/edge: A community of trees occupying a specific area and sufficiently uniform in composition (species), age, spatial arrangement, and conditions as to be distinguishable from the other growth on adjoining lands, so forming a silvicultural or management entity. Place where two different forest stands come together.

forest type: A descriptive term used to group stands of similar character of development and species composition (due to given ecological factors) by which they may be differentiated from other groups of stands.

fragmentation (habitat): The break-up of a large land area (such as a forest) into smaller patches isolated by areas converted to a different land type. The opposite of connectivity.

fuel (fire): Live or dead vegetation..

fuel, ladder: Vegetative structures or conditions such as low-growing tree branches, shrubs, or smaller trees that allow fire to move vertically from a surface fire to a crown fire.

fuel load: The dry weight of combustible materials per unit area; usually expressed as tons per acre.

G

geologic time: Implies extremely long duration.

gradient: A rate of vertical elevation change per unit of horizontal distance; also called slope.

granitic soils: Shorter name for soils developing from granodiorite, a coarse grained, acidic, intrusive rock similar to granite. (SRI p. 173)

grazing pressure: The ratio of forage demand to forage available, for any specified forage, at any point in time. (Thus, as forage demand increases relative to forage available, grazing pressure increases, and vice-versa.)

groundstone: A stone artifact that has been shaped by pecking and/or grinding. This type of artifact is often considered a marker of prehistoric plant processing.

H

habitat: A place that provides seasonal or year-round food, water, shelter, and other environmental conditions for an organism, community, or population of plants or animals.

Habitat Effectiveness Index (HEI): An index of a Rocky Mountain elk habitat model. Habitat Effectiveness Index is the relative value of habitat conditions based on the potential of the habitat type to provide cover, the quality of existing cover, and the miles of road open to vehicular traffic**.**

habitat type: A group of plant communities having similar habitat relationships.

hand line: A strip of land cleared or treated to control a fire's spread. That portion of a control line from which flammable materials have been removed by scraping or digging to

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mineral soil.

harvest: (1) Felling and removal of trees from the forest; (2) removal of game animals or fish from a population, typically by hunting or fishing.

hazard trees: Trees identified as a potential risk to a person or damage to property.

headwaters: Beginning of a drainage; un-branched tributaries of a stream, generally at higher elevations of watershed.

heritage resources: A structure, building, object, site or aggregation of sites that has one or more of the following: historic or natural significance, cultural, educational, scientific or artistic importance, significant architectural characteristics or an entity being managed for indefinite preservation.

high grading: The removal of the most commercially valuable trees (high-grade trees), often leaving a residual stand composed of trees of poor condition or species composition. (*Dictionary of Forestry*, Society of American Foresters, 1998.)

Historical Range of Variability (HRV): The natural fluctuation of ecological and physical processes and functions that would have occurred during a specified period of time. This document refers to the range of conditions that are likely to have occurred prior to settlement of the project area by Euro-Americans (approximately the mid 1800s), which would have varied within certain limits over time. HRV is discussed in this document only as a reference point, to establish a baseline set of conditions for which sufficient scientific or historical information is available to enable comparison to current conditions. From *Interior Columbia Basin Ecosystem Management Project Supplemental Draft EIS* glossary definition.

historic Site: A type of cultural resource property (CRP) associated with the historic-era that may possess archeological values; or may be valued in light of its ability to convey its association with important historic events, people, or architectural/engineering techniques (Hardesty and Little 2000). Historic sites usually must be 50 years of age or more.

HSH (Shelterwood): A mature stand is partially cut, leaving some of the better trees of desired species to grow, cast seed, and provide shade and perhaps other shelter for the new stand. These shelter trees will be harvested after seedlings have become established and no longer need protection.

HSV (Salvage): Removal of dead or dying trees.

HTH1: Commercial thin in connectivity corridors.

HTH (Commercial Thin): Thinning is an intermediate step in even-aged management. It is a cutting made in an immature stand to remove excess merchantable timber in order to accelerate diameter growth and to improve the average form of the trees that remain.

HUR (Understory Removal): Removal or thinning of the understory to promote growth, health, and sustainability of the overstory.

hydrologic: Refers to the properties, distribution, and effects of water. "Hydrology" refers to the broad science of the waters of the earth—their occurrence, circulation, distribution, chemical, and physical properties, and their reaction with the environment.

hydrophobic (soil): A condition in which soil becomes water-repellant, the capacity of soil to hold water is reduced, and chances for erosion are increased.

I

impermeable: Said of a rock, sediment, or soil that is incapable of transmitting fluids under pressure. (Bates, Robert L. & Jackson, Julia A , editors. 1984 *Dictionary of Geological Terms* 3rd edition, Anchor Books)..

indirect effects: Impacts on the environment that are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable

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infiltration: The movement of water through soil pores and spaces

initial attack: A fire- suppression action in which the aggressiveness of the attack is made consistent with the safety of the fire fighters and the public and with the values to be protected. (*Dictionary of Forestry,* Society of American Foresters 1998)

intermittent Stream: 1) A stream that flows only at certain times of the year when it receives water from springs or from some surface source such as melting snow (ICBMP) 2) PACFISH definition

issue: A matter of controversy, dispute, or general concern over resource management activities or land uses. To be considered a "significant" environmental impact statement issue, it must be well defined, relevant to the recommended action, and within the ability of the agency to address through alternative management strategies.

J

K

Key Linkage Areas (KLAs): Sufficient habitat in the form of cover vegetation, in quantity and arrangement that provides linkage between geographically isolated habitat areas throughout the Blue Mountains giving large, wide-ranging carnivores, such as Canada lynx, California wolverine, and gray wolf the ability of dispersal and movement across the landscape.

L

landscape: All the natural features such as grass-lands, hills, forest, and water, which distinguish one part of the earth's surface from another part; usually that portion of land which the eye can comprehend in a single view, including all its natural characteristics.

large downed wood (for wildlife habitat and site productivity): Large down sound logs. When determining leave log criteria:

(1) In ponderosa pine sites large downed wood should be at least 12 inches in diameter at the small end and greater than 6 feet in length. Leaving 3-6 pieces per acre for a total of 20-40 lineal feet.

(2) In mixed conifer sites large downed wood should be at least 12 inches in diameter at the small end and greater than 6 feet in length. Leaving 15-20 pieces per acre for a total of 100-140 lineal feet.

(3) In lodgepole pine should be at least 8 inches in diameter at the small end and greater than 8 feet in length. Leaving 15-20 pieces per acre for a total of 120-160 lineal feet. (Appendix B, page 12 of the *Revised Interim Direction of Regional Foresters Forest Plan Amendment #2*)

large snag: A standing dead tree with a diameter at breast height of at least 21 inches.

Large Woody Debris (LWD): Pieces of wood that are of a large enough size to affect stream channel morphology

lethal (stand-replacing) fires: In forests, fires in which less than 20 percent of the basal area or less than 10 percent of the canopy cover remains; in rangelands, fires in which most of the shrub overstory or encroaching trees are killed.

lithic scatter: A type of archaeological site that consists of surface or buried concentrations of stone waste flakes and tools. (Keyser et al. 1988)

litter: The uppermost layer of organic debris on the soil surface, which is essentially the freshly fallen or slightly decomposed vegetation material such as stems, leaves, twigs, and fruits

LRMP or Forest Plan: Malheur National Forest Land and Resource Management Plan, 1990.

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M

MBF: Thousand board feet of wood in saw logs or non sawlogs— *see* board foot.

MMBF: Million board feet of wood in saw logs or non-sawlogs— *see* board foot.

mainstem: The main channel of the river in a river basin, as opposed to the streams and smaller rivers that feed into it.

Management Area (MA): An area with similar management objectives and a common management prescription. *(LRMP, VIII-19)*

management direction: A statement of multiple use and other goals and objectives, the associated management prescriptions, and standards for obtaining them. (*LRMP*, VIII-19)

Management Indicator Species (MIS): A species identified to monitor the effects of planned management activities on viable populations of wildlife that are socially or economically important (i.e., pileated woodpecker, elk and pine marten for the Malheur *National Forest Land and Resource Management Plan*).

microclimate — The climate of a small area, such as under a plant or other cover.

migration corridor: The habitat pathway an animal uses to move from one place to another.

mitigation :Avoiding or minimizing impacts by limiting the degree or magnitude of the action and its implementation; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact by preservation and maintenance operations during the life of the action. (*LRMP*, VIII-20)

monitoring: A process of collecting information to evaluate whether or not objectives of a project and its mitigation plan are being realized. Monitoring allows detection of undesirable and desirable changes so that management actions can be modified or designed to achieve desired goals and objectives while avoiding adverse effects to ecosystems.

Multiple Use Sustained-Yield Act of 1960, (the): This act confirms the principle that all forest uses are of equal importance and should not damage the ability of the land to serve future generations. This act requires that National Forests be administered for "multiple use and sustained yield of the several products and services obtained there from," (16 USC 531).

mycorrhizae: The symbiotic relationship between certain fungi and the roots of certain plants, especially trees; important for plants to take nutrients from soil.

N

National Environmental Policy Act (NEPA): An act of Congress passed in 1969 declaring a national policy to encourage productive and enjoyable harmony between people and the environment, to promote efforts that will prevent or eliminate dam-age to the environment and the biosphere and stimulate the health and welfare of people, and to enrich the understanding of the ecological systems and natural resources important to the nation, among other purposes.

National Forest Management Act (NFMA): A law passed in 1976 requiring the preparation of Forest Service regional guides and forest plans and the preparation of regulations to guide that development.

National Register of Historic Places (NRHP): A list of significant CRP's that is maintained by the National Park Service. A "significant" site is a site that has been evaluated as eligible for inclusion to the National Register of Historic Places, or its eligibility status is undetermined.

native species: Species that normally live and thrive in a particular ecosystem.

no-action alternative: The most likely condition expected to exist in the future if current management direction were to continue unchanged.

noxious weed: A plant species designated by federal or state law as generally possessing one

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or more of the following characteristics: aggressive and difficult to manage; parasitic; a carrier or host of serious insects or disease; or non-native, new, or not common to the United States. According to the Federal Noxious Weed Act (PL 93-639), a noxious weed is one that causes disease or has other adverse effects on man or his environment and therefore is detrimental to the agriculture and commerce of the United States and to the public health.

O

obliterated Roads: Are a type of decommissioned road, on which the restoration work includes pulling back the fill materials and reshaping the roadway to restore natural contours.

Old Forest Multi Strata (OFMS): Large trees are frequent along with multiple canopy levels, often developing in absence of disturbances to the understory. (See also, structural stages.)

Old Forest Single Stratum (OFSS): Large trees are frequent with only one high canopy level, often developing in areas of frequent, low intensity ground fires.

Old Growth: A forest stand composed of mature/over mature trees (150 years or older) that provides habitat for wild life species dependant upon mature/over mature trees. LRMP IV-105.

P

PACFISH: Interim Fish-producing Watersheds Strategies for Managing Pacific Anadromous Salmonids in Eastern Oregon and Washington, Idaho, and Portions of California.

peak flows: The highest value of the stage of discharge attained by a flood, peak stage or peak discharge.

perennial stream: Streams that flow continuously throughout most of the year (Malheur National Forest Plan).

permanently flowing, non-fish bearing streams: Stream segments that contain running water throughout a typical year, but do not support fish during any portion of a typical year (PACFISH, Category 2 MNF Plan).

physiographic province: A region of which all parts are similar in geologic structure and climate and which has had a unified geomorphic history**.**

pool: Portion of a stream where the current is slow, often with deeper water than surrounding areas and with a smooth surface texture. Often occur above and below riffles and generally are formed around stream bends or obstructions such as logs, root wads, or boulders. Pools provide important feeding and resting areas for fish.

Potential Vegetation Group (PVG): Vegetation classification using similar moisture and temperature environments resulting in similar fire regimes. (Discussed in detail in the Affected Environment portion of this document.)

Precommercial Thinning (PCT): The selective felling, killing, or removal of trees in a young stand primarily to accelerate diameter increment on the remaining stems, maintain a specific stocking or stand density range, and improve the vigor and quality of the trees that remain.

prescribed fire: A fire burning under specified conditions which will accomplish specified objectives in strict compliance with an approved plan and the conditions under which the burning takes place, and the expected results are specific, predicted, and measurable. (*LRMP*, VIII-24)

prescription: A management pathway to achieve a desired objective(s).

primary range: That part of suitable range that livestock naturally graze first under current management practice; it usually includes the readily accessible areas that have available water and which will be overused before livestock significantly graze other parts of the

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allotment.

private land interface: Privately owned land in close proximity to public lands.

productivity: (1) *Soil productivity*: the capacity of a soil to produce plant growth, due to the soil's chemical, physical, and biological properties (such as depth, temperature, water-holding capacity, and mineral, nutrient, and organic matter content). (2) *Vegetative productivity*: the rate of production of vegetation within a given period. (3) *General*: the innate capacity of an environment to support plant and animal life over time

programmatic planning documents: The document discloses the environmental consequences of a program or plan that guides or prescribes the use of resources, allocates resources, or establishes rules and policies in contrast to disclosure of the environmental consequences of a site-specific project.

Proper Functioning Condition (Pritchard et a1993-4) when adequate vegetation, landform, or large woody debris is present to: Dissipate steam energy associated with high water flows, thereby reducing erosion and improving water quantity; filter sediment, capture bedload, and aid floodplain development; Improve flood-water retention and ground-water recharge; develop root masses that stabilize stream banks against cutting action; develop diverse ponding and channel characteristics to provide the habitat and water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses; and support greater biodiversity.

recommended action: A proposal by a federal agency to authorize, recommend, or implement an action.

Q

quaking aspen: A North American deciduous tree (*Populus tremuloides*) having broadly ovate, finely toothed leaves with a truncate base.

R

rangeland: Land on which the native vegetation is predominantly grasses, grass-like plants, forbs, or shrubs; not forest

Recreation Opportunity Spectrum (ROS): A framework for stratifying and defining classes of outdoor recreation environment, activities, and experience opportunities. The settings, activities, and opportunities for obtaining experiences have been arranged along a continuum or spectrum divided into seven classes: Primitive, Semi-primitive Nonmotorized, Semi-primitive Motorized, Roaded Modified, Roaded Natural, Rural, Urban.

redd: Spawning nest made by salmon, steelhead, or other salmonids in the gravel bed of a river.

reforestation: Treatments or activities that help to regenerate stands of trees after disturbances such as harvest or wildfire. Typically, reforestation activities include preparing soil, controlling pests, and planting seeds or seedlings.

refugia: Areas that have not been exposed to great environmental changes and disturbances undergone by the region as a whole; refugia provide conditions suitable for survival of species that may be declining elsewhere.

regeneration: The process of establishing new plant seedlings, whether by natural means or artificial measures (planting).

Replacement Old Growth Stands (ROGs): Stands that will replace old growth stands when old growth stands no longer meet old growth requirements**.**

reserve tree protection: Measure taken during slash disposal burning to maintain live trees left in regeneration units.

resident fish: Fish that live their entire life cycle in close proximity to where they are

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hatched, usually the same stream. (As opposed to fluvial or anadromous.)

resilient/resiliency: The ability of a system to respond to disturbances. Resiliency is one of the properties that enable the system to persist in many different states or successional stages. (From Interior Columbia Basin Ecosystem Management Project Supplemental Draft EIS glossary definition.)

restoration: Holistic actions taken to modify an ecosystem to achieve desired, healthy, and functioning conditions and processes. Generally refers to the process of enabling the system to resume acting or continue to act following disturbance as if the disturbances were absent. Restoration management activities can be either active (such as control of noxious weeds, thinning of over-dense stands of trees, or redistributing roads) or more passive (more restrictive, hands-off management direction that is primarily conservation oriented).

revegetation: Establishing or re-establishing desirable plants on areas where desirable plants are absent or of inadequate density, by management alone (natural revegetation) or by seeding or trans-planting (artificial revegetation).

riffle: Relatively shallow section of a stream or river with rapid current and a surface broken by gravel, rubble, or boulders

riparian area: Area with distinctive soil and vegetation between a stream or other body of water and the adjacent upland; includes wetlands and those portions of floodplains and valley bottoms that support riparian vegetation.

Riparian Habitat Conservation Areas (RHCAS): Portions of watersheds where riparian dependent resources receive primary emphasis, and management activities are subject to specific standards and guidelines. RHCAs include traditional riparian corridors, wetlands, intermittent headwater streams, and other areas where proper ecological functioning is crucial to maintenance of stream's water, sediment, woody debris and nutrient delivery systems. (*PACFISH*, decision notice, Glossay-6)

Riparian Management Objectives (RMO): Implementation of Interim strategies for managing anadromous fish-producing watersheds in eastern Oregon and Washington, Idaho and Portions of California. (Also referred to as PAC Fish)

road*:* A motor vehicle travel way over 50 inches wide, unless designated and managed as a trail. A road may be classified, unclassified, or temporary. **(36 CFR 212-1).**

road closure: A road management term indicating the road cannot be used by motorized traffic. This limitation can be accomplished by regulation, barricade, or blockage device. The road may be available for emergency use or permitted use such as firewood cutting during dry periods.

road decommissioning: Activities that result in the stabilization and restoration of unneeded roads to a more natural state (***36 CFR 212-1), FSM 7703***). See also, *Decommissioned Roads***.**

road work levels

reconstruction, minor: Roads where the typical work activities needed include brushing out of encroaching vegetation, blading and shaping the existing roadbed, turnouts, and turnarounds, hazard tree removal, cleaning and repair of existing drainage structures, and spot rocking.

reconstruction, major: Roads which need the same type of work listed for minor reconstruction, and additional work items, including one or more of the following: substantial removal of brush and trees from the roadbed, adding new drainage structures, adding new turnouts or turnarounds, widening of the roadbed, and substantial surface rock placement or replacement

decommission/Inactivation, minor: Roads that do not require brushing out for access, but

do require one or more of the following work activities: spot blading, ripping, or reshaping, .removal of a few ditch relief culverts, and other work that can be accomplished with hand tools and manual labor.

decommission/Inactivation, major — Roads that require the same type of work listed for minor decommissioning, as well as additional work items including one or more of the following: brush or tree removal to permit access with large motorized equipment, large culvert or bridge removal, and substantial blading, ripping, or reshaping of the roadbed.

road, classified: A road wholly or partially within or adjacent to National Forest System lands that is determined to be needed for long-term motor vehicle access, including State roads, County roads, privately owned roads, National Forest System roads, and other roads authorized by the Forest Service **(***36 CFR 212-1)***.** If a system road is no longer necessary for long-term resource management it is considered a candidate for decommissioning.

road, inactivated: Are a class of closed roads where a management decision has determined the road is not needed for an interval of at least ten years. Motorized traffic is excluded for an indefinite period of time by regulation, barricade blockage, or by obscuring the entrance. All stream crossing structures are removed, and the stream crossing areas are reshaped to resemble a natural condition. All culverts, roadside ditches, and ruts are removed. The road surface is shaped so that no segments provide a continuous surface flow path to a stream channel. This is typically accomplished by out sloping the road surface, constructing frequent cross ditches, or a combination of both. An inactivated road remains on the Forest Road Transportation System, but is left in a condition where basic custodial maintenance is not necessary. If a later decision determines the road should be decommissioned, no additional work would be usually be needed.

road, maintenance: The ongoing upkeep of a road necessary to retain or restore the road to the approved road management objective *(FSM 7712.3)*. Typical activities might include surface road and ditch blading, drainage structure cleaning and repair, minor brushing, minor rocking, and adding cross ditches.

road, new construction: Activity that results in the addition of forest classified or temporary road miles *(36 CFR 212-1)*. For the purposes of this document, road relocation is also considered road construction; while it may or may not result in addition of classified road miles, the short term impacts of relocation on natural resources is the same as construction.

road, open: A road, or segment thereof, that is open to the general public without restrictions other than general traffic control or restrictions based on size, weight, or class of vehicle. An otherwise open road may be closed during scheduled periods, extreme weather conditions, or emergencies.

road, reconstruction: Activity that results in improvement or restoration of an existing classified road. Typical reconstruction activities can include adding or repair of drainage structures such as culverts, drain dips, grade sags, rocked fords, and cross ditches, surface and ditch blading, spot rocking, aggregate surfacing or surface rock replacement, brushing, constructing additional turnouts, and other work needed for either safety or resource protection.

road, temporary: A road authorized by contract, permit, lease, other written authorization, or emergency operation, not intended to be part of the forest transportation system and not necessary for long-term resource management (*36 CFR 212-1).*

road, total density: Includes open and closed roads use for hydrologic/fish analysis.

road, unclassified: A road on National Forest System lands that is not managed as part of the forest transportation system, such as unplanned roads, abandoned travel ways, and off-road

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vehicle tracks that have not been designated and managed as a trail; and those roads that were once under permit or other authorization and were not decommissioned upon the termination of the authorization (*36 CFR 212-1)*.

roaded, modified (RM): A natural environment substantially modified, particularly by vegetation and landform alterations. There is strong evidence of roads and/or highways. Frequency of contact is low to moderate.

roaded, **natural (RN):** A natural appearing environment with moderate evidence of the sights and sounds of humans. Such evidence usually harmonizes with the natural environment. Interaction between users may be moderate to high with evidence of other users prevalent.. Motorized use is allowed.

roadless area — A National Forest area that (1) is larger than 5,000 acres, or, if smaller than 5,000 acres, is contiguous to a designated wilderness or primitive area; (2) contains no roads; and (3) has been inventoried by the Forest Service for possible inclusion in the Wilderness Preservation System.

roads, closed: Are roads on which motorized traffic has been excluded by regulation, barricade blockage, or by obscuring the entrance. A closed road remains on the Forest Road Transportation System, and is still an operating facility, but one on which motorized traffic has been removed (year-long or seasonal). Closed roads are expected to be needed on an occasional or intermittent basis, and require periodic monitoring and basic custodial maintenance.

runoff (surface): Fresh water from precipitation and melting ice that flows on the earth's surface into nearby streams, lakes, wetlands, and reservoirs.

S

salmonids: Fishes of the family Salmonidae, including salmon, trout, chars, whitefish, ciscoes, and grayling.

satisfactory cover: For elk, a stand of coniferous trees 40 or more feet tall with an average canopy closure equal to or more than 50 percent for ponderosa pine, and 60 percent for mixed conifer. Satisfactory cover typically exists as a multi-storied stand and will meet elk hiding cover criteria.

scenic Area: An area which has been designated by the Forest Service as containing outstanding natural beauty that requires special management to preserve this beauty.

scoping: The early stages of preparation of an environmental impact statement, used to solicit public opinion, receive comments and suggestions, and determine the issues to be considered in the development and analysis of a range of alternatives. Scoping may involve public meetings, telephone conversations, mailings, letters, or other contacts.

secondary Range: That part of the suitable range that, under the existing management and improvement level, is grazed significantly only after the primary range has been over used. Secondary range can be changed to primary range by changing management systems or practices or by constructing range improvements.

sediment: Solid materials, both mineral and organic, in suspension or transported by water, gravity, ice, or air; may be moved and deposited away from their original position and eventually will settle to the bottom.

Semi-Primitive Motorized (SPM): A natural or natural-appearing environment of moderate to large size. Interaction between users is low, but there is often evidence of other users. The opportunity exists to use motorized equipment.

Semi-Primitive Non-Motorized (SPNM): A natural or natural-appearing environment of moderate to large size. Concentration of users is low, but there is often evidence of other

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users. Use of local roads for recreational purposes is not allowed.

sensitive species: Species identified by a Forest Service regional forester for which species viability is a concern either a) because of significant current or predicted downward trends in population numbers or density, or b) because of significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

seral: Refers to the stages that plant communities go through during succession. Developmental stages have characteristic structure and plant species composition. Early seral refers to plants that establish soon after a disturbance, or at the beginning of a new successional process (such as seedling or sapling growth stages in a forest). Seral refers to plants that become established during later stages of plant community succession (such as the young and old forest stages).

seral stage: The developmental phase of a forest stand or rangeland with characteristic structure and plant species composition.

seral vegetation, early: The vegetation that occupies a site after a disturbance. This vegetation will not reproduce itself without continued disturbance. (*LRMP*, VIII-31)

seral vegetation, late: Vegetation that can become established during later seral stage underneath shade.

shade-intolerant: Species of plants that do not grow well in or die from the effects of too much shade. Generally these are fire-tolerant species

shade-tolerant: Species of plants that can develop and grow in the shade of other plants. Generally these are fire-intolerant species

silviculture:. The art and science of controlling the establishment, growth, composition health and quality of forests and woodlands to meet the diverse needs and values of society on a sustainable basis.

site potential: A measure of resource availability based on interactions among soils, climate, hydrology, and vegetation. Site potential represents the highest ecological status an area can attain given no political, social, or economic constraints. It defines the capability of an area, its potential, and how it functions.

slope movement: A general term for a variety of processes by which large masses of earth material are moved by gravity either slowly or quickly from one place to another. Equivalent to "mass wasting."

smolt: Young salmon or trout migrating to the ocean and undergoing biological changes to enable them to move from freshwater streams to saltwater.

snag: A standing dead tree, usually larger than forty feet tall and twelve inches in diameter at breast height. Snags are important as habitat for a variety of wildlife species and their prey.

Soil Resource Inventory (SRI): Publication in which solid, landforms, and bedrock characteristics are described at intensity sufficient to help develop resource management policies and basic plans. (SRI p.1)

soil structure: Refers to the physical structure of soils that enables air and water to move or be stored.

soil texture: Relative amounts of sand, silt, and clay in a soil. Coarse-textured soils are generally sandy and often contain gravel of various sizes; fine-textured soils are very fine, sandy, silty, or clayey.

spawning habitat: Areas used by adult fish for laying and fertilizing eggs (riffles and pool tailouts) with appropriate substrate composition.

Species of Interest (SOI): A species of high public interest or demand.

stand: A group of trees in a specific area that is sufficiently alike in composition, age,

arrangement, and condition so as to be distinguishable from the forest in adjoining areas.

stand density: Refers to the number of trees growing in a given area, usually expressed in trees per acre.

Stand Initiation (SI): A single canopy stratum of seedlings and saplings, often established after a stand-replacing disturbance.

stand-replacing fire: In forests, fire in which less than 20 percent of the basal area or less than 10 percent of the canopy cover remains; in rangelands, fires in which most of the shrub overstory or encroaching trees are killed. (see also, lethal)

State Historic Preservation Office (SHPO): The agency that represents the interests of the state in historic preservation and cultural resources. Federal land managers are required by the National Historic Preservation Act of 1966 to consult with the SHPO during land management planning.

Stem Exclusion Closed Canopy (SECC): A single canopy stratum of pole to small saw sized timber where shade excludes the development of an understory.

Stem Exclusion Open Canopy (SEOC): A single canopy stratum of pole to small saw sized timber where a lack of water excludes the development of an understory

stewardship contracting: A cost-share program administered by the USDA that funds forestry practices.

stocking surveys: Surveys taken after planting to determine the number of seedling currently living.

stream channel: The deepest part of a stream or riverbed through which the main current of water flows.

stream morphology: The form and structure of streams and their study.

structural stage: A stage of development of a vegetation community that is classified on the dominant processes of growth, development, competition, and mortality.

structural stages:

- **Stand Initiation (SI):** A single canopy stratum of seedlings and saplings, often established after a stand-replacing disturbance.
- **Stem Exclusion Closed Canopy (SECC):** A single canopy stratum of pole to small saw sized timber where shade excludes the development of an understory.
- **Stem Exclusion Open Canopy (SEOC):** A single canopy stratum of pole to small saw sized timber where a lack of water excludes the development of an understory.
- **Old Forest Multi Strata (OFMS):** Large trees are frequent along with multiple canopy levels, often developing in absence of disturbances to the understory.
- **Old Forest Single Stratum (OFSS):** Large trees are frequent with only one high canopy level, often developing in areas of frequent, low intensity ground fires.
- **Understory Reinitiation (UI):** The overstory has been opened up by natural mortality or thinning, allowing establishment of an understory.
- **Young Forest Multi Strata (YFMS):** Multiple canopy layers provide vertical and horizontal diversity with a mix of tree sizes. Large trees are absent or at low stocking levels.
- ***Note:*** *Interior Columbia Basin Ecosystem Management Project* Supplemental Draft EIS (ICBEMP) document uses the term "story" rather than "strata" in structural stage definitions.

subwatershed: A drainage area of approximately20,000 acres, equivalent to a 6th-field Hydrologic Unit Code (HUC). Hierarchically, subwatersheds (6th-field HUC) are contained

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within watershed (5th-field HUC), which in turn contained within a subbasin (4th-fieldHUC).

suckers (aspen): Shoots of new growth arising from the roots of aspens, vitally important in aspen proliferation, as these trees do not reproduce in any other manner.

suitable range: Land which produces or has the inherent capability to produce 50 pounds or more of palatable forage per acre, can be grazed on a sustained-yield basis, and is or can be feasibly made accessible for use. It is classified as either primary of secondary range.

surface fire: Fires that burn live or dead material in close proximity to the ground or on the ground surface.

T

thermal cover: Cover provided by vegetation and used by animals to protect them against weather.

thinning: An operation to remove stems from a forest for the purpose of reducing fuel, maintaining stand vigor, regulating stand density/composition, or for other resource benefits. Although thinning can result in commercial products, thinning generally refers to non-commercial operations.

threatened species: An animal or plant species listed under the Endangered Species Act that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Threatened, Endangered and Sensitive Species (TES): A species or subspecies of animal or plant whose prospects of survival and reproduction are in immediate jeopardy or likely to become so within the foreseeable future. The 1973 Endangered Species Act protects Threatened and Endangered species, while Sensitive species are managed by direction of the Regional Forester.

Threshold of Concern (TOC): The TOC is an index of watershed sensitivity to certain human and naturally caused disturbances. It is based on soil characteristics such as erosion potential or infiltration rate.

topography: Physical features of the ground surface such as hills, plains, mountains, steepness of slope, and other features.

trail: A linear corridor on land or water with protected status and public access for recreation or transportation.

trailhead: The parking, signing, and other facilities available at the terminus of a trail.

transitory range: Suitable range, which becomes available as a result of partial or total removal of overstory cover by events such as timber harvest, fire, insects or disease.

tribe: Term used to designate any Indian tribe, band, nation, or other organized group or community (including any Alaska Native village or regional or village corporation as defined in or established pursuant to the Alaska Native Claims Settlement Act) which is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians.

true firs: Coniferous trees of the genus *Abie*s. Grand fir *(Abies grandi*s) and Subalpine fir *(A. lasiocarp*a) are examples of true firs found in the analysis area. Douglas-fir *(Pseudotsuga menziesi*i) is in a different genus and is not closely related to true firs.

U

under burn: A burn by a surface fire that can consume ground vegetation and ladder fuels.

undesirable tree removal: cutting of small trees that are not desirable due to damage, disease, or are a species that is not desired due to lack of resiliency to forest disturbances.

uncharacteristically severe wildfire: A large stand replacing fire which enters the crowns of trees and burns the area of a subwatershed or greater.

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Understory Reinitiation (UI): The overstory has been opened up by natural mortality or thinning, allowing establishment of an understory.

unroaded characteristics, areas: Portion of the National Forest lands that does not contain roads. (Not to be confused with roadless areas.)

upland: The portion of the landscape above the valley floor or stream.

V

vegetative condition, outside of historical range of variability: Current vegetation condition which is different than the historic range of vegetative conditions. (see HRV)

viability: In general, viability means the ability of a population of a plant or animal species to persist for some specified time into the future. For planning purposes, a *viable population* is one that has the estimated numbers and distribution of reproductive individuals to ensure that its continued existence will be well distributed in the planning area.

visual resources — The visible physical features of a landscape.

W

water quality limited: A classification by the State under the Federal Clean Water Act for waters where application of best management practices or technology-based controls are not sufficient to achieve designated water quality standards.

watershed: (1) The region draining into a river, river system, or body of water. (2) a watershed also refers specifically to a drainage area of approximately 50,000 to 100,000 acres, which is equivalent to a 5th-field Hydrologic Unit Code (HUC). Hierarchically, subwatersheds (6th-field HUC) are contained within a watershed (5th-field HUC), which in turn is contained within a subbasin (4th-field HUC).

weed: A plant considered undesirable, unattractive, or troublesome, usually introduced and growing without intentional cultivation.

wetland: In general, an area soaked by surface or groundwater frequently enough to support vegetation that requires saturated soil conditions for growth and reproduction; generally includes swamps, marshes, springs, seeps, bogs, wet meadows, mudflats, natural ponds, and other similar areas. Legally, federal agencies define wetlands as possessing three essential characteristics: (1) hydrophytic vegetation (*Hydrophytic vegetation* is defined as plant life growing in water, soil, or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content.), (2) hydric soils (*Hydric soils* are defined as soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic, without oxygen, conditions in the upper part of the soil profile. Generally, to be considered a hydric soil, there must be saturation at temperatures above freezing for at least seven days.), and (3) wetland hydrology (*Wetland hydrology* is defined as permanent or periodic inundation, or soil saturation to the surface, at least seasonally). The three technical characteristics specified are mandatory and must all be met for an area to be identified as a wetland.

wetted width-to-depth ratio: Stream channel wetted width-to-depth ratio. A low width-to-depth ratio indicates there is less water surface area to the volume of water. Thus, in areas of low width to depth ratios, stream temperatures may be cooler as less water is influenced by exposure to sunlight present on the water surface.

wildfire: A human or naturally caused fire that does not meet land management objectives. Malheur National Forest Plan standard as part of Amendment 29. Ratio must be <10 to meet standards and guidelines.

wildfire risk, high: Measure of frequency of at least one wildfire expected in 0 to 10 years per 1000 acres.

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wildfire risk, low: Measure of frequency of at least one wildfire expected every 20 or more years per 1000 acres.

wildfire risk, moderate: Measure of frequency of at least one wildfire expected in 11 to 20 years per 1000 acres.

wildlife corridors: Cover vegetation provided in quantity and arrangement to provide Old Growth species sufficient habitat for free movement between distinct old Growth areas, interaction of adults and dispersal of young. *Also known as* connectivity corridors, Old Growth Corridors, LRMP 2 Corridors

wildlife emphasis area: Areas managed to provide high quality fish and wildlife habitat and water quality. Timber harvest is permitted if it will meet a wildlife and/or fish habitat objective.

wind throw: Trees blown over by the wind.

X

Y

Yard tops: Transporting the crown attached to the last log. The last log is trimmed and bunched at the landing. This is done to trees that are too large for whole tree yarding.

Young Forest Multi Strata (YFMS): Multiple canopy layers provide vertical and horizontal diversity with a mix of tree sizes. Large trees are absent or at low stocking levels. (See also, structural stages.)

Z

Appendix A

List of Preparers

Interdisciplinary Team

Edwards, Perry—Fisheries Biologist
(February 2000, to present)
Education:
B.S. Wildlife Management
Ohio State University 1990
Forest Service: 13 years
Fisheries Biologist, Malheur NF, Blue Mountain RD
Fisheries Technician, Nez Perce NF, Clearwater RD
Fisheries Technician, Lassen NF, Hat Creek RD
Biological (Wildlife)Technician, Deschutes NF, Sisters RD
Fisheries Technician, Tongass NF, Thorne Bay RD

Fauntleroy, Jan—Team Leader
(July 2000, to present)
Education:
B.S. Natural Resources Management
California Polytechnic State University
San Luis Obispo, CA 1978
Forest Service: 22 years
Resource Planner, Malheur NF, Blue Mountain RD (Bear Valley) RD
Sales Preparation/Administration, Bitterroot NF, West Fork RD
Sales Preparation/Administration, Sierra NF, Minarets RD,
Sale Preparation, Sierra NF, Kings River RD,
Recreation, Forest Stand Improvement, Sierra NF, Kings River RD,

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Education:
B.A., General Studies, Eastern Oregon State College, 1987
Forest Service: 15 years
GIS Analyst, Malheur NF, Bear Valley RD
GIS Asst. Analyst, Malheur NF, Bear Valley RD
Forest Technician, Malheur NF, Bear Valley RD
Range Technician, Malheur NF, Bear Valley RD,

Hagen, Daniel—Access Management
Education
A.S., Central Oregon Community College, 1975
Forest Service: 28 years
Access Manager, Malheur NF, Blue Mountain (Bear Valley) RD
Supervisory Forest Technician, Fishlake NF, Loa RD
Sale Administrator, Umatilla NF, North Fork John Day RD
Small Sale Technician, Fremont NF, Silver lake RD
Forest Technician, Beaverhead NF, Madison RD
Forest Technician, Wallowa-Whitman NF, Wallowa Valley RD
Forest Technician, Idaho Panhandle NF, Red Ives RD

Hutchins, Michael—initial Team Leader
(Transferred to Payette NF, July 2000)

Education
B.S., Forest Management, Oregon State University, 1988
Forest Service: 15 years
Resource Forester, Malheur NF, Blue Mountain (Long Creek) RD
Presale Forester, Tongass NF, Thorne Bay RD
Forest Technician, Wallowa-Whitman NF, Unity RD
Forest Technician, Umatilla NF, North Fork John Day RD

Jenkins, Connie—Geographic Information Systems
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Undergraduate, Geography/Geology, Eastern Oregon State University
Forest Service: 21 years
GIS Assistant, Malheur NF, Blue Mountain (Long Creek) RD
Forest Technician, Malheur NF, Long Creek RD
Forest Technician, Wallowa-Whitman NF, Hells Canyon NRA
Forest Technician, Fremont NF, Silver Lake RD

Kelly, James—Writer-Editor
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Northern Essex Community College, 1971-1973 English
Southern Oregon University 1975-77 English
Forest Service: 5 years
Writer/Editor, Malheur NF, Blue Mountain RD
Biological Technician/Writer-Editor, Rogue River NF, Applegate RD
Writer/Editor, Ochoco NF, Paulina RD
Forestry Technician/Writer-Editor, Rogue River NF, Prospect RD

Kohrman, Elaine—Socio-Economics
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B.S., Economics, Colorado State University, 1986
Forest Service: 16 years
Blue Mountains Tri-Forest Economist, Wallowa-Whitman NF Headquarters
IDT Leader, Wallowa-Whitman NF, Wallowa Valley RD
GIS Specialist, Wallowa-Whitman NF, Wallowa Valley RD
Wilderness Ranger, Wallowa-Whitman NF, Eagle Cap RD

Lynch, R. Lynch—Fire/Fuels
Education:
B.S., Forest Management, Northern Arizona University, 1972
Forest Service: 30 years
Fire Management Officer, Malheur NF, Blue Mountain (Long Creek) RD
District Silviculturist, Malheur NF, Blue Mountain RD
Planning Forester, Umpqua NF, Diamond Lake RD
Silviculture Forester, Umpqua NF, Diamond Lake RD
Forestry Technician, Siuslaw NF, Alsea RD
Forestry Technician, Siuslaw NF, Supervisor's Office
Forestry Technician, Region 3, Regional Office

Lysne, Mark—Engineering
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B.S. General Science, University of Oregon, 1971
Forest Service: 28 years
Civil Engineer, Malheur NF Headquarters
Geologist, Malheur NF Headquarters
Civil Engineering Technician, Malheur NF Headquarters

Mattson, Donna—Scenery
Education:
B.S., Landscape Architecture, University of Oregon, 1991

Forest Service: 11 years
Landscape Architect, Wallowa-Whitman NF, Hells Canyon NRA

Mendenhall, Thomas—Fisheries Biologist
Education
B.S., Fisheries Science, Oregon State University, 1985
Forest Service: 16 years
Fisheries Biologist, Malheur NF, Bear Valley RD
Ecosystem Management RDMA, Mt. Baker-Snoqualmie NF, Darrington RD
Fisheries Biologist, Tongass NF, Thorne Bay RD
Fisheries Biologist, Nez Perce NF, Selway/Moose Creek RDs
Biological Technician (fisheries), FS Research Station, Corvallis, OR

Rotell, Don—Heritage
Education:
B.A., Anthropology, Washington State University, 1992
Forest Service: 10 years
District Archaeologist, Malheur NF, Blue Mountain (Bear Valley RD
Compliance Archaeologist, Malheur NF, Blue Mountain (Bear Valley) RD
Compliance Archaeologist, Burns District BLM, Three Rivers RA
Archaeological Technician, Malheur NF, Prairie City RD

Scharpf, Karen—Geographic Information Systems
Education:
Currently Enrolled at Eastern Oregon University working towards a degree in Geography/Small City Rural Land Management Planning
Forest Service: 18 years
GIS Analyst, Malheur NF, Blue Mountain RD
Firefighter, Forest Stand Improvement, Sales Preparation, Appraiser, Public Relations; Gifford Pinchot NF

Schuetz, Kenneth—Wildlife
Education:
M.F., Forest Management, Duke University, 1987
B.S., Wildlife Biology, Albright College, 1982
Forest Service: 16 years
Wildlife Biologist, Malheur NF, Blue Mountain (Bear Valley) RD
Tree Improvement/Prescription Forester, Malheur NF, Bear Valley RD
Resource Forester, Malheur NF, Bear Valley RD
Resource Forester, Willamete NF, Sweet Home RD
Resource Forester, Gifford Pinchot NF, Mt Adams RD
Reforestation Technician, Gifford Pinchot NF, Mt Adams RD

Sullens, Jim—Logging Systems
Education:
Forest Engineering Institute, Oregon State University, 1992
U.S. Army Warrant Officer Aviation School, 1971
Undergraduate, Forest Engineering, Oregon State University, 1968-1969
Undergraduate, Education, Eastern Oregon State College, 1967-1968
Forest Service: 18 years
Forestry Technician, Presale, Malheur NF, Blue Mountain (Bear Valley) RD
Forestry Technician, Presale, Malheur NF, Bear Valley RD
Forestry Technician, Presale, Malheur NF, Bear Valley RD
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Appendix B

Plant BIOLOGICAL EVALUATION
Aquatics BIOLOGICAL EVALUATION and
Wildlife BIOLOGICAL EVALUATION

Note: the following biological evaluations were written separately and given separate table numbers. For the purposes of this appendix, data tables were numbered contiguously through this appendix with the label, BE Table and the original table numbers then retained in parens for text reference.

BIOLOGICAL EVALUATION
for
PROPOSED, THREATENED, ENDANGERED, AND SENSITIVE
PLANTS
February 2002
Blue Mountain Ranger District
Malheur National Forest
Southeast Galena Restoration

Prepared by:
Jean Wood – District Botanist

I. SUMMARY

This biological evaluation (BE) describes and displays any effects to sensitive species of the flora associated with the SE Galena Watershed Restoration Project on the Blue Mountain Ranger District. No proposed, threatened, or endangered plant species occur on the Malheur National Forest. The following are effects/impacts on the sensitive plant species considered in the SE Galena Restoration Analysis, and decisions are contingent upon implementation of mitigation measures, identified on the following page.

BE Table 1—Sensitive Plant Species of the Blue Mountain Ranger District

Species	Common Name	Populations Present	Habitat Present
Achnatherum hendersonii	Henderson's ricegrass	S	HD
Achnatherum wallowensis	Wallowa ricegrass	S	HD
Astragalus diaphanus var. *diurnis*	S Fork John Day milkvetch	N	HN
Astragalus tegetarioides	Deschutes milkvetch	N	HN
Botrychium ascendens	ascending moonwort	S	HD
Botrychium crenulatum	crenulate moonwort	D	HD
Botrychium lanceolatum	lance-leaf grapefern	D	HD
Botrychium minganense	Mingan grapefern	D	HD
Botrychium montanum	mountain moonwort	D	HD
Botrychium pinnatum	pinnate grapefern	D	HD
Calochortus longebarbatus var. *peckii*	long-bearded sego lily	N	HN
Camissonia pygmaea	dwarf evening primrose	N	HN
Carex backii	Back's sedge	S	HD
Carex interior	inland sedge	D	HD

Carex parryana	Parry's sedge	S	HD
Cypripedium fasciculatum	clustered lady slipper	S	HD
Lomatium erythrocarpum	redfruit desert parsley	N	HN
Lomatium ravenii	Raven's lomatium	N	HN
Luina serpentina	colonial Luina	N	HN
Mimulus evanescens	vanishing monkeyflower	N	HN
Pellaea bridgesii	Bridge's cliff-brake	S	HD
Phacelia minutissima	least phacelia	S	HD
Pleuropogon oreganus	Oregon semaphore grass	N	HD
Thelypodium eucosmum	arrow-leaved thelypody	N	HD

Occurrence

HD	Habitat Documented or suspected within the project area or near enough to be impacted by project activities
HN	Habitat Not within the project area or affected by its activities
D	Species Documented in general vicinity of project activities
S	Species Suspected in general vicinity of project activities
N	Species Not documented and not suspected in general vicinity of project activities

II. INTRODUCTION

This Biological Evaluation (BE) analyzes the potential effects of the proposed action for the SE Galena Restoration Project, Malheur National Forest. This BE satisfies the requirements of Forest Service Manual 2672.4 that requires the Forest Service to review all planned, funded, executed or permitted programs and activities for possible effects on proposed, endangered, threatened or sensitive species.

The following sources of information have been reviewed to determine which TES species, or their habitats, occur in the project area:

- Regional Forester's Sensitive Species List
- Forest or district sensitive species database(s) and the GIS mapping layer(s)
- Oregon Natural Heritage Program, Rare, Threatened and Endangered Plants and Animals of Oregon
- Project area maps and aerial photos.

The SE Galena Restoration project is composed of a variety of activities including timber harvest, forest thinning, prescribed burning, road decommissioning, aspen grove protection, riparian hardwood planting, and in-stream work.

III. PROJECT DESCRIPTION

The project will take place in the NE portion of Grant County in the Middle Fork John Day watershed, and includes at least portions of 5 subwatersheds.

For details of the project proposal, see the SE Galena Restoration EIS.

IV. EFFECTS ANALYSIS

To determine which sensitive plant species may be affected by the proposed action, two steps are taken. First, the Forest GIS and sensitive plant database is searched to locate known sensitive plant populations that occur in or near the area of the proposed action. Second, to identify habitats that may harbor sensitive plants, the physical and biological features in the project area are correlated with those in which sensitive plants are known or suspected to occur (Nelson 1985). Specific habitat features for Forest sensitive plants are described in Sensitive Plants of the Malheur, Ochoco, Umatilla, and Wallowa-Whitman National Forests, (Brooks, et al. 1991), and in site reports of documented species.

Areas of suspected habitat for sensitive plants are identified in pre-field analysis based on aspect, elevation, and ecoclass. A large proportion of potential habitats was surveyed by the intuitive controlled method at the appropriate season during 1998 and 2000. Several populations of sensitive species were found, as well as additional potential habitat. More habitat exists than was surveyed, especially for *Achnatherum, Botrychium,* and *Carex* species. However, these species favor habitats receiving minimal impacts from proposed activities, so are not at risk. The species in the following table of effects have either potential habitat or known populations within the analysis area.

BE Table 2—Conclusion of Effects

Species	Alternative				
	No Action	Alt.2	Alt. 3	Alt. 4	Alt. 5
Achnatherum hendersonii (Henderson's ricegrass)	NI	NI	NI	NI	NI
Achnatherum wallowensis (Wallowa ricegrass)	NI	NI	NI	NI	NI
Botrychium ascendens (ascending moonwort)	NI	NI	NI	NI	NI
Botrychium crenulatum (crenulate moonwort)	NI	NI	NI	NI	NI
Botrychium lanceolatum (lance-leaf grapefern)	NI	NI	NI	NI	NI
Botrychium minganense (Mingan grapefern)	NI	NI	NI	NI	NI
Botrychium montanum (mountain moonwort)	NI	NI	NI	NI	NI
Botrychium pinnatum (pinnate grapefern)	NI	NI	NI	NI	NI
Carex backii (Back's sedge)	NI	BI	BI	BI	BI
Carex interior (inland sedge)	NI	NI	NI	NI	NI
Carex parryana (Parry's sedge)	NI	NI	NI	NI	NI
Cypripedium fasciculatum (clustered lady slipper)	NI	MIIH	MIIH	MIIH	MIIH
Pellaea bridgesii (Bridge's cliff-brake)	NI	NI	NI	NI	NI
Phacelia minutissima (least phacelia)	NI	BI	BI	BI	BI
Pleuropogon oregonus (Oregon semaphore grass)	NI	BI	NI	NI	BI
Thelypodium eucosmum (arrow-leaved thelypody)	NI	NI	NI	NI	NI

Effects Determinations

Sensitive Species

NI	No Impact
MIIH	May Impact Individuals or Habitat, but Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species
WIFV	Will Impact Individuals or Habitat with a Consequence that the Action May Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species
BI	Beneficial Impact

Achnatherum hendersonii and ***wallowensis*** (Henderson's ricegrass)

Status Federal: none
State: Candidate
Region 6: Sensitive

Achnatherum hendersonii has recently been split taxonomically into 2 separate species (Maze and Robson, 1996). *A. hendersonii* populations are known from the Ochoco NF to the west of the Malheur, and *A. wallowensis* has been found primarily on the Wallowa-Whitman NF to the east. Because their habitats are similar, both are treated here under the common name of Henderson's ricegrass.

Environmental Baseline

Henderson's ricegrass is a strongly tufted perennial that has been found on the Ochoco NF at elevations from 4100 to 5400 ft. Its range is east of the Cascades from central Washington to the Wallowa Mountains of northeast Oregon.

This grass is found in dry, rocky, shallow soil, in association with sagebrush or ponderosa pine, although some sites have been found in scablands with no overstory. It has been found in *Artemisia rigida/ Poa secunda* plant communities, as well as *Eriogonum strictum/Poa secunda* plant communities. Other associated plants include species of *Lomatium, Sitanion, Trifolium,* and *Zigadenus.*

Henderson's ricegrass reproduces from seed, and known populations contain few plants.

No populations of *Achnatherum hendersonii* or *A. wallowensis* have been found during field surveys.

Direct Effects

Grazing, which is likely to remove the seed crop as well as impact individual clumps, is the greatest threat to Henderson's ricegrass.

Broad-spectrum herbicides applied directly to this species would kill it.

Indirect Effects

Ground-disturbing activities, such as road building and log skidding, can degrade habitat for Achnatherums, as well as damage any individual plants that are present.

Some noxious weeds such as St. Johnswort can thrive and spread in the dry habitats preferred by this ricegrass. Heavy infestations of such weeds can displace the native plants.

Cumulative Effects

Heavy historic grazing has likely been a prime factor in reducing the occurrence of this palatable grass. Historic use of scablands for yarding and log landings has destroyed vegetation, compacted soils, and altered runoff and moisture retention patterns on some potential habitat.

Fire is unlikely to affect Henderson's ricegrass or its habitat, which is so sparsely vegetated that a burn is not likely to carry through it.

Mitigation

Skidding will be avoided on unsuitable (non-forested) land, where feasible, to minimize displacement, erosion, and irreversible damage to the soils that may provide potential habitat for Henderson's ricegrass. Skid trail locations will be designated and approved prior to logging, to minimize soil impacts.

Determination

Alternative 1

Noxious weeds, without any control, are the most likely to spread into and degrade potential habitat for Henderson's ricegrass under this alternative. However, noxious weed populations are currently few and small, so do not pose a large or immediate threat. This alternative **would not impact individuals or habitat**, and would not contribute to a trend towards federal listing or cause a loss of viability to the species.

Alternatives 2 - 5

With the above mitigation, these alternatives would not impact potential habitat, nor are they likely to contribute to a trend towards federal listing or cause a loss of viability to the species.

Botrychium ascendens (ascending moonwort)

Status Federal: Species of concern
State: Candidate
Region 6: Sensitive

Botrychium crenulatum (crenulate moonwort)

Status Federal: Species of concern
State: Candidate
Region 6: Sensitive

Botrychium lanceolatum **(lance-leaf grapefern)**

Status Federal: none
State: none
Region 6: Sensitive

Botrychium minganense (Mingan moonwort)

Status Federal: none
State: none
Region 6: Sensitive

Botrychium montanum (mountain moonwort)

Status Federal: none
State: none
Region 6: Sensitive

Botrychium pinnatum (pinnate grapefern)

Status Federal: none
State: none
Region 6: Sensitive

All Botrychium species with occurrence potential on the district are here treated under a single analysis because they have common habitat requirements and are, in fact, frequently found growing together.

Environmental Baseline:

Botrychiums, also known as moonworts or as grapeferns (due to the clusters of fruiting structures at the top of their stalks), are small, primitive plants closely related to ferns.

They reproduce by spores, and are known to be mycorrhizal, though many details of their life history and growth requirements are still unknown. Although green and apparently photosynthetic, the species considered here are all capable of surviving for years with only sporadic above-ground growth, apparently drawing reserves from the host plants with which they have mycorrhizal connections. As a result, populations of these moonworts appear to fluctuate from year to year, depending on how many plants produce visible leaves and/or fruiting bodies. The factors determining yearly appearance of plants above ground are not yet understood.

These 6 Botrychium species are found sporadically throughout the mountains of the Pacific Northwest and the Rockies, and *B. minganense* is known across Canada to the eastern part of the continent. In the Blue Mountains they have primarily been found between 4500 and 7500 feet in elevation.

Preferred habitat of these species is perennially moist ground at the edges of small streams, wet meadows, springs, and seepy openings in forest. The plants often favor partial shade from an overstory of conifers and/or riparian shrubs such as alder and red-osier dogwood, but also occur in openings or meadows with only grasses and forbs providing shade. Wet meadow edges with encroaching lodgepole pine are prime grapefern sites, as are the mossy openings around springs in mixed conifer forest that includes subalpine fir and Engelmann spruce. On the Umatilla NF several botrychium species are found under young spruce in moist tree plantations that are 20 to 40 years old. Plants frequently associated with botrychiums in the Blue Mountains include strawberries and violets, *Pinus contorta, Picea engelmannii, Alnus incana, Vaccinium scoparium, Carex aurea, Geum macrophyllum, Platanthera dilatata,* and other *Botrychium* species.

In many instances, moonworts appear to be "seral" species favored by one-time ground disturbance, tending to appear 10 years or more after such disturbance occurs. It is possible that they die out eventually, as forest succession shades out understory plants. A mosaic of forest habitats that shift over time, providing new openings as old ones fill in, may best ensure the long-term survival of botrychiums. However, until this is definitively known and the needs of these moonworts are better understood, it is important to preserve existing populations. Since most of the plants are quite small and are difficult to find, they may be easily overlooked except in intensive surveys. Their habitat, on the other hand, is readily identified and protected or avoided during management activities.

Reproduction of these fern allies is accomplished by the dispersal of spores by wind and water, and pollinators are not required.

Good potential habitat for grapeferns exists at numerous sites within the SE Galena Project Area. Fourteen populations of *Botrychium spp.* have been documented, as shown in the following table.

BE Table 3—Documented Botrychium Populations in SE Galena

Species	Subwatershed	Number of populations
Botrychium crenulatum	30201	3
"	30203	1
"	30207	2
Botrychium lanceolatum	30201	1
Botrychium minganense	30203	2
"	30207	2
Botrychium montanum	30207	1
Botrychium pinnatum	30203	1
"	30207	1

Direct Effects

Loss of individual above-ground stems, as by herbivory, unseasonable frost, or mechanical damage, may not harm plants in the long run, considering that they do not appear every year, and probably rely on some underground reserves to persist through "dormant" years. However, ground disturbance such as soil disruption by road construction, logging and yarding activities, and trampling by ungulates may disrupt mycorrhizal connections, damage shallow root systems, and cause direct mechanical damage to above-ground plants during the growing season.

Herbicides applied directly to these species would probaby kill them.

Indirect Effects

Along with ground disturbance that alters the quality of habitat, changes in moisture availability, such as loss of ground water sources or hydrological alterations, are probably the most potentially damaging to moonwort populations. While existing plants may have the capacity to survive droughty periods via their mycorrhizal connections, germination and establishment of new plants require ample moisture. Loss of wet sites capable of supporting botrychiums, whether due to water "developments" for livestock or mining, or to upstream, upslope hydrologic disturbance such as by road building or soil compaction by heavy equipment, can most effectively eliminate potential habitat. Continuous crown closure and a lack of canopy gaps may also reduce the edge habitat that some moonworts favor.

The effects of fire on local botrychiums are not known. Several moonworts in the midwestern prairies are adversely affected by fire in drought years (Johnson-Groh and Farrar, 1999). Because moonworts are limited to very wet microhabitats in the Blue Mountains, they are unlikely to be directly affected by fire, unless it is severe. However, the death of overstory trees may remove a necessary mycorrhizal host and impact an entire population, as in those that grow at the edges of meadows around small lodgepole pine. Loss of even partial shade that many populations favor could also affect long-term survival of these plants. It is not known what consequences fire might have, or whether an existing population could persist after a severe burn.

Cumulative Effects

In meadow habitats, grazing can reduce competition from tall grasses and forbs, and may enhance moonwort vigor, but disturbance of substrates and of mycorrhizal connections is

detrimental. Overuse of wetlands, springs, and riparian areas by ungulates may have damaged some populations.

Water developments such as cattle troughs and ditches for mining and irrigation have decreased wet meadow habitat. Lowering of water tables associated with stream channel degradation and loss of historic beaver wetlands has reduced wetland habitat that probably supported some botrychium species.

Very hot burns through riparian areas during the Summit Fire may have killed some populations. Though surveys for these species were not conducted before the fire occurred, the nearly complete loss of canopy cover and shade may have affected any populations that did exist. Extensive potential habitat is present within the burn, but the few surveys done since the fire have documented no plants.

Mitigation

Current Pacfish buffers that avoid mechanical activities or timber harvest within at least 100 feet of riparian areas will adequately protect both exisiting populations and potential habitat. It should be emphasized that even the smallest springs and seeps provide good potential habitat, especially above 4500 feet elevation.

Determination

Alternative 1

The **no action** alternative could indirectly affect existing populations of botrychiums by changing canopy cover **if** severe wildfires were to occur. The loss of mycorrhizal host trees from severe fire could adversely affect existing populations, as well as decrease potential for new population establishment. However, the occurrence of wildfire is a risk, rather than a known outcome of this alternative. Alternative 1 **would not impact individuals or habitat**, and would not contribute to a trend towards federal listing or cause a loss of viability to the species.

Alternatives 3 & 4

Since these alternatives propose no harvest within RHCAs, they **would not impact individuals or habitat**, and would not contribute to a trend towards federal listing or cause a loss of viability to the species.

Alternatives 2 & 5

If the above mitigation is included, these alternatives **would not impact known individuals or habitat,** and would not contribute to a trend towards federal listing or cause a loss of viability to the species.

Carex backii (Back's sedge)

Status Federal: none
State: none
Region 6: Sensitive

Environmental Baseline:

Carex backii is a tufted sedge that grows in lowlands to mid-montane elevation. Its range extends across southern Canada to British Columbia and south to Utah and Colorado, though it is infrequent in the Pacific Northwest. Two documented sites in the Blue Mountains are on the northern Umatilla National Forest, and on the north end of the Burns Ranger District of the Malheur in a wetland classification plot.

Carex backii usually grows in riparian areas in warm, moist, often shady places, commonly in thickets or woods. On the Burns site, this sedge is found growing in an *Alnus incana/Symphoricarpos albus* plant association. Other shrubs present include *Prunus virginiana, Cornus stolonifera, Ribes aureum* and *R. hudsonianum*. Associated understory plants include *Carex praticola, Juncus balticus, Poa pratensis, Glyceria striata*, and numerous riparian forbs. At the Mill Creek site on the Umatilla, most plants occur on gravel bars and streamside substrates that show evidence of fairly frequent disturbance, and all are in dappled to deep shade. When mixed in with other riparian vegetation, this small sedge is difficult to find and recognize, so it is possible it is more abundant than current records indicate.

Carex backii does not have creeping rhizomes, therefore, only reproduces only by seed.

No *Carex backii* has been found in the analysis area, though ample potential habitat is present.

Direct Effects

Grazing, off-road recreation, and stream channel restoration are the management activities most likely to directly affect *Carex backii.*

Cattle grazing in riparian areas is the greatest threat to individual plants, due to the palatability of this sedge.

Inappropriate use of ORVs in riparian areas and stream crossings, as along the Davis Creek Trail, could damage plants as well as potential habitat.

Direct damage to individual plants and their habitat could result from in-stream restoration activities, especially if they involve the use of heavy equipment.

Because *Carex backii* grows in wet riparian zones, only severe fire is likely to adversely affect plants.

Direct application of broad-spectrum herbicide could kill this species.

Indirect Effects

Logging activities are only likely to have an adverse effect on this sedge if they encroach on riparian areas enough to reduce stream shading, or if road construction or other ground disturbing activities directly impact plants at stream crossings.

Excessive ungulate use resulting in bank degradation, and "post-holing" can adversely impact this sedge's habitat. Grazing during the period of seed set can eliminate this sedge's opportunities for reproduction and spread or increase.

Severe fire could impact populations or habitat of *Carex backii* indirectly by reducing shade to riparian areas, both from conifers and from streamside shrubs.

Construction of instream structures that result in aggradation, raising of water tables, and possible formation of gravel bars, could have a beneficial impact on this sedge by increasing potential habitat. So could shrub plantings that increase shade along stream channels.

Cumulative Effects

The associated plants from the Burns wetland classification plot that includes *Carex backii* indicate that the Burns site has been heavily grazed. The depletion of shrubs by long-term cattle use can cause a reduction in riparian shade, thereby degrading potential habitat. Late season grazing and wild ungulate use have likely decreased the abundance

of this sedge across the landscape, in part by seed crop consumption that limits reproduction, and in part by degradation and loss of habitat.

Historic activities such as mining have caused stream channel straightening and degradation leading to downcutting. Because *Carex backii* is often associated with gravel bars and shallow stream banks, these changes may have reduced potential habitat over the last century.

Determination

Alternative 1

Alternative 1 **would not impact individuals or habitat**, and would not contribute to a trend towards federal listing or cause a loss of viability to the species.

Alternatives 2-5

These alternatives **would not impact individuals, might beneficially impact habitat** due to instream work (Alternatives 2 & 5 only) and to an increase in shade from hardwood plantings (all the action alternatives), and would not contribute to a trend towards federal listing or cause a loss of viability to the species.

Carex interior (Inland Sedge)

Status Federal: none
State: none
Region 6: Sensitive

Environmental Baseline:

Carex interior is a densely tufted sedge that grows in lowland to mid-montane elevations. It is a widespread North American species found throughout the range of the Pacific Northwest, as defined by Hitchcock and Cronquist; however, it is apparently uncommon in Oregon.

Carex interior inhabits saturated riparian areas with year-round surface water, such as swamps and wet meadows associated with seeps, springs, or streams. It thrives in full sun, and can survive with small amounts of shade. Associated species include *Alnus incana*, *Carex cusickii, Carex utriculata, Cicuta douglasii, Deschampsia cespitosa, Juncus spp*., and *Menyanthes trifoliata.*

Carex interior is not rhizomatous and reproduces by seed only.

One population of *Carex interior* has been documented within the analysis area. Numerous areas of potential habitat exist, not all of which have been surveyed.

Direct Effects

Harvesting of logs from riparian areas might cause mechanical damage to plants.

Grazing is the most likely management activity to directly impact this species. Like other sedges, *Carex interior* remains palatable fairly late in the summer and may become preferred forage when other plants are drying up.

Inland sedge grows in such wet habitats that plants are unlikely to be adversely affected by controlled burning.

Direct application of broad-spectrum herbicide could kill this species.

Indirect Effects

The use of heavy equipment associated with logging, mining, road construction, and instream structure work can be very harmful to the fragile, wet soils that this sedge

inhabits, as can excessive use by ungulates. However, a reduction in overstory shading by timber harvest could increase potential habitat.

Besides potentially damaging substrates, late season grazing can remove the seed crop, negatively impacting this species' reproduction.

Intense fires in RHCAs, due to high fuel loading, could kill *Carex interior* plants. However, reduction in canopy cover and increase in light availability could increase potential habitat.

Cumulative Effects

Canopy closure and dense shade from conifers resulting from years of fire suppression may well have reduced potential habitat from the ERV, and may have caused existing populations to shrink.

Heavy grazing and wild ungulate use may have decreased the abundance of this sedge across the landscape.

Water developments such as cattle troughs and ditches for mining and irrigation have decreased wet meadow habitat. Lowering of water tables associated with stream channel degradation and loss of beaver wetlands has also reduced wetland habitat that has the potential to support *Carex interior.*

Mitigation

If an alternative is implemented that includes entering RHCAs to harvest logs within the Banner Blowdown area, the single known population will be protected from any direct mechanical impacts by the standard 100 foot buffer against heavy equipment use.

Determination

Alternatives 1- 5

If the above mitigation is included, **none** of the alternatives **would impact individual plants or habitat**, nor would they contribute to a trend towards federal listing or cause a loss of viability to the species.

Carex parryana (Parry's sedge)

Status Federal: none
State: none
Region 6: Sensitive

Environmental Baseline:

Carex parryana is a loosely tufted sedge that grows from lowlands to moderate elevation. Its range is chiefly east of the continental divide but it extends onto the Pacific slope in central and east Idaho and northern Utah; it is also known from northeast Oregon and central Nevada.

Carex parryana grows in the driest communities of moist meadows, swales, and moist, low ground around streams and lakes, and on prairies and high plains as well. Associated plants found on a wetland classification plot on the Burns RD were *Poa pratensis, Agrostis stolonifera, Juncus balticus,* and *Carex praegracilis*.

Carex parryana can reproduce via creeping rhizomes, and by seed production.

No populations of *Carex parryana* have been found within the analysis area, although there is some potential habitat.

Direct Effects

There is no information about the effects of fire on *Carex parryana*. However, because it grows in the driest communities of meadows, it could be affected by fire. If the fire is low to moderate, as in a controlled burn, the creeping rhizomes would likely survive and resprout after the fire.

The abundance of *Poa pratensis* and *Juncus balticus* on the Burns site indicate that the area has been grazed, though the effects on the *C. parryana* population are unknown. This sedge remains palatable fairly late in the summer and may become preferred forage when other plants are drying up.

Noxious weeds, knapweeds in particular, can spread rapidly in this species' preferred habitat.

Direct application of broad-spectrum herbicide could kill this species.

Indirect Effects

Late season grazing can remove the seed crop, negatively impacting this species' reproduction.

The meadow habitat is probably not negatively affected by controlled burning, or even by wildfire, since fuel loading tends to be light.

Cumulative Effects

Historic heavy grazing, including late season use that removes the seed crop, may have reduced occurrences of this sedge in NE Oregon.

Lowered water tables associated with stream channel degradation and with the loss of beaver wetlands may have reduced potential habitat.

Determination

Alternatives 1 - 5

The spread of noxious weeds that could potentially threaten the habitat of this species will not be controlled under Alternative 1, and only partially controlled under Alternatives 3 and 4. However, noxious weed populations are currently few and small, so do not pose a large or immediate threat. Therefore **none** of the alternatives **would impact individuals or habitat,** nor would they contribute to a trend towards federal listing or cause a loss of viability to the species.

Cypripedium fasciculatum (clustered lady's-slipper)

Status Federal: Species of concern
State: Candidate
Region 6: Sensitive

Environmental Baseline:

Cypripedium fasciculatum is an uncommon orchid that occurs sporadically in a variety of forested environments. It has been found over a range of elevations from 1600 to 8000 feet throughout the Pacific Northwest, from British Columbia south on both sides of the Cascade Range to California and Utah.

Habitats in which the clustered lady's-slipper grows range from wet forests dominated by grand fir overstory to, more commonly, drier forest types such as ponderosa pine and/or Douglas fir overstory with pinegrass (*Calamagrostis rubescens*) understory. It prefers at least dappled shade from overstory trees or shrubs, and can apparently tolerate fairly

dense shade. It has been found near springs and creeks in moist plant associations, as well as in drier environments in duff and moss under Douglas fir and oceanspray (*Holodiscus discolor*), and Douglas fir and ninebark (*Physocarpus malvaceus*). It sometimes grows with its larger and more conspicuous relative, *Cypripedium montanum*.

Cypripedium fasciculatum is a long-lived perennial that grows from a rhizome shallowly buried in duff or soil. Each year it puts up at least one pair of leaves and, probably only after reaching 12 years or more of age, an associated flowering stalk. Harrod (unpublished report) has found that each separate population probably consists of a single genet derived from one rhizome, which explains the lack of genetic variation between apparently separate "plants" within a population. Genetic variability is generally low throughout the species, suggesting the importance of protecting any populations found in order to preserve as much of that genetic potential as possible.

Harrod (unpublished report) has found that this lady's-slipper is particularly susceptible to mechanical soil disturbance. Because the above-ground portion of the plant is actively growing in the springtime, burns at this season are probably more detrimental to the plant than fall fires. On the other hand, a hot wildfire during the dry season is bound to cause more severe damage to the habitat than a controlled spring burn, and might kill individual rhizomes as well.

Response of *Cypripedium fasciculatum* to fire depends on burn intensity. This species' relatively long lifespan, especially before it reaches reproductive maturity, coupled with its preference for shaded environments, suggests that it may thrive in a longer fire return interval than was historically common in drier forests. On the other hand, its shade requirements could indicate that its preferred habitat is one hosting frequent cool fires that leave the overstory intact. In the latter case, the underground rhizomes would need to be resistant to surface fires. Frequent fires that minimized duff accumulations would cause the rhizomes to grow below the surface of mineral soil, thereby increasing their chances of survival when a ground fire did move through.

Seed set in the clustered lady's-slipper is typically low, and requires the activity of a pollinator, possibly a bumblebee. Seed germination, as in other orchids, requires a particular symbiotic fungus. Seeds, though tiny, do not move far at typical understory windspeeds, but may also be dispersed by wild ungulates that browse on the fruits (Harrod, unpublished report). Seedling establishment is probably extremely limited, based on the above factors, making the genetic contributions of each new individual especially important to the species as a whole.

No plants of *Cypripedium fasciculatum* were found in the analysis area, though potential habitat is abundant.

Direct Effects

Mechanical operations in forested environments pose a direct threat to this species and its habitat.

The Conservation Assessment for Region 1 reports the effects of several recent fires on known populations, and concludes that the lady's-slipper "can survive some low to moderate intensity fires, but not higher intensity fires" (Greenlee, 1997).

Direct application of herbicide could kill this species.

Indirect Effects

A decrease in canopy cover due to harvest, thinning, or fire reduces potential habitat for clustered lady's-slipper.

Possible effects of fire on pollinators of *Cypripedium fasciculatum* are unknown.

Cumulative Effects

Past harvest activities have reduced canopy cover in many areas, degrading potential habitat, especially in moist forest types. At the same time, fire suppression has raised the threat of severe wildfires that could cause further reductions in the quality and extent of potential habitat. Because both harvest and fire suppression have occurred over much of the Blue Mountains, potential habitat has been widely affected.

Determination

Alternative 1

This alternative **would not impact individuals or habitat**, and would not contribute to a trend towards federal listing or cause a loss of viability to the species.

Alternatives 2 - 5

Since no plants have been found within the analysis area, these alternatives **would not impact individuals, would impact potential habitat**, but would not likely contribute to a trend towards federal listing or cause a loss of viability to the species.

Pellaea bridgesii (Bridge's cliff-brake)

Status Federal: none
State: none
Region 6: Sensitive

Environmental Baseline

Pellaea bridgesii is a small, evergreen fern that favors the rocky substrate of outcrops and talus slopes of metamorphic and igneous origin, especially granitics. It tends to grow on south or east aspects on the upper third of slopes and over an elevation range from about 4000 to 9500 feet. It is known from the Sierras, the Wallowa and Elkhorn Mountains of northeast Oregon, and the ranges of central Idaho.

Known sites are mostly in full sun, but are occasionally under trees, and may or may not include moss and forb ground covers. Granitic rock crevices provide favored locations for this uncommon little fern.

The evergreen nature of the leaves of Bridge's cliff-brake make it identifiable any time of year that it is not covered with snow, though it may easily be confused with the closely related and more common *Pellaea breweri*.

Fire is not likely to threaten *Pellaea bridgesii* due to this species' preference for inflammable substrates, though where it grows with enough other ground forbs to carry a fire, it could be at risk. Logging is also unlikely to adversely impact this species, due to the plant's inclination for non-forested habitat and its resilience in unshaded environments.

Reproduction of this small fern is accomplished by the dispersal of spores on the wind and pollinators are not required.

There are small areas of potential habitat, but no plants of Bridge's cliff-brake have been found within the analysis area. Not all of the potential habitat has been surveyed, but

most of it occurs within the Vinegar Hill Scenic Area where no major activities are proposed.

Direct Effects

Bridge's cliff-brake is rare primarily due to the limited extent of its favored rocky habitat, and management activities in general have little impact on it. Direct mechanical alteration of its rocky environs, as in road building, could adversely impact a population.

Direct application of herbicide could kill this species.

Indirect Effects

None.

Cumulative Effects

None.

Determination

Alternatives 1 through 5

These alternatives **would not impact individuals or habitat**, and would not contribute to a trend towards federal listing or cause a loss of viability to the species.

Phacelia minutissima (least phacelia)

Status Federal: Species of concern
State: Candidate
Region 6: Sensitive

Environmental Baseline

Phacelia minutissima is a regional endemic of the Pacific Northwest, found in Oregon, Washington, Idaho, and Nevada. It grows at moderate elevations (5000 to 7000 feet) in the mountains, in micro-habitats that are at least vernally moist. It is known from the Wallowas, from the Aldrich Mountains, and from one site on upper Camp Creek, a tributary to the Middle Fork John Day River.

According to Atwood (1996) least phacelia grows along streambanks in sagebrush communities and in aspen stands. In the Blue Mountains it occurs in association with false hellebore (*Veratrum californicum*) and white mules ears (*Wyethia helianthoides*) in vernally moist meadows and small scablands that are common throughout the forest. In currently known sites, it exists in relatively disturbed habitat where its greatest threat may be invasion by exotic plant species such as birdsfoot trefoil (*Lotus corniculatus*).

Both because of its annual nature and its preferred moist habitat, this species incurs little threat from fires. It can survive fall burns in its seed stage, and is unlikely to be exposed to much heat in the case of spring burning, when vernal moisture will mostly exclude fires from the areas in which it grows. Prescribed fire is not likely to adversely impact this plant's favored habitat. While individual aspen stands might be temporarily altered by fire, the continued presence of spring moisture would ensure continuity of habitat.

Populations of least phacelia are most abundant and easily located in wet years, though its diminutive size, along with its annual life cycle, makes this plant difficult to locate. For this reason it is possible that it is more widespread than current records indicate. The first population to be found in the Middle Fork John Day watershed was documented in summer, 2001.

No populations of *Phacelia minutissima* have been found within the analysis area, although abundant habitat is present, and one population occurs in the neighboring Camp Creek watershed.

Direct Effects

Cattle grazing is the primary threat to *Phacelia minutissima* (Atwood, 1996).

Ground disturbing activities such as logging operations or fireline construction would have a direct negative impact on existing plants. However, by re-seeding onto disturbed ground, this species can survive some disruption of its habitat.

Direct application of herbicide could kill this species.

Indirect Effects

Aspen stand protection and enhancement could have a beneficial effect by increasing potential habitat for *Phacelia minutissima*.

Spread of noxious weeds and other introduced plants such as forage grasses could degrade habitat and outcompete this diminutive annual.

Cumulative Effects

Historic heavy grazing and overuse of riparian zones and meadows may have reduced the extent and abundance of least phacelia throughout its range, and may have degraded potential habitat as well. While it can exist in areas of moderate disurbance, its survival on severely impacted soils is in question.

Determination

Alternative 1

This alternative **would not impact individuals or habitat**, and would not contribute to a trend towards federal listing or cause a loss of viability to the species.

Alternatives 2-5

These alternatives **would not impact individuals, might beneficially impact habitat** through aspen grove enhancement, and would not contribute to a trend towards federal listing or cause a loss of viability to the species.

Pleuropogon oregonus (Oregon semaphore grass)

Status Federal: Species of Concern
State: Threatened
Region 6: Sensitive

Environmental Baseline

Oregon semaphore grass is a rare rhizomatous perennial that is known from 8 sites in Lake and Union counties in Oregon. It was considered extinct for much of this century until it was relocated in 1979 in Lake County, and 7 more sites were found in the 1980s.

This grass is found in moist meadows and marshlands, and in seasonally wet meadows, in association with several species of sedges, *Deschampsia cespitosa*, rushes, camas, and other grasses, some of them non-native.

Oregon semaphore grass can produce extensive rhizomes, but may not set much viable seed (But *et al*., 1985). Very little is known about this species, its pre-European distribution, or its reproductive potential.

No populations of *Pleuropogon oregonus* have been found during field surveys, and most of its potential habitat, which occurs along the Middle Fork John Day River, has been altered by agricultural use.

Direct Effects

Ground disturbance such as ditching of wet meadows, or plowing of drier ground would directly impact any individuals of this species that might be present.

Grazing, which is likely to remove the seed crop as well as impact individual clumps, is a common threat to this semaphore grass, though some populations have apparently survived fairly heavy fall grazing (Oregon Natural Heritage Program EO Report, 1983).

Broad-spectrum herbicides applied directly to this species would kill it.

Indirect Effects

Draining of wetlands could eliminate the moist habitat that this species favors.

Invasion of wetter habitats by noxious weeds could threaten this grass through excessive competition.

Cumulative Effects

Most of the extant populations of *Pleuropogon oregonus* occur in wetter areas of agricultural ground. Loss of habitat by conversion of native wet meadows to hayfields and pastures dominated by introduced grasses has probably been the primary factor in reducing occurrence of this species. Grazing may be an associated factor, but the extent of grazing effects is not currently clear.

Fire is unlikely to affect Oregon semaphore grass or its very moist habitat.

Determination

Alternative 1

Noxious weeds, without any control, are the most likely to spread into and degrade potential habitat for Oregon semaphore grass under this alternative. However, noxious weed populations are currently few and small, so do not pose a large or immediate threat. This alternative **would not impact individuals or habitat**, and would not contribute to a trend towards federal listing or cause a loss of viability to the species.

Alternatives 3 & 4

Because these alternatives do not propose alterations to floodplain habitat along the Middle Fork**, these alternatives would not impact individuals or potential habitat**, nor are they likely to contribute to a trend towards federal listing or cause a loss of viability to the species.

Alternatives 2 & 5

It is possible that, over time, the planned re-creation of wetlands near the mouths of Vincent and Caribou Creeks will create usable habitat for *Pleuropogon oregonus*. In this case **it is possible that proposed activities would have a beneficial impact on habitat**, and they are not likely to contribute to a trend towards federal listing or cause a loss of viability to the species.

Thelypodium eucosmum (arrow-leaved thelypody)

Status Federal: Species of Concern
State: Listed threatened
Region 6: Sensitive

Environmental Baseline

Thelypodium eucosmum is a locally endemic, short-lived perennial mustard found only in Baker, Grant, and Wheeler counties, Oregon. Known populations range in elevation from 1800 to 5000 feet.

Arrow-leaved thelypody inhabits slopes with vernal moisture sources on otherwise dry sites, and is often found in the shade of junipers or ponderosa pine. It also occurs in mountain mahogany, sagebrush, and grass steppe communities, frequently in association with many introduced weedy species such as *Bromus tectorum* and *Lepidium perfoliatum*. It can grow on a variety of substrates including light clays, and occasionally moist, possibly alkaline soils near rivers. It is probably not tolerant of very dry sites.

Thelypodiums propagate by seed or creeping rootstocks. Each plant requires a minimum of one year of adequate moisture to flower and set fruit. Plants may be able to hold for several years in the rosette stage until conditions are optimum for seed production; however, Thelypodiums are known to be highly palatable to cattle, so increasing time to seed set increases vulnerability to predation as well. Since this species often grows in heavily grazed habitat that has lost much of its palatable forage, presence of cattle is probably its primary threat.

Several populations documented by historic collections have proved impossible to re-locate, and the species was considered extinct until a new site was documented in 1981. About 20 extant populations have since been found. Because this species is so limited in distribution and in number of known populations, any documented sites should be protected.

No information is available on pollinators of this species.

No populations of this species have been found within the analysis area.

Direct Effects

Cattle grazing is the primary threat to *Thelypodium eucosmum*.

Ground disturbing activities such as logging operations or fireline construction would have a direct negative impact on existing plants. However, by re-seeding onto disturbed ground, this species can survive some disruption of its habitat.

The direct effect of fire on this species is not known. Presence of enough ground fuels to carry a fire would probably allow injury or killing of individual plants.

Direct application of herbicide could kill this species.

Indirect Effects

Increasing competition from exotic plant species may be reducing potential habitat and limiting the abundance of *Thelypodium eucosmum*.

Habitat could be lost if fire reduces overstory junipers or pines that provide shade. Potential habitat appears to be fairly widespread, so concerns about fire impacts are minimal.

Cumulative Effects

Historic overgrazing has probably reduced this species to its current limited occurrences because the plant is so highly palatable. Continued grazing may prevent it from rebounding.

As above, increasing loss of habitat to invading weeds is occurring across the range of this species.

Determination

Alternative 1

Noxious weeds, without any control, are the most likely to spread into and degrade potential habitat for *Thelypodium eucosmum* under this alternative. However, noxious weed populations are currently few and small, so do not pose a large or immediate threat. This alternative **would not impact individuals or habitat**, and would not contribute to a trend towards federal listing or cause a loss of viability to the species.

Alternatives 3 and 4

These alternatives **would not impact individuals or habitat**, and would not contribute to a trend towards federal listing or cause a loss of viability to the species.

Alternatives 2 and 5

Because chemical control of weeds is more effective than manual treatment, these alternatives **would maintain potential habitat longer** than the other alternatives. Alternatives 2 and 5 **would not impact individuals or degrade habitat**, and would not contribute to a trend towards federal listing or cause a loss of viability to the species.

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BIOLOGICAL EVALUATION

for

PROPOSED, THREATENED, ENDANGERED, AND SENSITIVE

AQUATICS

February 2002

Blue Mountain Ranger District

Malheur National Forest

Southeast Galena Restoration

Prepared by:
Perry Edwards – District Fisheries Biologist

Threatened, Endangered, Proposed, and Sensitive Species

BE Table 4—Summary Conclusion of Effects (Short and Long-term)

Threatened(T)/Endangered(E)	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Mid-Columbia River (ESU) Summer-run Steelhead (T)	NE/LAA	LAA/BE	LAA/BE	LAA/BE	LAA/BE
Columbia River Basin Bull Trout (T)	NE/LAA	LAA/BE	LAA/BE	LAA/BE	LAA/BE
Designated Critical Habitat					
Mid-Columbia River (ESU) Summer-run Steelhead	NE/NLAM	NLAM/BE	NLAM/BE	NLAM/BE	NLAM/BE
Spring Chinook Salmon Essential Fish Habitat (EFH)	NE/UAA	UAA/BE	UAA/BE	UAA/BE	UAA/BE
Sensitive Species					
Mid-Columbia River (ESU) Spring Chinook Salmon	NI/MIIH	MIIH/BE	MIIH/BE	MIIH/BE	MIIH/BE
Interior Redband Trout	NI/MIIIH	MIIH	MIIH	MIIH	MIIH
Westslope Cutthroat Trout	NI	NI	NI	NI	NI

Listed Species:
NE = No Effect
LAA = May Effect – Likely to Adversely Affect
NLAA = May Effect – Not Likely to Adversely Affect
BE = Beneficial Effect

Listed Habitat:

NE = No Effect
NLAM = Not Likely to Adversely Modify
LAM = Likely to Adversely Modify
UAA = Unlikely to Adversely Affect

Sensitive Species:
NI = No Impact
MIIH = May Impact Individuals or Habitat, but will not likely contribute toward federal listing or loss of viability to the population or species.
* WIFV = Will Impact individuals or habitat with a consequence that the action may contribute to a trend toward Federal listing or cause a loss of Viability to the population or species.
BE = Beneficial Impact

* = Trigger for a Significant Action as defined by NEPA

ESU = Evolutionary Significant Unit – a geographically definable landscape area utilized by a distinct taxa or species population unit, considered reproductively isolated from other conspecific population units, and represents an important evolutionary link in the species genetic legacy.

INTRODUCTION

This Biological Evaluation (BE) documents the review and findings of Forest Service planned programs and activities for possible effects on species (1) listed or proposed for listing by the USDI Fish and Wildlife Service (USFWS) and by the National Marine Fishery Service (NMFS) as Endangered or Threatened; or (2) designated by the Pacific Northwest Regional Forester as Sensitive. It is prepared in compliance with the requirements of Forest Service Manual (FSM) 2630.3, FSM 2672.4, FSM 10.89 R-6 Supplement 47 2670.44, and the Endangered Species Act (ESA) of 1973 (Subpart B; 402.12, Section 7 Consultation).

Proposed, Endangered, Threatened, or Sensitive species considered in this evaluation are those listed in FSM 2670.44, R-6 Interim Directive No. 90-1, March, 1989 as suspected or documented to occur on the Malheur National Forest's Blue Mountain Ranger District.

The following analysis addresses the potential effects of the SE Galena Restoration Project on threatened, endangered, and sensitive aquatic species. This determination, required by the Interagency Cooperation Regulations (Federal Register: January 4, 1978), ensures compliance with the Endangered Species Act of 1973, P.L. 93-205 (87 Stat. 884) as amended.

Species Considered in this Assessment

The following sources of information have been reviewed to determine if PETS (proposed, endangered, threatened, or sensitive) species and their associated habitats may or may not occur within the project area:

- Regional Forester's Sensitive Species List
- Forest sensitive species database and the current GIS mapping layers
- Sensitive Plants of the Malheur, Ochoco, Umatilla, and Wallowa-Whitman National Forests
- Oregon Natural Heritage Program Data Base records
- Project area maps, unique habitat data bases, and any historical records
- Current Regulatory Agency status reports and listed species new releases

Habitats for proposed, endangered, threatened, or sensitive species (PETS) are identified by correlating the physical and biological features found in the project planning area with habitat features in which PETS species are known or suspected to occur. All aquatic Management Indicator Species (MIS) on the Blue Mountain Ranger District of the Malheur National Forest are currently listed as threatened or sensitive. Therefore, MIS species will not be discussed as a separate topic.

Fish species documented to occur in the Middle Fork John Day River Basin are listed below.

Mid-Columbia River Summer-run Steelhead (*Oncorhynchus mykiss gairdneri*)

Status: Federal – Threatened (24 March 1999)
Critical Habitat – Designated (16 February 2000)
Heritage Status – Global Conservation Status Rank: G5T2Q (22 Oct 1999)

Rounded Global Conservation Rank: T2

Global Conservation Status Rank Reasons:

Small breeding range in the middle Columbia River basin, Washington, and Oregon; continued declines in abundance; increasing percentage of hatchery fishes in natural escapements; genetic introgression and detrimental ecological interactions with hatchery stocks are potential problems. The John Day, Deschutes, and Yakima Rivers support the largest native, natural spawning stocks (NMFS 1999) in the Middle Columbia River Evolutionary Significant Unit (ESU).

The total run size for the Columbia River during the pre-1960 era might have been in excess of 300,000. This number was reduced to somewhat below 200,000 by early 1980. The most recent 5 year average run size was 142,000, with a naturally produced component of 39,000. The Middle Columbia River ESU comprises the majority of this run estimate (NMFS 1996). Serious declines have however, occurred in the John Day basin (NMFS 1999).

Environmental Baseline

The Middle Columbia River summer-run steelhead are named for the timing of their adult spawning run. The name "summer" refers to the time of year the fish enter the Columbia River for migration to the middle portion of the Columbia River, between Mosier Creek in Oregon and the Yakima River in Washington. First time spawning fish are generally 4-5 years old. Individuals are capable of spawning more than once before they die, though spawning more than twice is rare. Adult steelhead in this ESU spend up to one year in fresh water prior to spawning. These fish can utilize headwater areas for spawning purposes and require clean gravels with nearby resting pool habitat during the three to six week spring spawning period. Steelhead eggs incubate 1.5 to 4 months before hatching which varies with water temperature. Juveniles spend 1-4 (generally 2) years in fresh water before migrating to the ocean as smolts. While in the fresh water rearing stage, young steelhead prefer a water temperature range between 10-13° C, adequate pool habitat, and cover in the rearing streams.

BE Table 5—Steelhead Bearing Streams in Analysis Area (Table2)

Subwatershed	Steelhead Fish Bearing Miles	Perennial Non-fish Bearing Miles	Intermittent/ Seasonal Miles	Habitat Type
Davis/Placer Gulch	9.5	10.6	11.7	Rearing, Spawning
Vinegar Creek	7.3	10.4	25.3	Rearing, Spawning
Vincent Creek	4.5	3.1	9.1	Rearing, Spawning
Little Boulder/Deerhorn Creek	10.6	16.5	28.8	Rearing. Spawning
Tincup Creek/Little Butte Creek	6.8	12.4	14.9	Rearing. Spawning
Butte Creek	2.7	7.1	10.2	Rearing, Spawning
Granite Boulder Creek	4.1	12.2	8.5	Rearing, Spawning

Mid-Columbia River (ESU) summer run steelhead (threatened) and its (designated) critical habitat. Most steelhead spawning and rearing occurs in the second to fourth order

streams in the forested environment. Even when small streams are not accessible to migrating fish because of barriers or steep gradients, they are vitally important to the quality of downstream habitats. Within this proposed project area, steelhead spawning and rearing habitat is found in Davis, Vinegar, Vincent, Tincup, Butte and Granite Boulder Creeks, as well as the in the Middle Fork John Day River (See Table 2). Due to the very limited flow in Tincup and Vincent Creeks, the potential for steelhead rearing is very limited in these streams.

Interior Redband Trout (*O. mykiss gairdneri*)

Status: USFS Region 6 Sensitive
Heritage Status – Global Conservation Status Rank: G5 (25 Sept 1996)
Rounded Global Conservation Rank: T4
American Fisheries Society Status: Special Concern

Global Conservation Status Rank Reasons:

Still widespread in interior western North America but with local declines and extirpations. The global range includes the Columbia River basin east of the Cascades to barrier falls on the Kootenay, Pend Oreille, Spokane, and Snake Rivers; the upper Frazier River basin above Hell's Gate; and Athabasca headwaters of the Mackenzie River basin, where headwater transfers evidently occurred from the upper Frazier River system (Benke 1992). In the Columbia River basin, nearly all upriver and many lower river stocks appear to be improving after having declined (Nehlsen et al. 1991). Many stocks in the Columbia River basin are, however, threatened by mainstem passage problems, habitat damage (due to logging, road construction, mining, and grazing, which decrease water quality and increase siltation), and interactions with hatchery fishes (Nehlsen et al. 1991).

Environmental Baseline

There are four different populations of redband trout in the Blue Mountains. These are: 1) sympatric populations with steelhead, 2) isolated allopatric populations in anadromous watersheds, 3) allopatric populations in the Great Basin portion of the Blue Mountains, and 4) allopatric populations in watersheds that formally supported anadromous populations (N.F. Malheur and Upper Malheur Rivers). There is little data on current population trends of the redband, however, the four population types do not face the same level of threats from management activities. Subpopulations of the Great Basin redband are probably at the greatest threat of listed as threatened under the ESA. These fish are located in Trout Creek, a tributary to the Silvies River. Redband populations in this project area are primarily of sympatric origin. Overall, the Interior redband trout have the most extensive area of all game fishes in the Blue Mountains. They are in the smallest headwater areas as well as in the largest rivers of the Blue Mountains.

BE Table 6—Redband Bearing Streams in Analysis Area (Table 3)

Subwatershed	Redband Fish Bearing Miles	Perennial Non-fish Bearing Miles	Intermittent/Seasonal Miles	Habitat Type
Davis/Placer Gulch	12.6	10.6	11.7	Rearing, Spawning
Vinegar Creek	11.1	10.4	25.3	Rearing, Spawning
Vincent Creek	5.2	3.1	9.1	Rearing, Spawning
Little Boulder/Deerhorn Creek	14.2	16.5	28.8	Rearing. Spawning
Tincup Creek/Little Butte Creek	12.4	12.4	14.9	Rearing. Spawning
Butte Creek	9.1	7.1	10.2	Rearing, Spawning
Granite Boulder Creek	8.1	12.2	8.5	Rearing, Spawning

Interior redband trout (sensitive) are assumed to be the resident form of the anadromous steelhead. Most redband spawning and rearing occurs in the second to fourth order streams in the forested environment. Even when small streams are not accessible to migrating fish because of barriers or steep gradients, they are vitally important to the quality of downstream habitats. Their distribution within the proposed project area (see Table 3), and habitat needs, are similar to the steelhead. However, redband spawning may occur in areas with insufficient flow for steelhead spawning.

Columbia River Basin Bull Trout (*Salvelinus confluentus*)

Status: Federal – Threatened (10 June 1998)

Heritage Status – Global Conservation Status Rank: G3T2Q (27 Oct 1999)

Rounded Global Conservation Rank: T2

Global Conservation Status Rank Reasons:

Many populations exist throughout the Columbia River basin, but these have been isolated by dams and expanses of degraded habitat. Many local extirpations have occurred throughout its range with a resulting ongoing reduction in total abundance. Many of the migratory forms of bull trout have been lost, exacerbating isolation.

This distinct population segment of bull trout includes populations residing in the Columbia River and its tributaries, excluding the Jarbridge River, Nevada, and east of the Continental Divide, Montana (USFWS 1998). Bull trout currently occur in 45 percent of the estimated historical range (USFWS 1998). Hydroelectric dams and large expanses of unsuitable habitat have isolated many populations. Factors contributing to isolation include habitat degradation (e.g. from forest management practices, agricultural practices, livestock grazing, road construction and maintenance), water diversion, mining, and residential development (see USFWS 1998 for details). Illegal harvest and introduced brook trout also appear to be having a negative impact on bull trout.

This Distinct Population Segment is significant because of the overall range of the species would be substantially reduced if this discrete population were lost (USFWS 1998).

Environmental Baseline

Bull trout require more specific habitat requirements than other salmonids. Water temperatures below 15° C are required for rearing and reproducing in forested streams (Buchanan and Gregory 1997). In addition, these fish need a "pristine" environment including high levels of shade, high levels of undercut banks, a large woody debris volume, high levels of gravels in riffles, low levels of sediment in riffles, and low levels of bank erosion (Dambacher and Jones 1997). These factors require careful management by landowners to ensure the conditions listed above continue to be in bull trout habitable waters.

Bull trout spawn during the fall months of September and October. Once deposited within the gravels, the eggs develop for 4 to 5 months. The alevins then further develop still within the gravels for three more months, finally emerging into the stream late summer.

BE Table 7—Bull Trout Bearing Streams in Analysis Area

Subwatershed	Bull Trout Fish Bearing Miles	Perennial Non-fish Bearing Miles	Intermittent/Seasonal Miles	Habitat Type
Granite Boulder Creek	4.1	12.2	8.5	Rearing, Spawning
Vinegar Creek	Currently, extent of population and habitat use is unknown			
Butte Creek	Currently, extent of population and habitat use is unknown			
Middle Fork John Day River	8.8	0.0	0.0	Migratory (mainstem)

Columbia River Basin bull trout (threatened) are found in varying numbers in the Middle Fork John Day River tributary drainages of Big Creek, including Deadwood Creek, Granite Boulder Creek, and upper Clear Creek. The lower Middle Fork John Day River is a migratory corridor for bull trout. The upper Middle Fork mainstem (upstream of the Analysis Area) prior to 1990 had bull trout in it however, because of water withdrawal, habitat degradation, and high water temperatures is now considered historic habitat. Within the project area, bull trout use appears to be limited to migratory/seasonal use in the main Middle Fork, and spawning/rearing habitat in Granite Boulder Creek (see Table 4). Individual bull trout have been found in Vinegar Creek and Butte Creek within the last 5 years. It is unknown if these were stray fluvial fish or small populations.

Mid-Columbia River Spring Chinook Salmon (*O. tshawytscha*)

Status: USFS Region 6 Sensitive

Heritage Status – Global Conservation Status Rank: G5Q

Environmental Baseline

Adult Mid-Columbia River spring Chinook enters natal streams in the spring, several months before spawning. The adult salmon remain in headwater streams, such as the Middle Fork John Day, throughout the summer then spawn in the fall (Torgerson 1996).

Torgerson (1996) also reported 2.4 adult Chinook per kilometer holding in the Middle Fork and 3.0 Chinook per kilometer spawning in the Middle Fork. The distribution of the salmon was clustered in reaches where stream temperature was lower than expected. The status of this species has been under review by the National Marine Fisheries Service (NMFS) that determined in February 1999 that listing was not warranted at that time. Returning adults in the John Day River basin range from 400 to 3,000 with the vast majority spawning in three main areas: the upper North Fork John Day, the upper Middle Fork John Day, and the upper mainstem John Day. The activities occurring in this Analysis Area may have an indirect effect to the salmon since the tributaries have a direct flow to the mainstem.

BE Table 8—Chinook Bearing Streams in Analysis Area (Table 5)

Subwatershed	Chinook Fish Bearing Miles	Perennial Non-fish Bearing Miles	Intermittent/Seasonal Miles	Habitat Type
Davis/Placer Gulch	1.9	10.6	11.7	Rearing
Vinegar Creek	7.1	10.4	25.3	Rearing
Little Boulder/Deerhorn Creek	3.5	16.5	28.8	Rearing
Tincup Creek/Little Butte Creek	4.4	12.4	14.9	Rearing
Butte Creek	0.64	7.1	10.2	Rearing
Granite Boulder Creek	2.0	12.2	8.5	Rearing

Mid-Columbia River spring Chinook salmon (sensitive) are found within the project area. Spawning within the project area is mostly in the Middle Fork John Day River. There is some very limited potential for spawning in the lower reaches of Granite Boulder Creek and Vinegar Creek. Adult holding and juvenile rearing also occur in these same general areas (see Table 5).

Chinook salmon Essential Fish Habitat (EFH) analysis is also included. Public Law 104-267, the Sustainable Fisheries Act of 1996, amended the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) to establish new requirements for "Essential Fish Habitat" (EFH) descriptions in Federal fishery management plans and to require federal agencies to consult with NMFS on activities that may adversely affect EFH. "Essential Fish Habitat means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (Magnuson-Stevens Act).

Westslope Cutthroat Trout

Westslope cutthroat trout do not occupy any habitat in the Middle Fork John Day Sub-basin or tributaries thereof and so are not found in the Southeast Galena Project Area.

Project Area Location

The Southeast Galena EIS analysis area is located about 25 air miles northeast of John Day, Oregon. Access to the analysis area is east from John Day on Highway 26 to the junction of Highway 7, north on Highway 7 to the junction of County Road 20, then west

on County Road 20 along the Middle Fork John Day River. Major Forest developed roads that access the analysis area include the 2010, 2045, 2050, 2055, 2610, 2612, 2614, 4550, 4557, and 4559 roads.

The Southeast Galena Analysis Area is located within the Galena Watershed, one of five watersheds located in the Middle Fork John Day River Sub-basin (see vicinity map). The analysis area encompasses the following subwatersheds:

BE Table 9—Subwatersheds and Land Ownership within the Southeast Galena Restoration Analysis area (Table 1).

Subwatershed (SWS) Name (HUC 6)	SWS Number	SWS Acres (in analysis area)	Malheur NF Acres	Umatilla & Wallowa-Whitman NF Acres	Private Acres
Davis/Placer Gulch	30201	7,462	6,966		496
Vinegar Creek	30203	7,585	7,118	411	56
Vincent Creek	30205	3,769	3,758		11
Little Boulder/Deerhorn Creek	30207	10,983	10,614		369
Tincup Creek/Little Butte Creek	30209	7,430	7,173		257
Butte Creek	30211	4,861	4,854		7
Granite Boulder Creek	30213	7,383	6,631	713	39
Total Acres		**49,473**	**47,114**	**713**	**1235**

Intensive timber harvest occurred within the area as early as the 1910s when extensive railroad logging removed much of the mature tree component in valley bottoms of analysis area streams. On July 2, 1998, a severe windstorm blew down several thousand trees over about 1,400 acres in the headwaters of Vincent and Vinegar subwatersheds. Resource specialists quickly toured the area to determine the scale of the blowdown and related consequences of having so much timber blown down over such a large area. Immediate concerns were the high fuel loads (about five times higher than normal) on the ground and the increased risk of wildfire; the high amount of spruce and Douglas-fir that was blown down creating suitable host for spruce and Douglas-fir bark beetles; loss of shade and soil holding capacity to the streams; and loss of cover habitat for big-game. District personnel began an environmental assessment (EA) that summer of the blow down to develop alternatives to address these concerns.

Following consultation with Forest managers, Regional Office Staff, resource specialists from two tribal governments, and resource managers from two federal regulatory agencies, the Forest determined that an EA would not adequately address the significance of the situation. The Forest decided to perform a watershed analysis (WA) for the Galena Watershed prior to preparing a National Environmental Policy Act (NEPA) document. The goal was to assess the condition of the watershed, identify recommendations for restoring its health, and then prepare an environmental impact statement (EIS) to implement recommendations from the watershed analysis.

Southeast Galena Analysis Area Total Road Density

In January 1999, District resource specialists began the *Galena Watershed Analysis*. In June 1999, the analysis was completed, and the *Southeast Galena Restoration EIS* was the first NEPA analysis initiated for implementing recommendations from this WA. In the mean time, the Forest initiated a large-scale project called *VV Beetle* to reduce the beetle population that was expected to emerge from the blowdown spring/summer of 1999. This project used attractant pheromones to draw insects to funnel traps and fell green spruce "trap" trees outside of riparian habitat conservation areas (RHCAs) to draw insects to the trap tree and away from the remaining standing spruce, as well as disruptive pheromones to repel insects from heavy concentrations of remaining live spruce and Douglas-fir. The funnel traps were emptied periodically of their insects. The insects were collected for analysis on the effectiveness of the pheromones. The trap trees were removed to a rock pit near Flagtail Lookout, over 60 miles southwest of the blowdown area, under a separate NEPA document. The bark was stripped off of them to expose the insects to weather and ultra violet sunlight, killing them. The *VV Beetle* project was implemented again during spring/summer 2000 (with the exception of creating additional trap trees) to ensure as many of the two-year life cycle insects were captured as possible. The project may be implemented again in 2001 if analysis of the 2000 trapping effort indicates large insect populations still remain on site. The VV Beetle project "bought time" for Forest managers. It did not address the elevated fuel levels created by the blowdown—that is one of the objectives of this EIS.

On June 30, 1999, Oregon Governor John Kitzhaber, USDA Under Secretary Jim Lyons, and USDA Forest Service Chief Mike Dombeck announced the Blue Mountains Province would serve as the first of several Demonstration Areas nationwide. The purpose of the Blue Mountains Demonstration Area is to accelerate forest and watershed ecological restoration activities, and continue developing and enhancing relationships with partners and communities in the Blue Mountains.

Shortly after this announcement, the Malheur National Forest (Forest) selected the Middle Fork John Day River Sub-basin as the area to implement projects developed within the Demonstration Area (DEMO). The *Southeast Galena Restoration Environmental Impact Statement* (EIS) is one of the first EIS projects the Forest has developed under DEMO.

Current Road Situation – All of the subwatersheds in the Southeast Galena Analysis Area are either "At Risk" or "Not Properly Functioning" according to the National Marine Fisheries Service Matrix of Pathways and Indicators. This road density information was obtained from Blue Mountain Ranger District GIS data (2002), which includes both open and closed roads (decommissioned roads are not included). Table 7 shows the road density and RHCA road miles by subwatershed for the entire analysis area.

BE Table 10 —Road density and RHCA road miles by subwatershed (Table 7)

Subwatershed	Total Road Density (Miles/ Mile^2)	Total RHCA Roads (miles)
Davis/Placer Gulch	3.9	9.9
Vinegar Creek	3.6	8.8
Vincent Creek	5.2	7.1
Little Boulder/Deerhorn	2.4	10.1
Tincup/Little Butte	3.2	8.0
Butte Creek	3.7	5.8
Granite Boulder Creek	3.5	9.8
Total		59.5

Any density over 2.0 mi/mi^2 is considered either At Risk (2-3 mi/mi^2) or Not Properly Functioning (greater than 3 mi/mi^2). The matrix of pathways and indicators for bull trout (USF&W 1998) lists road densities of <1 mi/mi^2 with no valley bottom roads as Properly Functioning, 1-2.4 mi/mi^2 with some valley bottom roads as Functioning at Risk, and densities over 2.4 mi/mi as Functioning at Unacceptable Risk. Granite Boulder, Vinegar Creek and Butte Creek should be held to USF&W standards as bull trout are present or have been observed in the last 5 years in these streams. Any new road construction without an equal or greater decommission or obliteration would be detrimental to the remaining subwatersheds.

II. Proposed Action and Alternatives Considered

See Southeast Galena Environmental Impact Statement for details by each alternative

III. Potential Effects of the Proposed Action and Alternatives on Listed Species and Designated Critical Habitat

To reduce the amount of redundancy in the document, the following discussion will not be done species by species (unless warranted), and alternative by alternative.

Redband trout and steelhead are resident and anadromous life forms of the same species. The potential effects of proposed actions are essentially the same for both species. These are the fish with the widest distribution within the project area. Potential effects to fish and fish habitat will focus on those species most likely affected by activities in the project area.

Chinook salmon distribution is generally limited to the main Middle Fork John Day River with limited potential for use in the lower segments of tributary streams. Therefore, the potential effects on Chinook salmon, or salmon habitat, is generally more of an off-site effect. For example, sediment input to a tributary stream could potentially affect redband/steelhead, or their habitat. To affect Chinook salmon, or salmon habitat, that sediment would have to be transported downstream in a quantity sufficient to have an effect downstream or flows/water temperatures modified to the extent to affect Chinook salmon in the Middle Fork John Day River. With limited actions proposed within RHCAs, the threshold for effects to fish and fish habitat will generally be lower for redband/steelhead, than for Chinook salmon. The threshold for effects to bull trout is lower than redband or steelhead where bull trout utilize project area subwatersheds, or 6th field HUCs (Habitat Unit Codes).

For the proposed action and the action alternatives, regarding potential effects on fish and fish habitat, there is also a lot of overlap. After discussing the No Action alternative, Alternative 2, the proposed action, will be described in detail. Then Alternatives 3, 4 and

5 will be described in terms of how they differ from Alternative 2. The NMFS matrix of pathways and indicators will be used as a checklist for this evaluation. The baseline conditions are listed in table 3.

Westslope cutthroat trout do not occur in, or downstream from the proposed project area. There will be "No Impact" to this species under any alternative.

WATERSHED(S): Middle Fork John Day River Sub-basin

BE Table 11—CHECKLIST FOR DOCUMENTING ENVIRONMENTAL BASELINE ON RELEVANT INDICATORS

DIAGNOSTICS/ PATHWAYS	**POPULATION AND ENVIRONMENTAL BASELINE**		
INDICATORS	Functioning Appropriately	Functioning At Risk	Functioning at Unacceptable Risk
Subpopulation Characteristics:		St	BuT
Subpopulation Size			
Growth and Survival		St	BuT
Life History Diversity and Isolation		St, BuT	
Persistence and Genetic Integrity		St ,BuT	
Water Quality:			X
Temperature			
Sediment		X	
ChemicalContaminants./Nutrients		X	
Habitat Access:			X
Physical Barriers			
Habitat Elements:			X
Substrate Embeddedness			
Large Woody Debris		X	
Pool Frequency and Quality			X
Large Pools			X
Off-channel Habitat		X	
Refugia		X	
Channel Cond. & Dynamics:		X	
Wetted Width/Max. Depth Ratio			
Stream bank Condition		X	
Floodplain Connectivity		X	
Flow/Hydrology:		X	
Change in Peak/Base Flows			
Drainage Network Increase		X	
Watershed Conditions:			X
Road Density & Location			
Disturbance History		X	
Riparian Conservation Areas		X	
Disturbance Regime		X	
Integration of Species and Habitat Conditions		X	

A. Alternative 1-No Action:

In order to compare this alternative to the other alternatives, it is necessary to identify some of the actions that will not occur under this alternative. No vegetative treatments would occur in riparian areas. There would be no prescribed fire treatments, which could affect riparian vegetation. There would be no road management activities other than routine road maintenance, which is an ongoing program. There would be no weed treatment activities other than those specified in the *Malheur National Forest Weed EA* and those activities completed by State and County Road Departments.

1. Water Quality

a. Temperature: With no vegetative treatments or prescribed burning in riparian areas, there will be no short-term effect on water temperature. Riparian areas within the project area are not large enough to act as fire breaks for higher intensity wildfires. Since there would be no treatment to reduce the risk of stand replacement wildfires, all streams in the area with existing conifer, hardwood or shrub shading, will be at risk for losing shade and increasing summer water temperatures in the future. This alternative is a no effect in the short-term, and a potential adverse effect in the long-term.

b. Sediment: The activities with the highest potential for affecting sediment input to streams are road management activities. Under this alternative, there would be no road management activities other than ongoing routine road maintenance. This can be considered a no effect, or no change from the existing condition, in the short-term. At existing funding levels, road maintenance will not keep up with all needs. This alternative would do nothing to reduce impacts of the existing road system. Analysis of project area roads estimated that 25% of the 467 road/stream crossings are not designed to handle a 100-year event. It would be expected that sedimentation from existing roads would increase over time, unless other projects are implemented to address these impacts. This is a no effect in the short-term, and an adverse effect in the long-term.

c. Chemical contaminations/nutrients: With no proposed actions using chemicals near streams, this is a no effect. Current weed spraying was covered under the *Malheur National Forest Weed EA*.

2. Habitat Access

Physical barriers: The activities with the highest potential for affecting physical barriers to fish movement are road management activities. Under this alternative, there would be no road management activities other than ongoing routine road maintenance. Roads crossings (culverts) that inhibit fish movement at some flow would continue to do so with the no action alternative. Analysis in the project area 23 of 31 road/stream crossings on Category 1 streams pose a barrier to fish migration at some level of flow. This can be considered a no effect, or no change from the existing condition.

3. Habitat Elements

a. Substrate embeddedness: See the previous discussion on sediment. Substrate embeddedness is affected by changing the amount of sediment input to the stream (or by changing the hydraulic energy of the stream, which is not a consideration here). Therefore, this is a no effect in the short-term, and an adverse effect in the long-term.

b. Large woody material (LWM): See the previous discussion on water temperature. Large woody material is provided by large trees, as they die and fall. The no action alternative would have no effect on LWM in the short-term, but would put the source of future LWM at greater risk of stand replacement fire that could reduce LWM amounts in project area streams.

c. Pool frequency and quality: See the previous discussion on LWM and sediment. A major factor affecting pool frequency and quality is the supply, condition, and future sources of LWM. Another is brush or small hardwood trees providing stability in meander pools. A third that can diminish pool frequency and quality is sediment from historic activities and road/stream crossings. The no action alternative would have no effect on pool frequency (currently reduced) and quality (currently degraded) in the short-term, but would likely have an adverse effect in the long-term with the risk of wildfire and sediment.

d. Large pools: See the previous discussion on pool frequency and quality. In these streams, the potential to affect pool structure is similar for large pools.

e. Off-channel habitat: The potential for off-channel habitat is very limited along the small streams in this project area. This alternative would have no effect on off-channel habitat.

f. Refugia: This alternative would likely have no effect on refugia within the project area. It would not lead to any improvement or degradation of current conditions.

4. Channel condition and dynamics:

a. Wetted width/maximum depth ratio: The no action alternative would have no effect on this parameter in the short-term. In the long-term, the only potential scenario that could adversely affect this parameter would be a stand replacement fire of sufficient size and intensity to result in increased peak flow and sediment as well as reduced riparian vegetation causing increased channel instability.

b. Streambank condition: See above.

c. Floodplain connectivity: The activities with the highest potential for affecting floodplain connectivity are road management activities. Under this alternative, there would be no road management activities other than ongoing routine road maintenance. This can be considered a no effect, or no change from the existing condition.

5. Hydrology/flow:

a. Change in peak/base flows: The no action alternative would have no effect on this parameter in the short-term. Current base flows are below what are expected in project area subwatersheds. In the long-term, the only potential scenario which could adversely affect this parameter would be a stand replacement fire of sufficient size and intensity to result in increased peak flow and decreased base flows.

b. Drainage network increase: The activities with the highest potential for affecting drainage network are road management activities. Under this alternative, there would be no road management activities other than ongoing routine road maintenance. There is the potential for drainage structures to not function as designed and cause ephemeral draws to become intermittent channels if there is a lapse in road maintenance. Effects of past management activities (grazing, fireline construction, timber harvest, trails, etc.) are also contributing to erosion of ephemeral draws resulting in formation of intermittent

(PACFISH definition) channels. This would increase the drainage network. Overall, this alternative can likely be considered a no effect, or no change from the existing condition.

6. Watershed Condition:

a. Road density and location: Under this alternative, there would be no road management activities other than ongoing routine road maintenance. No roads would be constructed nor decommissioned. This can be considered a no effect, or no change from the existing condition.

b. Disturbance history: As a result of historic activities in the area, several watershed conditions have been modified. Historic logging practices and fire control have resulted in existing tree (conifer) stands having fewer large trees, but much higher smaller tree densities. The no action alternative would have no effect on features of the disturbance history within the sub basin.

c. Riparian Conservation Areas: This is not applicable to the no action alternative.

Summary of effects:

In summary, the No Action alternative would have no effect on fisheries, or fish habitat, in the short-term. There is an increasing risk, over time, that this alternative would result in adverse effects, as a result of increasing impacts from the existing road system and from the risk of high intensity, stand replacement fire. These future impacts could potentially reach a magnitude of "Likely to Adversely Affect" steelhead and bull trout. It is not likely that the effects would reach a magnitude that they would have a long-term adverse effect on steelhead designated critical habitat (NLAM). These impacts would not cover a large enough area to result in a "WIFV" determination for redband trout. It is also unlikely, but possible, that these effects would be of a magnitude to affect Chinook salmon, downstream from most of the potential impacts.

Determinations:

Mid-Columbia Summer Steelhead (T): No Effect in the short-term. Risk of May Affect, **Likely to Adversely Affect** in the long-term.

Steelhead Designated Critical Habitat: No Effect in the short-term. Risk of May Affect, **Not Likely to Adversely Modify** in the long-term.

Columbia River Basin Bull Trout (T): No Effect in the short-term. Risk of May Affect**, Likely to Adversely Affect** in the long-term.

Chinook Salmon (S): No Impact in the short-term. Risk of **May Impact Individuals or Habitat**, but will not likely contribute toward federal listing or loss of viability to the population or species, in the long-term.

Chinook Salmon Essential Fish Habitat: No Effect in the short-term. Risk of May Affect**, Unlikely to Adversely Affect** in the long-term.

Interior Redband Trout (S): No Impact in the short-term. Risk of **May Impact Individuals or Habitat**, but will not likely contribute toward federal listing or loss of viability to the population or species, in the long-term.

B. Alternative 2:

1. Water Quality

a. TEMPERATURE: No commercial timber harvest and non-commercial thinning of live trees is proposed within RHCAs. There will be limited commercial thinning of live trees on 30 acres in RHCAs associated with aspen stand improvement in 5 subwatersheds. There is very little risk of a loss of stream shade due to these activities. Trees already down will be removed on 72 acres in the outer half of RHCAs in the headwaters of Vinegar Creek, but they are not currently providing or have potential to provide shade.

The riparian planting of hardwoods/conifers and vegetation protection projects would occur in RHCAs in Category 1, 2 and 4 streams. Hand placement of coarse woody debris, fiber matting is also planned in Category 2 and 4 streams. These activities are not expected to cause any short-term impacts or benefits to temperature. In the long-term they would create shade to better maintain stream temperatures in project area streams and downstream in the Middle Fork John Day River.

Channel/floodplain rehabilitation projects (hydrology) on 2 miles in Vincent Creek and 1 mile in Deerhorn Creek would entail the use of heavy equipment to reestablish channels and floodplains by connecting relic channels or constructing new channels. Fisheries habitat improvement projects include creation of 3 instream structures in Vinegar Creek to allow for fish passage through a culvert, 69 structures in Granite Boulder Creek and 14 structures in Butte Creek are designed to create deep, self-maintaining pools, decrease width to depth ratios, reconnect floodplains, improve base flows and maintain stream temperatures. Improvement of existing structures (29) in Butte Creek and (7) in Granite Boulder Creek would have the same benefits as listed for new structures with less short-term impacts. These projects would not likely have short-term impacts on stream temperature and are designed to have long-term benefits for stream temperature.

Wildfire in riparian areas can result in substantial loss of stream shade. However, design criteria for the proposed prescribed burning treatments in this project ensure that the risk of losing substantial stream shade will be negligible. Prescribed fire may occur in the spring or in the fall, depending on weather and fuel moisture conditions. Suitable burning conditions will be identified in each "burn plan." Seasonal weather conditions may not produce a suitable open "burn window" in any given spring or fall. Suitable fall burning conditions usually occur during "Indian Summer," after there has been some rain.

Ignition is not planned within RHCAs. Fire from upslope burning units, which is within prescription, will be allowed to back into RHCAs. Design criteria include retention of at least 95% of stream shade. The prescribed burning will be done with moisture and climate conditions that would minimize the potential for a hot fire. With these planned low intensity burns, very little stream vegetative cover is expected to burn under the more moist conditions encountered in riparian areas. The risk of a loss of shade which would result in affecting stream temperature, is minimal.

Longer term beneficial effects could result from increased riparian vegetative vigor, as a result of these low intensity burns in riparian areas. However, with the design criteria to reduce the risk of short-term loss of shade, the potential beneficial effect is limited. To

substantially increase the vigor of the post-fire vegetation, it would be necessary to "thin" the existing vegetation, which would have the corresponding risk of a short-term loss of shade.

Proposed transportation management actions will have a negligible short-term effect on stream shade/water temperature. Approximately 0.12 miles of road construction is proposed within RHCAs. Road decommissioning and closure actions will not have any direct effect on shade in the short-term. Removal of a few hazard trees in RHCAs which may be providing shade to a stream would potentially have a minor effect on water temperature but would not likely be measurable. Over the long-term, vegetation which is reestablished in the decommissioned roadways will provide additional shade in those areas where the existing road is precluding shading vegetation.

The combined effects of the proposed actions on water temperature are expected to be a negligible short-term effect, and a beneficial long-term effect.

b. SEDIMENT: No commercial timber harvest is proposed within RHCAs. Commercial thinning would be implemented on 30 acres of RHCAs associated with aspen enhancement in 5 subwatersheds. Trees already down will be removed on 72 acres using helicopters in the outer half of RHCAs in the headwaters of Vinegar Creek, but they are not currently providing soil stability or reducing sediment. Trees in contact with the ground will not be removed; only “stacked” trees will be flown out.

There will be soil disturbance associated with commercial timber harvest, primarily as a result of tractor skidding, and subsoiling of skid trails and landings. The risk of enough sediment from these activities reaching a stream with fish present, to adversely affect fish habitat, is negligible, due to the distance of these activities (use of PacFish RHCAs) from stream channels. Sediment generated from these activities which has the potential to move off-site, would be captured in the RHCA "buffer."

There is minimal potential for generating sediment from non-commercial thinning operations. And none of this activity is proposed within RHCAs. The potential for sediment from this activity affecting fish habitat is negligible.

There is no planned use of heavy equipment for the hardwood/shrub planting and protection projects planned to occur in Category 1, 2 and 4 streams. Hand placement of coarse woody debris, fiber matting is also planned in Category 2 and 4 streams. These activities are not expected to cause any short-term impacts or benefits to sediment. The risk of creating enough sedimentation to impact streams and affect fish habitat is negligible. In the long-term they would improve bank stability and reduce rilling/gullying in the vicinity of project area streams and downstream in the Middle Fork John Day River.

Channel/floodplain rehabilitation projects (hydrology) on 2 miles in Vincent Creek and 1 mile in Deerhorn Creek would entail the use of heavy equipment in RHCAs to reestablish channels and floodplains by connecting relic channels or constructing new channels. Fisheries habitat improvement projects include creation of 3 instream structures in Vinegar Creek to allow for fish passage through a culvert, 69 structures in Granite Boulder Creek and 14 structures in Butte Creek to create greater habitat complexity, reconnect floodplains, improve base flows and reduce sedimentation. Improvement of existing structures (29) in Butte Creek and (7) in Granite boulder would have the same benefits as listed for new structures with less short-term impacts. These projects would

have short-term impacts on sedimentation but would have long-term benefits for fish and fish habitat.

High intensity fire has the potential to result in exposed soil, which in turn poses a potential for sediment transport off-site. The design criteria for the proposed prescribed burning in this project would minimize sedimentation risk. Burn plan prescriptions will include parameters for weather and fuel moisture conditions, percent duff removal, percent mineral soils exposed, and others. These will set the sideboards to keep fire intensity to a level that will not result in soil loss. Along with the limits on the use of fire within RHCAs described above, this will result in a negligible risk of sediment from prescribed burning activities adversely affecting fish habitat.

From the standpoint of habitat management for listed fish species, an important component of the proposed action is to reduce impacts of the existing road system on water quality and fish habitat. This is a continuation of actions initiated with the Summit Environmental Assessment [EA](Pogo Timber Sale, 1994), Crawford EA (2001), and several road management actions. Roads and road management contribute more sediment to streams than any of the other proposed management activities. Most sediment from timber harvest is related to roads and road building. The existing road system within this project analysis area includes 264 miles of open and closed roads. About 61 miles of these roads, including some of the main access routes into the area, are within RHCAs.

There are several interrelated road management actions that are part of this alternative (see transportation maps in the Southeast Galena EIS). The general approach is to build new roads needed for future management of the area in upslope locations, and to decommission existing roads that are within RHCAs, and which are not needed for management actions in the foreseeable future.

New Road Construction: The proposed action includes construction of about 17.52 miles of system road, with only 0.12 miles within RHCAs. Approximately 2.8 miles were specifically identified for fish watershed improvement reasons. Some of these new system roads will be closed following implementation. Roads closed after use will be left in a self-maintaining condition. Very little sediment generated from the construction, or use of these roads, is expected to reach fish bearing streams because of the location and design criteria for these roads. The risk of causing enough sedimentation to reach streams and affect fish habitat is negligible.

Temporary Road Construction: Less than 0.5 miles of temporary road construction are planned with this alternative (in Vincent Creek subwatershed). None would occur within RHCAs. As described in chapter 3 of the *SE Galena EIS*, temporary roads are not part of the Forest Developed Road system, and they will be decommissioned after use. Similar to the new road construction described above, these are low standard, low profile roads. The main difference between decommissioning these roads and closing the roads as described above, is that as needed to assure revegetation of the road surface, the roads will be scarified, or subsoiled. Because of the location and design criteria for these roads, it is not expected that any sediment generated from the construction, or use of these roads, will reach fish bearing streams. The risk of causing enough sedimentation to streams to affect fish habitat is negligible.

Road Reconstruction and Maintenance: Road reconstruction and maintenance include several activities that potentially result in sedimentation from the road prism to the ditch line, or the adjacent slope. These include adding, or replacing drainage structures, installing drainage dips, road blading, snow plowing, adding road surfacing, and cleaning culverts. Based on existing surveys, the only in-channel work planned is culvert cleaning. This will be done during the instream work window of July 15 – August 15.

There are about 165 miles of roads in need of reconstruction. Twenty-three miles of which are within RHCAs, some segments within 100 feet of stream channels. These actions do pose a short-term risk of generating sediment which could reach streams, and could affect the fish and fish habitat in those streams. Best management practices (BMPs) for these activities are incorporated into standard road maintenance and reconstruction practices, and standard contract clauses. The proposed design criteria and application of BMPs will reduce the probability and magnitude of this short-term risk to impact steelhead, steelhead habitat, or bull trout. There is potential of sediment impacting individual fish where culvert replacement is planned on Category 1 streams. The potential to transfer this effect downstream to Chinook salmon EFH is low.

The long term effects of road reconstruction and maintenance actions would reduce the chronic sediment production of existing roads by improving drainage, removing ruts and rills from the driving surface, replacing or adding drainage structures, and adding less erosive surfacing material. This is particularly important on roads within RHCAs.

Road Decommissioning: About 65 miles of existing roads are planned for decommissioning as part of this project. Twenty-four miles of this total are portions of roads within RHCAs. There is a short-term risk of generating sediment that could reach streams and could affect the fish and fish habitat in those streams. This risk is primarily associated with removing culverts and with the scarification (subsoiling) which may be needed on some road segments to assure revegetation and proper water infiltration on the road surface. Design criteria include the culvert removal guidelines listed in chapter 3 of the Southeast Galena EIS, as well as standard contract clauses, which incorporate BMPs. The proposed design criteria and application of BMPs would reduce the probability and magnitude of this short-term risk to fish and fish habitat.

The long-term effects of road decommissioning are beneficial effects for water quality and fish habitat. The improved infiltration and ground cover conditions of the decommissioned roads will help restore natural watershed function, including reduced sediment yield from the road prism.

Road Closure: Some of roads planned to be constructed for this project will be closed after use for management activities. These roads will be needed for future management of the area, but they will be closed to use following this project. Drainage will be self-maintaining after closure. Closure of these roads poses a negligible risk of sedimentation to fish bearing streams. Four miles of roads closed will be inactivated. The standards for inactivation are the same as decommission except they are kept on the transportation system for future management activities.

The long-term effects of road closure are beneficial effects for water quality and fish habitat. The improved infiltration and ground cover conditions of the closed roads will help increase natural watershed function, including reduced sediment yield from the road

prism, although these beneficial effects will likely accrue more slowly than after decommissioning.

Design Criteria for Commercial Road Use and Operations: These design criteria, described in chapter 3 of the Southeast Galena EIS, also help to limit sedimentation from road use during the heavier use period associated with commercial operations. The combined effects of the proposed road management actions on sediment are expected to be a minimal short-term sediment input, and a beneficial long-term effect.

The combined effects of the proposed road management actions on sediment are expected to be a small short-term increase in sediment input, and a beneficial long term effect. The potential number of fish that might be affected by these actions is small.

c. CHEMICAL CONTAMINATIONS/NUTRIENTS: Several chemicals will be used with the proposed actions. These include saw gas and oil, fuels used to ignite fires, and herbicides/pesticides used to reduce weeds, vegetative competition and damage by gophers. All have the potential to adversely affect fish or fish habitat if they were to enter nearby stream systems. Only weed control activities would use chemicals within PacFish RHCAs. Spot application of herbicide (glyphosate) is planned on 1.5 acres within RHCAs with Alternative 2. Project Design Criteria (listed in Chapter 2 of the EIS), BMPs, handling procedures and spill plans will minimize the risk of potential effects of any chemical use. Fire suppression chemicals will not be used within RHCAs in the event of the need for fire suppression actions. There is minimal risk of an accidental spill from vehicles used to transport crews, equipment and ignition materials.

Lignin sulfonate, or magnesium chloride may be used for dust abatement, as needed, during periods of heavier vehicle use associated with commercial timber harvest activities. "Based on the literature review and typical application rates for dust abatement, the effects of these compounds on plants and animals would be negligible" (Heffner, K. 1992).

2. Habitat Access

PHYSICAL BARRIERS: Analysis in the project area estimated that 23 of 31 existing road/stream crossings on Category 1 streams pose a barrier to fish migration at some level of flow. These crossings would be modified as funding sources are found to improve connectivity. No new physical barriers limiting bull trout or steelhead movement and dispersal will be created as a result of this project. Activities will be conducted mostly outside established RHCAs, and activities within the RHCAs will not contribute to any new physical barrier. All culverts to be removed during decommissioning, or replaced during reconstruction would be improved to pass fish at all flows. The baseline condition will likely be maintained but moved toward restore with this alternative.

3. Habitat Elements

a. SUBSTRATE EMBEDDEDNESS: See the previous discussion on sediment. The combined effects of the proposed road management actions on sediment are expected to be a minimal short-term effect, and a beneficial long-term effect. The expected minimal short-term effect on sediment would have a negligible effect, if any, on substrate embeddedness.

b. LARGE WOODY MATERIAL (LWM): See the previous discussion on water temperature. The proposed actions which have the potential to have a short-term effect on large woody material, are the same as those which have the potential to affect shade/water temperature. These include removal of down trees in RHCAs, the hardwood restoration projects, prescribed burning and hazard tree removal. The combined effects of these proposed actions on large woody material are expected to be negligible, for the same reasons as described for water temperature. Similar to potential effects on water temperature, the long-term effects of the road decommissioning would likely be a beneficial effect, although it will take several decades to grow trees to a size that would provide natural large woody material.

c. POOL FREQUENCY AND QUALITY: See the above discussion on LWM. The potential to affect pool frequency and quality is mostly related to the potential to affect the supply, condition, and future sources of LWM. As described above, the potential for a short-term loss of LWM is negligible. The likely long-term effect would be a beneficial effect, mostly as a result of road decommissioning.

The other potential way to affect pool quality would be by producing a substantial increase in sediment input to the streams, which could result in filling in of existing pools. As described above in the discussion of sediment, only a minor input of sediment is expected as a result of the proposed actions. This would likely have no discernable effect on pool frequency, or quality.

Instream improvement projects (creation of structures or channel modification would increase pool frequency and quality in the activity area as well as in the proximity of these projects on Vincent Creek, Butte Creek and Granite Boulder Creek. The potential to reduce pool frequency and quality is minimal; these projects would create a beneficial effect

d. LARGE POOLS: See the above discussions on LWM and Pool Frequency and Quality. The potential to affect large pools is mostly related to the potential to affect the supply, condition, and future sources of LWM. As described above, the potential for a short-term loss of LWM is negligible.

e. OFF-CHANNEL HABITAT: Existing off-channel habitat within the Southeast Galena Analysis Area is very limited. The potential for off-channel habitat along the small streams in this area is also quite limited. Instream improvement projects (creation of structures or channel modification would improve floodplain connectivity and reconnect abandoned side channels. This would increase off channel habitat in the long term; no impacts to this criterion are expected in the short term.

f. REFUGIA: None of the proposed actions have the potential to substantially affect this baseline condition for the Middle Fork John Day River subbasin. Instream improvement projects (see pool frequency and quality discussion) could improve this matrix criterion in subwatershed where activities would occur.

4. Channel Condition and Dynamics

a. WETTED WIDTH/MAXIMUM DEPTH RATIO: A limited amount of activity is proposed within RHCAs. Heavy equipment use immediately adjacent to streams is associated with the creation of instream structures (see chapter 3 of *Southeast Galena EIS* and discussion on sediment in this BE). These structures are designed to reduce width/depth ratios in project streams and the vicinity. Removal of culverts from project

area stream channels as part of road decommissioning are not expected to impact this parameter in the short-term and are designed to improve these ratios in the long-term.

b. STREAMBANK CONDITION: See above, wetted width/maximum depth ratio.

c. FLOODPLAIN CONNECTIVITY: No road construction, or other activity is proposed, which could result in disconnecting any floodplain function from the adjacent stream. The proposed action, which has the potential to affect floodplain connectivity, plans decommissioning about 25 miles of roads. Only a small portion of these roads, approximately 9.6 miles are within RHCAs, is actually within a floodplain. After road decommissioning activities, the reduction of compaction of the road prism, resulting from physical processes such as freeze/thaw cycles, will occur for several years, or maybe a few decades. Removal of culverts that maintain downcut channels in the current location as well as wood added to channels and instream structures would improve floodplain connectivity. There will likely be no adverse short term effect and a limited long-term beneficial effect on floodplain connectivity.

5. Hydrology/Flow

a. CHANGE IN PEAK/BASE FLOWS: About 9,870 acres (16%) of the analysis area (63,277 acres total) are proposed for some type of mechanical treatment which will decrease tree (conifer) density over the next 5 – 10 years. This includes commercial and non-commercial thinning. Reducing the number of trees growing on a site can result in increased summer base streamflow, by reducing evapotranspiration. Many conifers effectively stop respiration during the late summer months. Conversely, snow tends to remain on the ground longer where tree density is higher which slows the movement of water to streams during spring melt. With the level of canopy reduction in this proposed action, the expected magnitude of the change in base flow would be small.

Up to 21,970 acres are proposed for prescribed burning. A large portion of this is in areas where a primary objective is to reduce ground fuels (duff and needle layer). In this type of prescribed burning, about 60% of the area typically burns, and fire intensity is low. There will be some mortality of very small trees, but very limited loss of larger trees. With the percentage area treated in any given year, and the low intensity of the prescribed burning, the risk of increased peak flows of a magnitude to affect channel stability and sedimentation will be insignificant in most areas. The headwaters of Deerhorn, Little Butte and Little Boulder Creeks may be exceptions. Large scale, high intensity wildfires can result in increased peak flows.

Road systems can also affect peak flow by extending the drainage network and increasing delivery efficiency to the stream channel. As described below, the proposed action will not extend the drainage network and will not change peak flows from the existing condition.

The combined effects of the proposed actions on peak/base flows is expected to be minimal in the short-term and designed to improve conditions (beneficial effect) in the long-term.

b. DRAINAGE NETWORK INCREASE: Road management is the part of the proposed action that has the greatest potential to affect the drainage network. Design criteria and location for the new road construction will result in no increase in the drainage network. Road reconstruction will result in a reduction of the drainage network by adding relief drainage structures and reducing the channeling of water in ephemeral draws.

Decommissioning of roads in RHCAs will decrease the drainage network over time. A lesser beneficial effect will result from road closures. Watershed improvement projects would rehabilitate areas of disturbance and reduce channeling by slowing and capturing overland water flow. Implementation of this project is expected to maintain the baseline condition in the short-term, and improve the baseline in the long-term.

6. Watershed Condition

a. ROAD DENSITY AND LOCATION: 17.6 miles of new construction are proposed; 0.12 miles of the total construction will occur within RHCAs. Most of the construction will take place in uplands. Some New roads will be put in a condition of self-maintaining drainage and closed after use. Others will remain open, replacing roads to be decommissioned in RHCAs with the action.

About 65 miles of road decommissioning are proposed; 24 miles of the total are located within RHCAs. Many segments of these roads are hydrologically connected to the stream drainage network.

The net change in road miles is a reduction of approximately 46 miles. The net decrease of 31.8 miles of roads in RHCAs is even more important to fisheries. This would reduce road densities in all project area subwatersheds. This is a beneficial effect from the baseline condition.

b. DISTURBANCE HISTORY: The proposed action would have a limited effect on features of the disturbance history within this watershed. As a result of historic activities in the area, several watershed conditions have been modified. The proposed action addresses a few of those modifications to a limited degree.

As a result of historic logging practices and fire control, existing tree (conifer) stands have fewer large trees, but much higher tree densities. The proposed action would move about 9870 acres (16% of the area) to a condition which is more similar to historic open canopy stand conditions.

The proposal also includes:

- The use of prescribed burning to move toward reestablishing low intensity, recurring fires to the area. The proposed action would treat about one third of the area over the next 5-10 years.
- Road management actions which will have the net result of reducing the effects of the existing road system, especially existing roads in riparian areas.
- Limited restoration of riparian hardwood (aspen and cottonwood) stands.
- Limited meadow restoration projects.

The net sum of all projects planned in the analysis area is nearly equivalent considering additional disturbance (adding to history) and restoration (subtracting from history) effects. The magnitude of these beneficial effects is relatively small, in such a large area.

c. RIPARIAN CONSERVATION AREAS: The Upper Middle Fork John Day Watershed is covered by the PACFISH riparian conservation strategy. The proposed action follows the standards and guidelines in PACFISH. The action would not retard attainment of RMOs, and in several cases would contribute to meeting RMOs.

Summary of effects:

Collectively, analysis of all criteria discussed for Alternative 2 shows a low risk of short-term adverse effects on fisheries and fish habitat, with long-term beneficial effects. It is unlikely that the short-term effects discussed above would be of a magnitude to result in fish mortality, or adverse modification of habitat. There is the potential that sediment from road management actions, timber management or stream channel improvement projects could affect a few rearing redband trout, steelhead fry or bull trout. The potential to transport short term effects downstream to Chinook salmon or EFH in the Middle Fork John Day River is negligible.

Determinations:

Mid-Columbia Summer Steelhead (T): May Affect, **Likely to Adversely Affect** in the short-term. **Beneficial Effect** in the long-term.

Steelhead Designated Critical Habitat: May Affect, **Not Likely to Adversely Modify** in the short-term. **Beneficial Effect** in the long-term**.**

Chinook Salmon (S): May Impact Individuals or Habitat, but will not likely contribute toward federal listing or loss of viability to the population or species, in the short-term. **Beneficial Effect** in the long-term.

Chinook Salmon Essential Fish Habitat: No Effect in the short-term. **Beneficial Effect** in the long-term.

Columbia River Basin Bull Trout (T): May Affect, **Likely to Adversely Affect** in the short-term. **Beneficial Effect** in the long-term.

Interior Redband Trout (S): May Impact Individuals or Habitat, but will not likely contribute toward federal listing or loss of viability to the population or species, in the long-term.

D. Alternative 3:

Summary of Effects:

From the standpoint of potential effects on fish and fish habitat, Alternative 3 is essentially the same as Alternative 2. This alternative would do about 1930 acres less of commercial harvest and thinning treatments. Road construction is one mile less, reconstruction is nearly identical and decommission is the same for this alternative as for Alternative 2. There would be about 2750 fewer acres of prescribed burning and 1 miles less road construction than in Alternative 2. The main difference between this alternative and Alternative 2 is no instream work would be completed using heavy equipment in RHCAs with Alternative 3.

All of the same design criteria apply as in Alternative 2 except for the increase in stream buffers for intermittent channels in the project area. The same Access and Travel Management plan would be implemented. As a result, the potential risk of short term adverse effects is somewhat less, and the potential long term beneficial effects are somewhat less than for Alternative 2. The overall differences are minimal, and do not change the determinations for listed and sensitive species.

Determinations:

Mid-Columbia Summer Steelhead (T): May Affect, **Likely to Adversely Affect** in the short-term. **Beneficial Effect** in the long-term.

Steelhead Designated Critical Habitat: May Affect, **Not Likely to Adversely Modify** in the short-term. **Beneficial Effect** in the long-term**.**

Chinook Salmon (S): May Impact Individuals or Habitat, but will not likely contribute toward federal listing or loss of viability to the population or species, in the short-term. **Beneficial Effect** in the long-term.

Chinook Salmon Essential Fish Habitat: No Effect in the short-term. **Beneficial Effect** in the long-term.

Columbia River Basin Bull Trout (T): May Affect, **Likely to Adversely Affect** in the short-term. **Beneficial Effect** in the long-term.

Interior Redband Trout (S): May Impact Individuals or Habitat, but will not likely contribute toward federal listing or loss of viability to the population or species, in the long-term.

E. Alternative 4:

Summary of Effects:

From the standpoint of potential affects on fish and fish habitat, Alternative 4 has some similarities to Alternative 2 but several important differences. This alternative would do no commercial harvest but would have 2730 acres of precommercial thinning treatments. There would be only 2 miles of road construction and 20 miles less road reconstruction than alternative 2. Road decommission projects are the same for this alternative as for Alternative 2. There would be about 10610 fewer acres of prescribed burning than in Alternative 2. Another difference between this alternative and Alternative 2 is no instream structure, channel or floodplain work would be completed using heavy equipment in RHCAs with Alternative 4.

All of the same design criteria apply as in Alternative 2. The same Access and Travel Management plan would be implemented. The potential risk of short-term adverse effects is somewhat less, but the potential long term beneficial effects are also somewhat less than for Alternative 2. The overall differences do not change the determinations for listed and sensitive species.

Determinations:

Mid-Columbia Summer Steelhead (T): May Affect, **Likely to Adversely Affect** in the short-term. **Beneficial Effect** in the long-term.

Steelhead Designated Critical Habitat: May Affect, **Not Likely to Adversely Modify** in the short-term. **Beneficial Effect** in the long-term**.**

Chinook Salmon (S): May Impact Individuals or Habitat, but will not likely contribute toward federal listing or loss of viability to the population or species, in the short-term. **Beneficial Effect** in the long-term.

Chinook Salmon Essential Fish Habitat: No Effect in the short-term. **Beneficial Effect** in the long-term.

Columbia River Basin Bull Trout (T): May Affect, **Likely to Adversely Affect** in the short-term. **Beneficial Effect** in the long-term.

Interior Redband Trout (S): May Impact Individuals or Habitat, but will not likely contribute toward federal listing or loss of viability to the population or species, in the long-term.

C. Alternative 5:

Summary of Effects:

From the standpoint of potential effects on fish and fish habitat, Alternative 5 is essentially the same as Alternative 2. This alternative would do about 1600 acres more harvest and thinning treatments. Nearly 4 more miles of road construction are planned, associated with harvest units. About 5 miles less of decommission is planned with this alternative. There would be about 740 more acres of prescribed burning.

All of the same design criteria apply as in Alternative 2. None of the additional harvest, or fuels treatment is within RHCAs. Only 0.4 miles of the additional roadwork are located in RHCAs. As a result, the potential risk of short term adverse effects is minimally greater, and the potential long term beneficial effects are somewhat less than for Alternative 2. The overall differences are minimal, and do not change the determinations for listed and sensitive species.

Determinations:

Mid-Columbia Summer Steelhead (T): May Affect, **Likely to Adversely Affect** in the short-term. **Beneficial Effect** in the long-term.

Steelhead Designated Critical Habitat: May Affect, **Not Likely to Adversely Modify** in the short-term. **Beneficial Effect** in the long-term**.**

Chinook Salmon (S): May Impact Individuals or Habitat, but will not likely contribute toward federal listing or loss of viability to the population or species, in the short-term. **Beneficial Effect** in the long-term.

Chinook Salmon Essential Fish Habitat: No Effect in the short-term. **Beneficial Effect** in the long-term.

Columbia River Basin Bull Trout (T): May Affect, **Likely to Adversely Affect** in the short-term. **Beneficial Effect** in the long-term.

Interior Redband Trout (S): May Impact Individuals or Habitat, but will not likely contribute toward federal listing or loss of viability to the population or species, in the long-term.

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BIOLOGICAL EVALUATION

for

PROPOSED, THREATENED, ENDANGERED, AND SENSITIVE

WILDLIFE SPECIES

February 2002

Blue Mountain Ranger District

Malheur National Forest

Southeast Galena Restoration

Prepared by:

Ken Schuetz District Wildlife Biologist

This Wildlife Biological Evaluation is organized in the following manner:

GALENA VEGETATION MANAGEMENT PROJECT

I. SPECIES CONSIDERED IN THIS ASSESSMENT

II. POTENTIAL EFFECTS OF THE PROPOSED ACTION AND ALTERNATIVES ON LISTED SPECIES AND CRITICAL HABITAT

Gray Wolf (*Canis Lupis*)

Northern Bald Eagle (*Haliaeetus leucocephalus*)

Canada lynx (*Lynx canadensis*)

III. POTENTIAL EFFECTS OF THE PROPOSED ACTION AND ALTERNATIVES ON SENSITVE SPECIES

American Peregrine Falcon (*Falco peregrinus*)

California Wolverine (*Gulo gulo*)

Pacifc Fisher (*Martes pennanti*)

Bobolink (*Dolichonyx oryzivorus*)

Sandhill Crane (*Grus canadensis*)

Long-billed Curlew (*Numenius americanus*)

Tricolored Blackbird (*Agelaius tricolor*)

Columbia Spotted Frog (*Rana luteiventris*)

Western Sage Grouse (*Centrocrcus urophasianus phaios*)

Gray Flycatcher (*Empidonax rightii*)

References

Summary of Effects

Species	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
Threatened					
Gray Wolf *(Canis hupis)*	NE	NE	NE	NE	NE
Northern Bald Eagle *(Haliaeetus leucopephalus)*	NE	NE	NE	NE	NE
Canda Lynx *(Lynx canadensis)*	NE	NLAA	NLAA	NLAA	NLAA
Sensitive					
American Peregrne Falcon *(Falco peregrinus)*	NI	NI	NI	NI	NI
California Walverine *(Gulo gulo)*	NI	MIIH	MIIH	MIIH	MIIH
Pacific Fisher *(Mares pennanti)*	NI	MIIH	MIIH	MIIH	MIIH
Bobolink *(Dolichonyx oryzivorus)*	NI	MIIH	NI	NI	MIIH
Sandhill Crane *(Grus Canadensis)*	NI	MIIH	NI	NI	MIIH
Long-billed Curlew *(Numenius americanus)*	NI	MIIH	NI	NI	MIIH
Tri-colored Blackvird *(Agelaius tricolor)*	NI	NI	NI	NI	NI
Columbia Spotted Frog *(Rana luteiventris)*	NI	MIIH/BI	MIIH/BI	MIIH/BI	MIIH/BI
Western Sage Grouse *(Centrocercus urophasianus phaios)*	NI	NI	NI	NI	NI
Gray Flycatcher *(Empidonax wrightii)*	NI	NI	NI	NI	NI

Lister Species	**Sensitive Species**
NE = No Effect NLAA = May Affect-Not Likely to Adversely Affect	NI = No Impact MIIH = May Impact Individuals or Habitat but will not likely contribure toward federal listing or loss of viability to the population or species BI = Beneficial Impact

BIOLOGICAL EVALUATION

This Biological Evaluation analyzes the potential effects of the proposed action and other alternatives on species listed under the Endangered Species Act and species identified as sensitive by the U.S.D.A. Forest Service, Pacific Northwest Region. The most recent R-6 sensitive species list, dated November 11, 2000, was used.

I. SPECIES CONSIDERED IN THIS ASSESSMENT

The federally listed species documented or suspected to occur in the project area are: gray wolf (endangered), northern bald eagle (threatened), and habitat for the Canada lynx (threatened). Sensitive species documented or suspected to occur in the project area are: California wolverine, Pacific fisher, bobolink, sandhill crane, long-billed curlew, tricolored blackbird, Columbia spotted frog, western sage grouse, and gray flycatcher.

II. POTENTIAL EFFECTS OF THE PROPOSED ACTION AND ALTERNATIVES ON LISTED SPECIES AND CRITICAL HABITAT

Gray Wolf (Canis lupis)

Status: Federal — Endangered
State — Endangered
Region 6 — Endangered

Biology and Ecology

Wolves are considered to be absent from Oregon although one female radio-collared wolf from the experimental population in Idaho traveled to the Malheur National Forest and was trapped and returned to Idaho in 1999. This wolf was in the vicinity of the Upper Middle Fork Watershed. During the fall of 2000, a male wolf was killed on Interstate 84 near Baker City, Oregon. This indicates that wolves can and will travel to Oregon and the Malheur National Forest. It is very probable that dispersing wolves will eventually establish breeding territories in Oregon and possibly on the Malheur National Forest.

Gray wolves (*Canis lupus*) are the largest wild members of the Canidae, or dog family, with adults ranging from 18 to 80 kilograms (kg) (40 to 175 pounds [lb]) depending upon sex and subspecies (Mech 1974 as cited in Federal Register: July 13, 2000). Wolves resemble coyotes (*Canis latrans*) or domestic German shepherd or husky dogs (*C. domesticus*), but can be distinguished from them by their longer legs, larger feet, wider head and snout, and straight tail (Federal Register: July 13, 2000).

Wolves are social animals, normally living in packs of two to ten members. They need a large, remote area relatively free from human disturbance (Snyder, S. A. 1991 [16]). Packs occupy, and defend from other packs and individual wolves, a territory of 50 to 550 km^2 (20 to 214 mi^2)). In the northern U.S. Rocky Mountains territories tend to be larger, typically from 520 to 1040 km^2 (200 to 400 mi^2) (Federal Register: July 13, 2000).

The gray wolf historically occurred across most of North America, Europe, and Asia. In North America, gray wolves formerly occurred from the northern reaches of Alaska, Canada, and Greenland to the central mountains and the high interior plateau of southern Mexico. The only areas of the contiguous United States that apparently lacked gray wolves since the last glacial events are much of California and the Gulf and Atlantic coastal plain south of Virginia. Wolves were generally absent from the extremely arid deserts and the mountaintops of the western United States (Goldman 1944, Hall 1959, Mech 1974 [all as cited in Federal Register: July 13, 2000]). The influx of European settlers into North America brought superstitions and fears of wolves.

Their attitudes, coupled with perceived and real conflicts between wolves and human, led to widespread persecution of wolves. Poisons, trapping, and shooting, spurred by Federal, State, and local government bounties, resulted in its extirpation from more than 95 percent of its range in the 48 conterminous States. When the Endangered Species Act was passed, probably only several hundred wolves occurred in northeastern Minnesota and on Isle Royale, Michigan, and possibly a few scattered wolves in the Upper Peninsula of Michigan, Montana, and the Southwest.

Normally, only the top-ranking male and female in each pack breed and produce pups. Litters, usually four to six pups, are born from early April into May (Michigan Department of Natural Resources (MI DNR) 1997, U.S. Fish and Wildlife Service 1992a, both as cited in Federal Register: July 13, 2000). Wolves excavate natal dens in well-drained soils in meadows near water, but occasionally they will den in hollow logs, under tree roots, rock outcrops, or even in beaver lodges (Snyder, S. A. 1991 [11, 16]). After 1 to 2 months natal dens are abandoned for an open area called a rendezvous site. Here a few adult pack members guard the pups, while the rest of the pack hunts (Snyder, S. A. 1991 [1]).

Yearling wolves frequently disperse from their natal packs, although some remain with their pack (Michigan Department of Natural Resources (MI DNR) 1997, U.S. Fish and Wildlife Service 1992a, both as cited in Federal Register: July 13, 2000). Dispersers may become nomadic and cover large areas as lone animals, or they may locate suitable unoccupied habitat and a member of the opposite sex and begin their own territorial pack.

Wolves' habitat preferences appear to be more prey dependent than cover dependent. Forests, open meadows, rocky ridges, and lakes or rivers all comprise a pack's territory (Snyder, S. A. 1991 [16]). In the West wolves have been known to follow the seasonal elevational movements of ungulate herds. Wolves prey mainly on large ungulates, such as moose (*Alces alces*), deer (*Odocoileus* spp.), elk (*Cervus elaphus*), and caribou (*Rangifer tarandus*). Beaver (*Castor canadensis*) are a major supplement to wolves' diets (Snyder, S. A. 1991 [23]). Voigt and others (Snyder, S. A. 1991 [33]) reported that wolves' diets vary, depending on relative prey abundance. Other prey species include mountain goats (*Oreamnos americanus*), bison (*Bison [Bos] bison*), pronghorn (*Antilocapra americana*), various rodents, upland game birds and waterfowl, snowshoe hare (*Lepus americanus*), and black bear (*Ursus americana*) (Snyder, S. A. 1991 [6,10,21,23,25,33]). Occasionally wolves prey on domestic livestock.

Humans are the only significant predator of the wolf and have eradicated it from almost all of its former range worldwide (Snyder, S. A. 1991 [27,34]). Pimlott and others (Snyder, S. A. 1991 [26]) noted black bear preying on wolf cubs and adults.
Wolf extermination efforts in the western United States began in the 1860's. Yellowstone and Glacier National Parks established an official predator-control policy between 1914 and 1926 (Snyder, S. A. 1991 [27]). Today both parks are included in the Northern Rocky Mountain Wolf Recovery Plan as two areas capable of sustaining viable wolf populations. Fear of livestock depredation seems to be the biggest reason for opposition to wolf recovery. Also hunters worry that big game populations will decrease if wolves recolonized their former ranges.

Environmental Baseline

Wolves are habitat generalists and potentially could occupy the entire Malheur National Forest. Because of human persecution, seclusion is a very important factor in providing wolf habitat; therefore open road density can be used to evaluate wolf habitat. Within the Galena Watershed, there are approximately 613 miles of roads of which over 420 miles are open to all traffic. The total road density is 5.16 miles/square mile, and the open road density is 3.54 miles/square mile.

Timber sales that are on going within the watershed are Pog/Pogo on the Blue Mountain Ranger District and Clear Salvage, Foggy, and Angel Timber Sales on Prairie City Ranger District. Other projects are planned but not implemented on the Prairie City Ranger District were analyzed in the Dry Fork EA resulting in Dry Fork, Stormy, Clear, and possibly other timber sales. Currently, Pog/Pogo the timber sale in the SE Galena area is nearly complete, but post-sale activities, such as slash treatments, planting, animal damage control (mostly gopher control through baiting or trapping), and small-diameter tree thinnings (also called precommercial thinning) are still to be completed. Other sales on the Prairie City Ranger District have similar post-sale activities.

Effects Common to All Action Alternatives

The SE Galena project would manage vegetation and roads. All other activities that occur in the watershed will remain as described above in the baseline. Only effects actions proposed in SE Galena will be addressed in this BE.

Wolves feed on big-game animals and occasionally on other species. Therefore, actions that affect big-game populations could affect wolf survival or productivity. Overall, Alternatives 2, 3 and 4 improve big game habitat by 1) improving cover/forage ratios, 2) enhancing forage by opening up canopies and planting and protecting hardwoods, and 3) reducing open road densities. The SE Galena Restoration EIS Wildlife Report provides detailed information. .

Alternative 5 reduces deer and elk habitat effectiveness due to increased open road densities and reduced thermal and hiding cover in several subwatersheds. Given that no wolves currently occupy the Forests, the effects of reduced prey would still result in a No Effects call.

Effects of Pesticide/Herbicide Use:

Tables 7 and 8 display treatment acres. Chemicals would only be applied under Alternatives 2 and 5.

Strychnine baiting - There would be no risk of primary poisoning; gray wolves do not consume grains or seeds as part of their diets. There would be little to no risk of secondary poisoning. The potential for exposure to bait or poisoned animals is low. The bait would be applied below ground. Applicators would adhere to strict handling and storage procedures. Poisoned gophers typically die below ground. Although wolves may feed on pocket gophers, gophers are unlikely to be a significant component of a wolf's diet. If one applies the lowest lethal dose for mammals of .33 mg/kg, a 40 kg wolf would have to consume 5 to 50 poisoned gophers in a short period of time to be killed. Given the absence of populations on the Forest, coupled with the low risk of toxic exposure, no effects to gray wolves would be expected.

Aluminum phosphide fumigation - Because the effects of fumigation are limited to those animals which actually inhabit the underground burrows, no direct effects to gray wolves would occur. The potential for secondary toxicity would be highly unlikely. Phosphine does not accumulate in animal tissue. Due to the mode of action - phosphine reacting within the respiratory system - and the extremely short half-life in target animals following death, residue levels present in animals directly killed by phosphine gas are not high enough to produce the same effect in a predator or scavenger.

Herbicide Applications –The US Forest Service contracted Syracuse Environmental Research Associates Inc. and the Syracuse Research Corporation to compile relevant studies on registered pesticides and to evaluate ecological risks (SERA, 1995, 1996 and 1997). Studies generally indicate that glypohosate, and hexazinine are characterized by relatively low toxicity to mammalian and avian species. These herbicides do not bioaccumulate in tissues of exposed animals, but rather are rapidly excreted in urine or feces (USDA 1992 and 1997).

See the Southeast Galena Restoration Project Wildlife Report for additional discussion on chemical effects.

Determination of Effects

The determination for is No Effect (NE) for the following reasons:

1. No populations currently occupy this Forest.
2. No denning or rendezvous sites have been identified.
3. There is an abundance of prey; that is not a limiting factor.
4. Most Forest Service management activities for non-breeding populations are compatible with wolf protection and recovery.
5. If wolves become established while project implementation is occurring, measures will be taken to protect them.

Northern Bald Eagle (Haliaeetus leucocephalus)

Status: Federal – Threatened
State – Threatened
Region 6 — Threatened

Biology and Ecology

Bald eagles prey largely on fish and, to a lesser extent, waterfowl and are usually associated with rivers or lakes. Habitat includes clean water with abundant fish and/or waterfowl populations, and many large, "wolfy" (having many dense branches) perch trees and roost sites nearby. In the Pacific Northwest, bald eagle nests are usually in multistoried, predominantly coniferous stands with old growth components near water bodies that support adequate food supply (U. S. Dept. Interior 1986). They usually nest in the same territories each year and often use the same nest repeatedly which can result in very large nest structures, 2-3 feet deep and up to 5 feet in diameter. They will use alternate nests. Nest trees have stout upper branches to support the nest structure and usually provide an unobstructed view of an associated water body. Most nests in Oregon have been within 1/2 mile of water.

Existing Condition

On the Malheur National Forest, bald eagles congregate at winter roost sites during the late fall, winter, and early spring. They scavenge in agricultural valleys and wetlands, feeding primarily on carrion normally found in areas of cattle concentration and birthing, or where ranchers dispose of dead animals. They roost at night in mature forest stands that provide a microclimate that helps protect them from cold weather and wind.

Bald eagles have been sighted along the Middle Fork of the John Day River and probably forage there during the winter as long as carrion is present and available. In 2001, wildlife biologists identified the first suspected bald eagle nest to be located on the Blue Mountain Ranger District. The nest was identified along the Middle Fork of the John Day River, approximately 9 miles west, i.e., down river, of the Southeast Galena project area. It is believed the nest failed to fledge young. In the winter, bald eagles roost and feed in Bear Valley, along the South Fork John Day River, Middle Fork John Day River, and the main John Day River. Temporary winter roosts are possible within the project area but none have been documented. Bald eagles have been sighted on or near the Blue Mountain Ranger District in each month, but not every month for every year since 1990; and peak use is November to March.

There are no bald eagles or critical habitat necessary for their recovery within the project area. According to the Pacific Bald Eagle Recovery Plan (USFWS 1986), key areas nearest the project area occur as winter roost sites along the John Day River.

Effects Common to All Alternatives

Bald eagle presence in the area is transitory in nature and eagles would not likely be affected during implementation of the proposed activities. There would be no direct, indirect, or cumulative effects to bald eagles.

Effects of Pesticide/Herbicide Use:

Tables 7 and 8 display treatment acres. Chemicals would only be applied under Alternatives 2 and 5.

Seasonal Restrictions - Seasonal restrictions would prohibit chemical applications from November 15th to March 15th, the winter roosting season for bald eagles on the Malheur National Forest, reducing the potential for exposure.

Strychnine baiting - There would be no risk of primary poisoning; bald eagles do not consume grains or seeds as part of their diets. There would be no risk of secondary poisoning. Although bald eagles may feed on pocket gophers, gophers are unlikely to be a significant component of a bald eagle's diet. Although no strychnine tolerance studies have been conducted on bald eagles, it may be reasonable to apply the results of the clinical studies on great-horned owls and red-tailed hawks as discussed previously (Anthony et al. 1984). Raptors have a relatively high tolerance for strychnine (Anthony et al. 1984). If one applies the lowest lethal dosage of 7.7 mg/kg, a 4.5 kg bald eagle would have to consume 12 to 385 strychnine killed mammals over a short period of time to be killed. No effects to bald eagles would be expected.

Aluminum phosphide fumigation – Because the effects of fumigation are limited to those animals which actually inhabit the underground burrows, no direct effects to bald eagles would occur. The potential for secondary toxicity would be highly unlikely. Phosphine does not accumulate in animal tissue. Due to the mode of action - phosphine reacting within the respiratory system - and the extremely short half-life in target animals following death, residue levels present in animals directly killed by phosphine gas are not high enough to produce the same effect in a predator or scavenger.

Herbicide Applications –The US Forest Service contracted Syracuse Environmental Research Associates Inc. and the Syracuse Research Corporation to compile relevant studies on registered pesticides and to evaluate ecological risks (SERA 1996 and 1997). Studies generally indicate that glypohosate, and hexazinine are characterized by relatively low toxicity to mammalian and avian species. These herbicides do not bioaccumulate in tissues of exposed animals, but rather are rapidly excreted in urine or feces (USDA 1992 and 1997).

See the Southeast Galena Restoration Project Wildlife Report for additional discussion on chemical effects.

Determination of Effects

There would be no effect to bald eagles, or critical habitat by implementing any of the alternatives.

Canada Lynx (Lynx canadensis)

Status: Federal – Threatened
State – None
Region 6 - Threatened

Biology and Ecology:

Major Threats

The Canada lynx has a large range in northern North America, particularly in Alaska and Canada. Declines have occurred in some populations, but are apparently still widespread and relatively abundant in most of the historic range, though population data are lacking for many areas. Lynx

distribution at southern latitudes, including mountainous regions in Northeast Oregon, represent the occupation of marginally suitable habitat that decreases in quality and availability as one continues to move southward.

Habitat loss, fragmentation and susceptibility to overharvest (trapping) are major concerns across the lynx's range (TNC 1999). Factors contributing to these concerns include; forest management activities, fire suppression, landscape level catastrophic wildfire, roads, developments that destroy habitat, grazing, predator control and trapping, competition with other predators, and human disturbances (winter recreation off-highway travel and highways) that displace lynx from their habitat (Wisdom et al. 2000, TNC 1999, and Witmer et al. 1998).

Habitat General Description

Lynx are typically associated with large tracts of high elevation boreal forests where their physical adaptations of long legs and broad paws allow them to negotiate deep snow and effectively hunt their principal prey, the snowshoe hare (*Lepus americanus*). Lynx require a mix of late and early seral habitats to meet their cover and food needs. Mature forests provide the lynx with denning space and hiding cover, while early seral habitats provide a prey base (Koehler 1990). Intermediate successional stages may serve as travel cover, but function primarily to provide connectivity within a forested landscape. Home range size varies considerably and is usually dependent upon prey availability. Typical home range territories are 45-155 mi^2 (Ruggiero 1994).

Lynx denning habitat is characterized as having large woody debris that provides security and thermal cover and mature overstory canopies. These elements combine to provide both vertical and horizontal structural diversity (Ruggiero 1994). Habitat quality, as measured by the availability of alternate den sites, appears to be an important factor in kitten survival when disturbance occurs. Primary denning sites are often in large hollow logs, beneath windfall or upturned roots, or in brush piles in dense thickets (Brittell et al. 1989). Lynx den sites are in forests with a high density of downfall logs in patches scattered over 5-10 acres (>40 logs per 40 yards [46 m] lying 1 to 4 feet [0.3-1.3 m] above the ground) (Koehler 1990). Pockets of dense forest must be interspersed with prey habitat (Grange 1965). Pockets of late and old forest, at least 5-10 acres (2-4 ha), should be left for denning sites. Management units should be designed to provide travel corridors, especially along ridges and saddles, as lynx are more likely to use these areas.

Lynx primarily prey on snowshoe hare (*Lepus americanus*). Their diet also includes squirrels (*Tamiasciurus spp.),* ducks (Anas spp), and upland game birds; especially grouse (*Dendrogapus* spp). Preferred foraging habitat is found in early to mid-successional, densely stocked, mixed conifer forests that support plentiful populations of snowshoe hare for hunting (Ruggiero 1994). Good hare habitat is provided by stands with a high stem and lower bough density (approximately 2,400 to 13,000 stems and boughs per acre) on trees that are small (less than 4-inch dbh with 1-inch diameter stems and boughs preferred) but above snow level. Lynx populations usually fluctuate in a cycle with snowshoe hare populations, peaking about every 9 to 10 years (Burt and Grossenheider 1976, Fox 1978, Mech 1980, U.S.D.I. Fish and Wildlife Service 1994). Because of these volatile swings, their populations became very low about every 10 years. Therefore, they can be rare in any one given area at these times.

Deep snow and cold temperatures are often associated with lynx habitat. Other predators, such as the wolverine, may need to migrate to lower elevations under these conditions in order to follow their food source. Lynx, however, remain and thrive under these conditions due to their physical adaptations to low temperatures, deep snow and ability to successfully hunt the snowshoe hare.

Because lynx populations fluctuate with snowshoe hare populations, events that create snowshoe hare cover and forage generally benefit lynx (Koehler and Brittell 1990). These events might have negative short-term effects by eliminating denning habitat. However, as forest succession

progresses after a disturbance, such as fire, insect outbreak, or logging, stands transition from non habitat to forage and then to denning habitat. A certain level of dynamic cycling it seems is essential for maintaining optimal habitat.

Travel corridors provide security during movement from denning areas to foraging areas and during dispersal. Cover that is generally greater than 8 feet tall with stem densities in excess of 180 trees per acre allows for movement of lynx within their home ranges (Koehler 1990). Riparian corridors, forested ridges, and saddles appear to be favored travel ways. Lynx avoid large openings (> 300 feet from cover) that have the potential to disrupt movement between isolated populations (Ruggiero 1994).

Lynx can be managed by managing for their prey. Snowshoe hare populations increase dramatically following disturbance, particularly fire. However, snowshoe hare recolonization may not occur until 6 to 7 years following logging, and that snowshoe hare densities may not reach their maximum for another 20 to 25 years (Koehler and Brittell 1990). This depends on site conditions and type of treatment. As stands become older (about 20 to 30 years old), their benefits to snowshoe hare decrease.

Lynx breed when they are one year old. The breeding season is January or February, sometimes into April (Brainerd 1985, Nellis et al. 1972). The gestation period is 60 days and birthing occurs in March or April, sometimes May or June.

Distribution

The geographic range of lynx includes all of Alaska and Canada (except the northeastern parts of Northwest Territories) and the United States south to a line from southern Oregon to southern Colorado, southern Iowa, southern Indiana and southern Maryland (Verts and Carraway 1998). Lynx are considered to have historically resided in 16 of the contiguous United States (Maine, New Hampshire, Vermont, New York, Massachusetts, Pennsylvania, Michigan, Wisconsin, Minnesota, Washington, Oregon, Idaho, Montana, Wyoming, Utah, and Colorado) based on historical observations, trapping records, and other documented evidence. The occurrence of lynx in most of the contiguous United States is likely the result of transient dispersal during declines in population density of their primary prey, snowshoe hares (Quinn and Parks 1987).

Oregon Distribution

Oregon is considered to be at the southern fringe of the lynx's range, and animal density and habitat use are expected to differ from further north where habitat is considered more suitable. The lynx has always been rare in Oregon (Koehler and Aubry 1994).

In Oregon, there are twelve verified records of lynx documented between 1897-1993, six of which were taken from the Blue Mountains (Ruggiero et al 1999, Verts and Carraway 1998). Of these 12 known specimens, one each was collected in 1897, 1964, 1974, and 1993, 2 in 1920, and 3 each in 1916 and 1927. Three of the six specimens taken in the Blue Mountains were collected near the town of Granite, approximately 10 miles northeast of the project area. The remaing six specimens were taken from the Wallowa Mountains, the Cascade Mountains, the Willamette Valley, the Stinkingwater Mountains and the Steens Mountains.

Peaks in density of lynx populations in Alaska reportedly occurred in 1916-1918, 1926-1928, 1963-1966, and 1974-1975 (Quinn and Parks 1987). Peak periods somewhat correlate to collections made in Oregon. Verts and Carraway (1998) suggest that lynx occurrence in Oregon may be dispersed from occupied areas farther north that immigrate into the area and persist for a short time.

Surveys using a hair sampling protocol that targets lynx were conducted on the Malheur National Forest in 1999, 2000 and 2001. One of the 1999 surveys included habitat in the Southeast Galena Project Area. The 1999 and 2000 surveys did not determine lynx presence; the 2001 data is still being analyzed. Surveys to detect other forest carnivores have been conducted in the past, and

while no lynx were detected, snowshoe hare tracks were reported along several routes. In the early 1990's, winter track and camera station surveys were conducted on the Malheur National Forest to inventory forest carnivores, but no lynx were detected.

Recent unconfirmed lynx sightings have been reported along the Middle Fork of the John Day River, Blue Mountain Ranger District, and in the Reynolds Creek Subwatershed, Prairie City Ranger District.

Based on the limited available information, the Fish and Wildlife Service cannot substantiate the historic or current presence of a resident lynx population in Oregon (USF&WS 2000). Verts and Carraway (1998) conclude that there is no evidence of self-maintaining populations in Oregon and USDI (1997) considered lynx "extirpated" from Oregon. Additional surveys and research are warranted before lynx are considered as having self-maintaining populations in Oregon.

Until survey results supply better information, analysis for this Environmental Impact Statement assumes that the project area currently supports reproductive lynx and assesses the effects due to management actions accordingly. Effects have been analyzed using project-level standards and guidelines provided in the Lynx Conservation Assessment and Strategy (LCAS) (Ruediger et al. 2000).

Lynx Habitat Analysis in the Galena Project Area

Lynx habitat was modeled for the Malheur National Forest using forest stand plant association information as well as verification through field surveys. A stand's plant association indicates the type of vegetation likely to occur on the site throughout succession.

Habitat is defined as stands above 5,000 feet that are classified as subalpine fir, Engelmann spruce, lodgepole pine, or moist grand fir plant associations. Biophysical environments are considered cold/dry, cool/moist, or cool/wet. Subalpine fir, Engelmann spruce and lodgepole pine plant associations are considered primary habitat. Grand fir types in the cool/moist and cool/wet biophysical environments provide habitat only in conjunction with primary types and are considered secondary habitat.

The grand fir/grouse huckleberry plant association, a cold/dry type, provides lynx habitat at the higher elevations, but frequently does not at the lower elevations, particularly on south and west slopes. Under these latter conditions, grand fir/grouse huckleberry sites are often warm/dry types shaped by low intensity/high frequency fire regimes. Historically, ponderosa pine, western larch and Douglas-fir dominated these sites and consequently, did not provide lynx habitat. In general, the grand fir/grouse huckleberry plant association provides habitat on north and east slopes above 5,000 feet and on south and west slopes above 5,650 feet.

Lynx Analysis Units

Lynx Analysis Units (LAUs) are areas delineated for management of habitat characteristics and implementation of Project Design Criteria (PDC's) necessary for the lynx to complete its life cycle. An LAU contains lands capable of producing the necessary lynx components: denning and foraging habitat. LAUs encompass both suitable lynx habitat and unsuitable areas. Habitat may or may not be currently in suitable conditions for denning or foraging habitat.

The Malheur National Forest developed LAU's using protocol in the Canada Lynx Conservation Assessment and Strategy (LCAS) (2000). Lynx habitat was classified based on lynx plant associations, elevation, structural stage and canopy closure. Concentrations of lynx habitat were then aggregated into LAU's based on LAU sizes recommended in the LCAS.

LAUs are not designed to represent the actual home range of a lynx. Rather, LAUs are intended to provide the fundamental or smallest scale which to begin evaluation and monitoring of the effects of management actions on lynx habitat. Conservation measures listed in the LCAS will generally apply only to lynx habitat on federal lands within LAU's.

Nine LAU's have been designated on the Malheur National Forest. The Galena Restoration Project Area is in the Southeast Galena Lynx Analysis Unit (see map). Twenty-nine percent (16,636 of the 58,352 acres) of this LAU is classified as lynx habitat. Habitat is concentrated in two areas. In the north, habitat is located in and around the Vinegar Hill-Indian Rock Scenic Area. In the south, habitat is located in and around the Dixie Butte Wildlife Emphasis Area. In the Southeast Galena Project Area, twenty-eight percent (13,688 of the 49,473 acres) of the project area is classified as lynx habitat.

Denning and Foraging Habitat

Stand structural stages, combined with tree canopy coverage, were used to help classify stands as denning, foraging or unsuitable habitat. Table 2 displays lynx habitat classification within the SE Galena LAU and the SE Galena Project Area. The Canada Lynx Conservation Assessment and Strategy (LCAS) (2000) recommends assessing effects at the LAU scale.

BE Table 12—(Table 2). Lynx habitat classification in SE Galena LAU and SE Galena Project Area —denning, foraging, unsuitable, and created unsuitable habitat by acres and percent of total lynx habitat.

Habitat Element	Exiting Condition			
	SE Galena LAU -		SE Galena Project Area	
	Acres	% Habitat	Acres	% Habitat
Denning	8,165	49%	6,608	48%
Forage	6,166	37%	5,739	42%
Unsuitable[1]	2,305	14%	1,341	10%
Created Unsuitable[2]	1,281[2]	8%[2]	639[2]	5%[2]
Total[3]	16,636[3]	100%[3]	13,688[3]	100%[3]

[1]*Unsuitable* = habitat made unsuitable by management activities, such as timber harvest, within the last *15* years *or* habitat made unsuitable by natural disturbances such as wildfire or wind throw regardless of when the disturbance occurred.

[2]*Created Unsuitable* = a subset of "unsuitable" and refers to lynx habitat made unsuitable by management activities within the last *10* years. The 1,281 acres of "created unsuitable" habitat displayed above are included in the 2,305 acres of "unsuitable" habitat as well.

[3]*Total acres* = denning + forage + unsuitable = 16,638 acres/13,688 acres. *Created unsuitable* acres are already included in *unsuitable* category and consequently, not double-counted.

In the LAU, denning habitat comprises 8,165 acres or 49% of total habitat. Denning habitat typically occurs in stands where mature trees and multiple canopy layers are present. The number of down logs tends to be higher in these stands than in younger stands. Insects, such as mountain pine, and diseases, such as root rot, often kill mature trees. Windstorms will occasionally blow down patches of trees. Many stands with past spruce budworm outbreaks contain areas with accumulations of down logs; however, most logs are smaller diameter and the accumulations do not occur at depths that would be likely to facilitate lynx denning. Down logs of the density to provide good denning habitat occur infrequently, but are believed to occupy at least 10% of the total denning habitat. During past field reconnaissance, areas of sufficient downed logs have been identified, but not recorded or mapped. Although some stands may lack the down wood necessary to provide a den, most other important structural characteristics are intact.

In the LAU, foraging habitat comprises 6,166 acres or 37% of total lynx habitat. Habitat exists for snowshoe hare as well as known and fairly dense populations of Douglas squirrel. Snowshoe hares are the primary prey of lynx. Douglas tree squirrels are considered a secondary prey species. Research suggests that when a lynx depends on tree squirrels as a primary food source, lynx reproduction rates may not be sustainable (Koehler 1990).

Because lodgepole pine regenerates in thick dense stands, it provides excellent snowshoe hare habitat when trees are young and needles continue to be within reach at normal snow depths. In

this LAU, normal snow depths are 2-4 feet at elevations above 5,000 feet. Stands that are likely to support a significant component of lodgepole pine at some point during succession were considered to be the best potential snowshoe hare habitat. The quality of forage habitat is unknown throughout most of the LAU.

Stands that are likely to best develop and sustain mature, multistoried characteristics were considered to be potential Douglas squirrel habitat. The quantity of forage for snowshoe hare is usually lower than in a stand classified solely as foraging habitat, and the quantity of forage for Douglas tree squirrels is higher than in a stand classified as foraging habitat. Many plant associations/structural satges can support both hares and squirrels.

Denning and foraging habitats are typically interspersed. Habitat has been fragmented by natural disturbances, such as wildfire and wind throw, as well as human-related disturbances, such as timber harvest.

Denning and Foraging Habitat by Structural Stage

Denning habitat typically occurs in stands classified as OFMS (Old Forest Multiple Strata), YFMS (Young Forest Multiple Strata), or UR (Understory Reinitiation).

Foraging habitat occurs in many, but not all, stands classified as OFMS (Old Forest Multiple Strata), YFMS (Young Forest Multiple Strata), UR (Understory Reinitiation), and SI (Stand Initiation) stands. OFMS and YFMS stands, which represent more mature stand conditions, are likely to be optimal squirrel habitat. OFMS, YFMS and UR stands having small openings dominated by thickets of dense young trees probably provide habitat for both squirrels and snowshoe hares. SI stands, i.e., early successsional stands, dominated by dense young trees, provide habitat for snowshoe hares if trees are about 8 feet or taller and provide winter forage. These younger stands often have high densities of lodgepole pine unless the stands have been precommercially thinned. Because snowshoe hares tend to occur more frequently in very dense lodgepole pine stands, thinning results in lower snowshoe hare density and a reduced prey base for lynx.

SECC (Stem Exclusion Closed Canopy), stands containing fairly dense pole-sized trees, provide some forage during the winter; however the forage is very limited. The quantity is much lower than in stands in the other structural stages because tree crowns frequently are too far above the ground for snowshoe hares to reach, and bole diameters are greater than those used by hares. Also, stand structure and cone production provide limited tree squirrel habitat.

OFSS (Old Forest Single Stratum) and SEOC (Stem Exclusion Open Canopy) stands are typically found on hot/dry and warm/dry sites. Low intensity/high frequency fires kept these stands relatively open and dominated by ponderosa pine, western larch and Douglas-fir. Consequently, these sites typically do not provide lynx habitat.

Unsuitable Habitat

Table 2 indicates that approximately 2,300 acres or 14% of total lynx habitat is currently classified as "unsuitable" as a result of vegetation management or natural disturbance. These stands currently do not have the necessary vegetation and/or down logs to support lynx for either denning or foraging. Specifically, "unsuitable" refers to habitat made unsuitable by management activities, such as timber harvest, within the last ***15*** years *or* habitat made unsuitable by natural disturbances such as a wildfire or windstorm regardless of when the disturbance occurred. Harvested stands greater than 15 years old generally have redeveloped into foraging habitat. "Created unsuitable" is a subset of "unsuitable" and refers to lynx habitat made unsuitable by management activities within the last ***10*** years. In the Southeast Galena LAU, approximately 1,300 acres or 8% of the habitat is classified as "created unsuitable."

LCAS standards permit the conversion of suitable lynx habitat to a nonsuitable condition, but limits the rate of conversion. If more than 30% of lynx habitat within an LAU is currently in unsuitable condition, vegetation management activities, which would further reduce suitable

conditions, is prohibited. Currently, 14% of lynx habitat in the LAU is in an unsuitable condition. In addition, management activities shall not change more than 15% of lynx habitat within a LAU to an unsuitable condition within a 10-year period. About 8% of lynx habitat has been converted to an unsuitable condition in the last 10 years.

Two large-scale fires, the Summit (29,809 acres) and Reed (2,310 acres) Fires, have burned in the LAU since 1970. Most of the Summit Fire occurred in the adjacent Northwest Galena LAU. These fires were predominantly high severity, stand replacement fires, destroying denning and foraging habitat in some areas. Many acres have been planted with conifers. Natural regeneration of lodgepole is high in some areas. Recent burns may stimulate woody browse production for use by snowshoe hares. Although many fire-killed trees were harvested, snag levels remain high. Snags will eventually fall, and may provide down wood for future lynx denning.

In July 1998, approximately 1,400 acres blew down in the Vincent and Vinegar Subwatersheds. Rarely was blowdown 100% on any one acre. Quality denning conditions probably exist where blowdown was more moderate and overstory canopies remain intact. Extreme blowdown occurred on only 245 acres, and even on these acres smaller trees and advanced regeneration remain intact and are providing forage. On the 245 acres, the windstorm converted lynx denning habitat to forage habitat due to the reduction in canopy cover. These acres are unlikely to redevelop into denning habitat in the short-term. The number of large trees on the ground would provide great opportunities for denning except that many of the concentrations are out in the open. Quality denning conditions probably only exist where log piles are located immediately adjacent to undamaged denning habitat at the periphery of the blowdown area. Log piles provide natal sites while adjacent canopy cover provides additional security.

Connectivity Habitat

Connectivity for lynx is being addressed via the Land and Resource Management Plan, Amendment 2 old growth corridors (LRMP2 corrdiors)) and Key Linkage Areas (KLAs) (see connectivity map in Appendix). Definitions follow:

LRMP Amendment 2 (LRMP2) Corridors –LRMP2 corridors are also referred to as old growth corridors or late and old structure (LOS) corridors. Cover vegetation is provided in a quantity and arrangement to provide old growth associated wildlife species sufficient habitat for free movement between distinct old growth areas, interaction of adults, and dispersal of young. LRMP standards require that LOS stands be connected by corridors where trees of medium or larger diameter are common and canopy closures are within the top 1/3 of site potential. Standards require that corridors be at least 400 feet wide. Management direction for LRMP2 corridors is included in the Malheur National Forest Plan, as amended (USDA 1990 and USDA 1995). Although the main purpose of LRMP2 corridors is to connect blocks of old growth, the corridors also inadvertently provide connectivity for lynx. In some instances, LRMP direction failed to create connectivity between blocks of lynx habitat, specifically, stands that do not classify as old growth. In these areas, additional connectivity corridors were added. Geographic features that lynx are known to use for travel including ridges, riparian areas, and saddles, are to a certain extent represented in the corridors, but were not specific targets. Corridors were designed primarily on structural stage characteristics, not geographic features. Therefore, geographic features conducive to lynx travel may be lacking in some portions of connective habitat.

Proposed Key Linkage Areas (KLA) – KLAs are intended to provide cover vegetation in a quantity and arrangement to provide large, wide-ranging carnivores, such as Canada lynx, California wolverine, and gray wolf, sufficient habitat for dispersal and movement across the landscape. Connected forests allow animals to easily move long distances in search of food, cover and mates. On the Malheur National Forest, proposed KLAs are approximately 3 miles wide. Within any perpendicular transect to the KLA, at least 1/3 (i.e., 1 mile) should provide movement and dispersal habitat any point in time. In the project area, a KLA is proposed along

the northern boundary. This KLA is intended to connect LAUs on the Malheur National Forest to LAUs on the Umatilla, Wallowa-Whitman and Ochoco National Forests. Although management direction for KLAs is included in the Canada Lynx Conservation Assessment and Strategy (LCAS) (Ruediger, et al. 2000), the LCAS does not provide specific direction on how to implement KLAs. The USFS Regional Office is currently developing a region-wide strategy for KLAs. On the Malheur National Forest, KLAs are only proposed at this time pending further direction.

Alternative 1 - No Action Alternative

Direct and Indirect Effects

Short-term (less than 10 years)

Under the No Action Alternative, there would be no management activities; therefore, there should be no direct or indirect effects to transient lynx or the lynx habitat.

Denning habitat, i.e., mature stands with significant amounts of down logs, would remain unchanged. In the Vincent/Vinegar blowdown area, large concentrations of down logs would remain where they fell. On the periphery of the blowdown area, where down log levels are moderate and overhead canopies remain intact, conditions are likely some of the best for lynx denning.

Forage habitat, i.e. early successional stands, exist on 6,166 acres within the LAU. Approximately 925 of the 6,166 acres are in plant associations where lodgepole pine is seral. These stands should provide the highest quality habitat for snowshoe hare, and consequently the highest quality foraging habitat for lynx as well. The remaining acres are in subalpine fir, Engelmann spruce and grand fir stands where lodgepole pine is not as major a stand component. These stand provide foraging habitat, but are considered of somewhat lesser quality. Small trees forage stands would continue to mature and lower branches on stems would begin to self-prune. Alternate forage habitat, i.e., habitat for Douglas tree squirrels, is more often associated with older, mature stands. Little change would occur in these stands because they change more slowly than young stands. Where the 1998 Vincent/Vinegar windstorm converted denning habitat to forage habitat (250 acres), the number of logs on the ground is probably limiting development of new regeneration. Development of foraging habitat into denning habitat would likely be delayed. This area in particular remains at high risk to wildlife due to the elevated fuels caused by the windstorm.

Approximately 2,300 acres of unsuitable habitat exists within the Southeast Galena LAU, 1,300 acres in the Southeast Galena Project Area. Most of these acres have either been planted and/or are naturally regenerating. By 2010, acres regenerated in the early- to mid-1990s would begin to redevelop into foraging habitat. Regenerating trees would just begin to reach sufficient height and density to begin providing forage at average snow depths. Few of these stands are expected to develop into suitable in the next 10 years.

Sufficient connectivity habitat is available for dispersal and movement of animals across the landscape.

Long-term (greater than 25 years)

Denning habitat is not expected to increase significantly. Endemic levels of insect and disease should continue to kill both large and small diameter trees. Eventually snags would fall, gradually contributing down logs for natal sites. Field observations indicate that many natural stands that have never been entered for timber harvest, do not support downed logs of sufficient diameter and density to provide quality natal sites. Endemic levels of insect and disease have rarely generated large piles of large diameter trees. Suitable concentrations of downed logs are probably best created by small blowdown events or elevated bark beetle infestations in lodgepole pine stands.

Stand classified as forage habitat in 2000 are expected to undergo reductions in suitability as dense stands age and begin to self-prune and lose green needles in the lower branches, taking forage out of reach of snowshoe hares. Habitat for Douglas tree squirrels should remain plentiful.

Approximately 2,300 acres of unsuitable habitat would likely develop into foraging habitat in the next 10 to 25 years. Essentially all acres considered potential for lynx habitat would be classified as lynx habitat.

In the absence of a major disturbance, stands will eventually transition from unsuitable to foraging habitat to denning habitat. The YFMS would most likely become denning habitat first, followed by UR and SECC, then SI. This can provide an even flow of habitat overtime, depending on future management. If all acres develop into denning habitat, the amount of foraging habitat would become the limiting factor in population viability. Denning habitat is currently comprises 49% of the lynx habitat in the LAU; this is in excess of the 10% standard in the LCAS. If anything, denning currently is in excess and foraging is low in the LAU.

Habitat would remain at high risk to stand replacement fire. Although stand replacement fires are considered within the Historic Range of Variation (HRV) for many of these sites, the uncharacteristically "*large size"* of recent wildfires, e.g. the Summit Fire at 30,000 acres, is considered outside HRV. Risk remains high that a large, uncharacteristically severe wildlife could destroy lynx habitat. The Vincent/Vinegar blowdown area remains at particularly high risk; and this area likely supports some of the best denning habitat in the project area. In the Dry Forest types, much of the travel or connectivity habitat remains susceptible to stand replacement fire as well. Loss of travel habitat could isolate animals or populations at the landscape level.

Road density would remain as currently exists (Table 3). See Alternative 1 – No Action.

BE Table 13—(Table 3). Open, closed, decommissioned and total miles of roads, and open and total road density by alternative.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Open Road Miles	169.46	128.46	128.46	126.46	201.46
Closed Road Miles	175.54	168.54	167.54	153.54	104.54
Total Road Miles	345.00	297.00	296.00	280.00	306.10
Open Road Density	1.80	1.37	1.36	1.34	2.14
Total Road Density	3.66	3.15	3.14	2.97	3.25
Constructed Roads	0.00	18.00	17.00	2.0	22.00
Decommissioned Roads1	0.00	67.00	67.00	67.00	62.00
Decommissioned roads are not included in total road mileage and road density values. These roads are removed from the District's transportation system. Road entrances are obscured, culverts are removed, and the roadbeds are either re-contoured or re-shaped to the lie of the land or allowed to revegetate on their own.					

Cumulative Effects
None are identified

Determination of Effects

This alternative will *not effect (NE)* lynx or their habitat.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Timber harvest

Alternative 2 does not treat lynx denning or foraging habitat with the exception of the Vincent/Vinegar blowdown area.

In the blowdown area, salvage harvest (HSV) would occur on 245 acres classified as lynx foraging habitat. The objective is to reduce elevated fuel loads. Proposed salvage units would be #'s 350, 352. 354. 356, 358 and 360. All of the units are in primary habitat except unit 354, which is in secondary habitat. The majority of the overstory trees were blown down in these areas. Sufficient understory trees and advance regeneration survived for these stands to still classify as foraging habitat. Following treatment, habitat percentages would remain as displayed in Table 2.

Salvage harvest would be limited to downed trees. Live, commercial sized trees still standing would not be removed, unless considered a safety hazard during logging operations. Trees would be removed by helicopter. Following harvest, slash would be hand piled and burned. Non-commercial size trees, i.e., trees less than 7" dbh, would be retained to maintain foraging habitat and security cover. Areas below recommended trees stocking levels would be planted.

Ten percent of the acres to be treated (25+ acres) would be retained in untreated patches of 2 to 5 acres to provide denning opportunities for Canada lynx. A District biologist would locate those patches which would best meet the needs of lynx, i.e., concentrations of blowdown located over a variety of topographical features including ridges, saddles and riparian areas and where patches of vegetation cover may still be available. This design feature meets direction in the Canada Lynx Conservation Assessment and Strategy (2000) and the Forest's Project Design Criteria (PDC) (2001).

Salvage operations would have negative effects on lynx in the short-term by removing downed logs that could be used for security and in some places for denning. Where blowdown is heavier, small openings could be created, but the units as a whole are expected to remain forage habitat. Openings would be planted.

Salvage operations would benefit lynx in the long-term. Removal of downed material would open up areas and expose mineral soil for planting and natural regeneration. Quality forage habitat would likely be restored more rapidly over more acres than if left untreated. Lodgepole regeneration is already high in some locations. Salvage of blowdown would reduce high fuel accumulations, and consequently reduce the risk of severe wildfires. Fire risk would be reduced within the units as well as in adjacent denning and foraging habitat.

In denning habitat, blowdown would be partially removed from 72 acres located within Riparian Habitat Conservation Areas (RHCAs). Blow down levels are lower here than in the salvage units discussed previously. Much of the mature overstory and complex stand structure remains intact. Blowdown would only be removed from the outer ½ of the RHCAs, and only 50% to 80% of the blowdown would be removed. Trees would be removed by helicopter and decked. As with the salvage units, concentrations of blow down would be left in patches 2 to 5 acres in size to maintain denning opportunities. Patches would be retained over at least 20% of the acres as compared to 10% in the salvage units. These stands would still be classified as denning habitat following treatment. Habitat percentages in Table 2 would remain the same. Risks of wildfire would be reduced.

Because only 317 acres of 16,636 acres of habitat would be treated; overall effects to habitat would be as described in Alternative 1 - No Action.

Prescribed burning

No prescribed burning would be conducted with lynx denning or foraging habitat. No effects to lynx would occur. Treatment of slash in salvage units would be as described in the timber harvest section above.

Connectivity habitat

Tables 4 and 5 display proposed harvest acres within LRMP2 corridors and KLAs by alternative.

BE Table 14—(Table 4) Treatment in LRMP2 corridors by Alternative.

Total LRMP2 acres = 7,333 ac.	Alt 1	Alt. 2	Alt. 3	Alt. 4	Alt.5
LRMP2 acres treated	0	171	0	38	220
% of LRMP2 corridors treated by harvest	0%	2%	0%	1%	3%
LRMP2 acres treated with modified prescription (HTH1/SPC1)	0	171	0	38	220
% of LRMP2 treated acres with modified prescription	---	100%	---	100%	100%1
1Prescription requires canopy closure remain within the top1/3 of site potential, but does not require stocking at 180 trees per acre.					

BE Table 15—(Table 5)—Treatment in KLAs by Alternative. Percentage of KLA which meets 1/3rd canopy rule and 180 tpa stocking.

Total KLA acres = 18,369 ac.	Alt 1	Alt. 2	Alt. 3	Alt. 4	Alt.5
KLA acres treated	0	2,833	2,619	847	3,619
% of LRMP2 corridors treated by harvest	0%	15%	14%	5%	20%
KLA acres treated with modified prescription	0	1,122	1,013	511	0
% of KLA treated acres with modified prescription	0%	40%	39%	60%	0%
% of KLA which meets 1/3rd canopy rule and 180 tpa	75.3%	66.2%	66.5%	73.5%	55.6%

Alternative 2 would harvest timber on 171 acres or 2% of the LRMP2 corridors. A modified commercial thinning (HTH1) would reduce stocking, increase growth rates on the residual trees, and accelerate development of old forest structure, while maintaining connectivity. Thinning prescriptions would maintain the minimum standards required for movement and dispersal. Canopy closure would be maintained in the top 1/3 of site potential; and a minimum of 180 trees per acre would be left on site. Whereas a standard thinning prescription might leave about 60 square feet of basal area, this prescription would retain approximately 80 square feet. LRMP standards require that canopy closure meet the top 1/3 of site potential, but does not specify minimum tree density. Koehler (1990) reports that lynx may not use stands that are thinned below 180 trees per acre for movement and dispersal. Tops of trees would be yarded. Where understory stocking is high, a modified precommercial thinning (SPC1) would also be used to reduce stocking. Clumps of small trees would be retained to provide connectivity and horizontal as well as vertical diversity. Treatment units are 47,48, 49, 64, 600, 602, 603, 606 and 608. In

units 64 and 606, slash would be hand piled and burned. Several travel corridors are being maintained in riparian areas. Timber harvest is being excluded within 100 feet of intermittent streams, 150 feet of perennial fish bearing, and 300 feet of major fish bearing streams. These riparian corridors would be widened to at least 400 feet to meet LRMP standards.

Harvest and slash disposal would reduce tree density, and down wood that could have provided cover for lynx for a short time would be burned. Although this reduces the potential for lynx hiding cover, this is consistent with the LCAS because the stand would be managed within the HRV for these Forest types. Harvest on 171 acres would have negligible effects on the overall corridor system. These corridors would remain conducive to lynx travel (Koehler 1990).

In the proposed KLA, alternatives 2 would treat 2,833 acres. Tree stocking and canopy closure would be reduced in all treatment units, likely reducing the quality of some habitats for wildlife movement and dispersal. Densities would be reduced to levels that maximize tree growth and reduce bark beetle risk. Harvest prescriptions would be modified on 1,122 acres or 40% of the acres treated to retain canopy closures in the top 1/3 of site potential and tree stocking at 180 trees per acre or greater. Within the KLA, minimum cover standards would be met on 66% of the acres, well above the 33% level desired to ensure at least a 1-mile swath of the 3-mile wide corridor maintains sufficient cover for travel. Harvest would reduce stand densities, but still maintain connectivity.

Prescribed burning would be conducted within connectivity habitat, including LRMP2 corridors and KLAs. Underburning would be used to reduce fine fuels. Burning could kill smaller trees or prune back branches that are near the ground, which could reduce hiding cover within corridors. Burning prescriptions would be designed to maintain canopy closure within the top 1/3 of site potential and stocking at a minimum of 180 trees per acre. Where these standards cannot be met, burning would be forgone. Several LRMP2 corridors are within RHCAs; fires would not be ignited within RHCAs, but would be allowed to creep in from the outer edges. Most of the area proposed for burning is in Dry Forest types with a history of high frequency/low intensity fires. Burning would begin to restore the natural fire regime, but it would reduce the quality of habitat in the corridor for at least few years. In the future, additional maintenance prescribed burning may occur in the project area and surrounding areas. This activity should remove accumulations of natural fuels from the uplands, remove decadent vegetation, stimulate regeneration of fire dependent plants, and maintain the area so natural fire cycles can be reestablished that create and retain mosaic habitat conditions.

New roads would be constructed across connectivity corridors at four locations. Three of the four new roads would remain open following harvest; one road would be closed. Two of the roads would be constructed as close to right angles to the corridors as possible to minimize effects. The other two roads would be constructed to relocate roads outside of RHCAs; these two roads would be *aligned* with the corridors, increasing potential effects. These two roads would remain open. This will adversely affect the quality of the affected corridors. About 22 miles of road would be decommissioned or relocated outside RHCAs, improving corridors for travel.

Management activities would reduce the risk that uncharacteristically severe disturbance events could reduce or alter connectivity habitat and isolate populations.

Hardwood Restoration

Although considered suitable as lynx habitat, most hardwood stands in the LAU are not mapped as lynx habitat because they are very small, usually less than a couple acres. Twenty-five decadent aspen stands on 28 acres have been identified. Healthy, reproducing aspen stands can provide quality habitat for snowshoe hare. Most of the aspen stands in the project area are at elevations below 5000 feet. The 5000 foot elevation band is used as the minimum elevation to classify stands as denning or forage habitat. However, aspen stands are located in riparian areas,

many of which serve as travel corridors between lynx habitat on the north side and south sides of the project area.

Hardwood rehabilitation will increase the amount of aspen by protecting sprouts from browsing. All action alternatives would remove encroaching conifers from around aspen. Aspen stands would then be fenced, often by buck and pole fences, to reduce browsing and facilitate regeneration, ensuring the long-term survival of these stands. Snowshoe hare and lynx will still have access to these aspen stands. Lodgepole pines may be removed or girdled. Cutting lodgepole pine would reduce the amount of forage for snowshoe hare temporarily until new aspen suckers begin to grow which will take about two growing season. However, it will be about 5 years before aspen suckers provide much forage. Cutting conifers is consistent with the LCAS because the LCAS standards state, "apply harvest prescriptions that favor regeneration of aspen." (Ruediger et al., 2000, p. 79). Because aspen grows so quickly, it has the potential to replace the forage removed by cutting conifers in just a few years. Snowshoe hare habitat would be incrementally improved by aspen restoration.
Hardwood trees and shrubs would be planted along 21 miles of streams; seedlings would be fenced to protect them from browsing. An additional 4 miles of existing shrubs would also be fenced. Hardwood restoration would likely benefit lynx.

Road Densities

Roads through lynx habitat increases human access and may increase human-lynx encounters. High road densities lead to increased potential for poaching, road kill, and incidental mortality of lynx (Witmer et al. 1998). Road density would be reduced in all subwatersheds. Total road miles would be reduced by decommissioning 67 miles (see Table 3). Road entrances would be obscured, culverts removed, and the roadbeds would either be re-contoured or re-shaped to the lie of the land or allowed to re-vegetate on their own. Open road density would be reduced from 1.8 miles per square mile to 1.4 miles per square mile. Closing roads would reduce the risk of incidental lynx mortality if transient lynx were to pass through the area in the future. Closed roads have the potential to be used periodically, or the road could be opened again if another project is implemented in the area (currently none are envisioned). Therefore, closed roads probably will remain as created openings indefinitely.

As an action connected to the timber sale, 18 miles of roads would be constructed of which .06 miles miles would be through lynx foraging habitat. New roads would be closed after the sale, but would remain on the transportation system.
Winter harvest could occur with this project. Roads could be plowed which would allow other carnivores to have access to elevation above 5,000 feet, areas where deep snows, greater than 2 feet during the winter, usually exclude them. This could increase competition for food, which could adversely affect lynx. Because the duration of the project is relatively short, usually 3-5 years, this is consistent with the LCAS. There will be no net increase in permanently plowed roads nor an increase in winter sports activities from this project.

Trail Construction

Approximately 38 miles of designated hiking/biking/all-terrain vehicle trail are within the LAU (Table 6). Portions of these trails are located within or adjacent to denning or foraging habitat. The Davis Creek Trail is the only trail designated for use by all-terrain vehicles. Alternative 2 proposes several changes to the area's trail system.

BE Table 16—(Table 6) - Bike/Hiking/ATV trails within the Southeast Galena LAU.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Blackeye Trail	3.46	3.26	3.26	3.26	3.26
Davis Creek	9.16	8.66	8.66	8.66	14.26
Princess/Vincent	20.85	20.85	20.85	20.85	20.85
Sunrise Butte	0.89	.89	.89	.89	.89
Tempest Mine	3.38	4.68	4.68	4.68	4.68
TOTAL	37.74	38.34	38.34	38.34	43.94

The Blackeye and Tempest Trails would be modified to reduce resource concerns and create a new loop trail opportunity. On the Blackeye Trail system, an existing trailhead and about 0.7 miles of trail would be decommissioned. This section of trail is located in lynx denning habitat. A new trailhead and about 0.5 miles of new trail would be constructed to provide a new tie in to the trail system. This new section of trail would parallel Forest Road 2010, the major access road into the Vinegar Hill-Indian Rock Scenic Area. New construction would be within lynx denning habitat.

Approximately 1.3 miles of new trail would be added to the Tempest Trail, with about 0.7 miles through lynx foraging habitat. This new section of trail would follow an existing jeep trail, so construction would be minimal. Recreation use would not be expected to change significantly as a result of these modifications. Effects to lynx would be minimal.

The Davis Creek Trail would be modified to reduce hydrology and fishery resource impacts. Approximately 1.0 mile of trail would be decommissioned; and replaced with 0.5 miles of new trail to reduce hydrology and fisheries concerns. These activities are outside lynx habitat. About 8.3 miles would be reconstructed. Reconstruction would not change the existing use of this trail, but it would be widened to reduce safety and resource concerns related to ATV use. Approximately 0.4 miles of this trail pass through lynx habitat. Because the trail already provides motorized access, no effects to lynx would be anticipated.

No changes would be made to the snow mobile trail system.

Pesticide and Herbicide Use

Tables 7 and 8 display animal damage control and competing vegetation control by alternatives. In additional, 1.4 acres of noxious weeds would be treated by herbicide. Non-chemical treatments would not be a concern to lynx. This section discloses the effects of chemical use.

BE Table 17—(Table 7) –displays acres of animal control treatments by alternative.

Treatment	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Strychnine Baiting	0	1,439	0	0	2,298
Trapping	0	0	1,197	0	0
Aluminum Phosphide Fumigation	0	250	0	0	300
Total Pocket Gopher Treatment	0	1689	1,179	0	2,598

BE Table 18—(Table 8) –displays acres of competing vegetation control by alternative.

Treatment	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
No Treatment	0	844	508	0	1,259
Subsoiling	0	193	193	0	266
Large Scalps or Mulch Mats	0	897	741	0	1,318
Herbicides	0	897	0	0	1,318

Strychnine baiting - There would be no risk of primary poisoning. Canada lynx do not consume grains or seeds as part of their diets. There would be little to no risk of secondary poisoning. The potential for exposure to bait or poisoned animals is low. The bait would be applied below ground. Applicators would adhere to strict handling and storage procedures. Poisoned gophers typically die below ground. Although lynx may feed on pocket gophers, gophers are unlikely to be a significant component of a lynx's diet. Strychnine would be prohibited within ½ mile of Canada lynx denning habitat, and at distances in excess of ½ mile, where lynx plant associations are continuous between denning habitat and a reforestation unit. If one applies the lowest lethal dose for mammals of .33 mg/kg, a 6.7 kg lynx would have to consume <2 to 20 poisoned gophers in a short period of time to be killed. No effects to lynx would be expected.

Aluminum phosphide fumigation - Because the effects of fumigation are limited to those animals which actually inhabit the underground burrows, no direct effects to gray wolves would occur. The potential for secondary toxicity would be highly unlikely. Phosphine does not accumulate in animal tissue. Due to the mode of action - phosphine reacting within the respiratory system - and the extremely short half-life in target animals following death, residue levels present in animals directly killed by phosphine gas are not high enough to produce the same effect in a predator or scavenger.

Herbicide Applications –The US Forest Service contracted Syracuse Environmental Research Associates Inc. and the Syracuse Research Corporation to compile relevant studies on registered pesticides and to evaluate ecological risks (SERA, 1995, 1996 and 1997). Studies generally indicate that glypohosate, and hexazinine are characterized by relatively low toxicity to mammalian and avian species. These herbicides do not bioaccumulate in tissues of exposed animals, but rather are rapidly excreted in urine or feces (USDA 1992 and 1997). No effects to lynx or their prey would be expected.

See the Southeast Galena Restoration Project Wildlife Report for additional discussion on chemical effects.

Disturbance

Timber harvest, post-harvest activities, and associated activities, such as road construction and reconstruction, precommercial thinning, and underburning, have the potential to disturb lynx that potentially could be in the project area when activities are in progress. This could cause a change in movement patterns while projects are ongoing. Activities could continue for up to 10 years after initiation, but not all activities would occur at the same time. Timber harvest and associated activities, such as road construction and reconstruction, are likely to occur first. These would be followed by post-harvest activities of damaged and diseased tree removal, precommercial thinning, fuels treatment, and prescribed underburning. Management activities would be prohibited within ¼ mile of lynx denning habitat from May 1 to August 30 to prevent disturbances to lynx raising their young.

Cumulative Effects

The Canada Lynx Conservation Assessment and Strategy (2000) recommends analyzing lynx habitat at the LAU scale. Projects similar to those proposed in this project are being conducted or planned elsewhere within the LAU, and include timber harvest, road construction, prescribed burning, precommercial thinning, and hardwood planting and protection. Most of the activities have already been completed. Projects are listed in the Cumulative Effects Table located in Appendix C of the Southeast Galena Restoration Project EIS. Potential cumulative effects have been considered, and pose no additional threats to lynx or its habitat. The Middle Fork and Northwest Galena LAUs lie to the east and west of the Southeast Galena LAU. Separate lynx assessments are being made for projects that are ongoing or proposed within these LAUs. Projects are listed in the Cumulative Effects Table located in Appendix C of the Southeast Galena Resotoration Project EIS. The cumulative total of treatments in all areas has the potential to alter suitable lynx forage and denning habitat. However, without a large-scale habitat assessment determining the status of lynx habitat components, the effects of cumulative actions are unknown.

Determination of Effects – Alternative 2

This project meets the standards and guidelines in the LCAS. Based on the information provided in this assessment, I conclude that actions proposed under the action alternative may affect individuals, but are not likely to adversely affect the continued existence of the Canada lynx. Thresholds for creation of unsuitable habitat are not exceeded. Although salvage of blowdown in denning and foraging habitat would reduce security cover, and denning and foraging opportunities, treatment intensity would not be sufficient to change habitat classification to unsuitable. Concentrations of blowdown would be retained on site on at least10% of the acres, as recommended by the LCAS. Salvage operations would benefit lynx in the long-term. Removal of downed material would open up areas and expose mineral soil for planting and natural regeneration. Quality forage habitat would likely be restored more rapidly over more acres than if left untreated. Salvage of blowdown would reduce high fuel accumulations, and consequently reduce the risk of severe wildfires. Fire risk would be reduced within the units as well as in adjacent denning and foraging habitat.

Harvest, thinning, and burning in LRMP2 corridor and KLAs would affect the lynx habitat by reducing the quality, less horizontal and vertical structure to hide a lynx, of connectivity habitat; however, standards for cover would be met. New road construction though corridors and habitat could degrade use locally, but would be offset by an overall reduction in open road density. The changes to the connectivity corridors would reduce their effectiveness, but would not preclude their use by lynx. Disturbance for proposed activities could affect a lynx's movement and foraging patterns, but other options would remain allowing foraging and movement through the area.

Alternative 3

Direct and Indirect Effects

Timber harvest

Timber harvest would be similar to Alternative 2. Blowdown would be removed by helicopter on 317 acres; on 245 acres in foraging habitat and 72 acres in denning habitat. Salvage operations would have negative effects on lynx in the short-term by removing downed logs that could be used for security and in some places for denning. Removal of blowdown would not modifiy habitat classification in these areas; acres would not be converted to unsuitable.

Salvage operations would benefit lynx in the long-term. Removal of downed material would open up areas and expose mineral soil for planting and natural regeneration. Quality forage habitat would likely be restored more rapidly over more acres than if left untreated. Salvage of blowdown would reduce high fuel accumulations, and consequently reduce the risk of severe

wildfires. Fire risk would be reduced within the units as well as in adjacent denning and foraging habitat.

Prescribed burning

No prescribed burning would be conducted with lynx denning or foraging habitat. No effects to lynx would occur. Treatment of slash in salvage units would be as described in the timber harvest section above.

Connectivity habitat

Tables 4 and 5 display proposed harvest acres within LRMP2 corridors and KLAs by alternative. Alternative 3 does not propose harvest activities within LRMP2 corridors. Harvest is proposed within the KLA; effects are similar to Alternative 2 except that fewer acres are treated. Following harvest activities and prescribed burning, 66% of the KLA would meet cover and density standards, well above the 33% level desired to ensure at least a 1-mile swath of the 3-mile KLA maintains sufficient cover for travel. Management activities would reduce the risk that uncharacteristically severe disturbance events could reduce or alter connectivity habitat and isolate populations.

New roads would be constructed across connectivity corridors at four locations. Three of the four new roads would remain open following harvest; one road would be closed. Two of the roads would be constructed as close to right angles to the corridors as possible to minimize effects. The other two roads would be constructed to relocate roads outside of RHCAs; these two roads would be *aligned* with the corridors, increasing potential effects. These two roads would remain open. This will adversely affect the quality of the affected corridors. About 22 miles of road would be decommissioned or relocated outside RHCAs, improving corridors for travel.

Hardwood Restoration

Effects of hardwood restoration would be as described for Alternative 2.

Road Densities

Changes in the road system would be similar to Alternative 2. Total road miles would be reduced by decommissioning 67 miles (see Table 3). Open road density would be reduced from 1.8 miles per square mile to 1.4 miles per square mile. Closing roads would reduce the risk of incidental lynx mortality if transient lynx were to pass through the area in the future. As an action connected to the timber sale, 17 miles of roads would be constructed of which 0.6 miles would be through lynx foraging habitat. New roads would be closed after the sale, but remain on the transportation system. Winter harvest could occur with this project. Roads could be plowed. Because the duration of the project is relatively short, usually 3-5 years, this is consistent with the LCAS. There will be no net increase in permanently plowed roads nor an increase in winter sports activities from this project.

Trail Construction

Proposed activities and effects would be as described for Alternative 2.

Pesticide and Herbicide Use

No pesticides or herbicides would be use to control competing vegetation, noxious weeds or pocket gophers (see Tables 7 and 8). No adverse effects to lynx would be expected.

Disturbance

Management activities would be prohibited within ¼ mile of lynx denning habitat from May 1 to August 30 to prevent disturbances to lynx raising their young. Effects would be as described for Alternative 2.

Determination of Effects – Alternative 3

This project meets the standards and guidelines in the LCAS. Based on the information provided in this assessment, I conclude that actions proposed under the action alternative may affect

individuals, but are not likely to adversely affect the continued existence of the Canada lynx. Effects would be similar to Alternative 2. Slightly less acres would be treated. No harvest activities would be conducted in LRMP2 corridors, so effects to connectivity would be reduced. No pesticides or herbicides would be used. See Determination of Effects for Alternative 2 for detailed rationale for determination.

Cumulative Effects

Cumulative effects would be similar to those described in Alternative 2.

Alternative 4

Direct and Indirect Effects

Timber harvest

No harvest would be conducted with lynx denning or foraging habitat. No blowdown would be removed in the Vincent and Vinegar Subwatersheds. Logs would remain on the ground providing security habitat for lynx and their prey. Quality denning conditions probably exist along the periphery of the blowdown area where concentrations of downed logs are found in proximity of vegetation with high canopy closure. High concentrations of blowdown

Prescribed burning

No prescribed burning would be conducted with lynx denning or foraging habitat. No effects to lynx would occur. Treatment of slash in salvage units would be as described in the timber harvest section above.

Connectivity habitat

Tables 4 and 5 display proposed harvest acres within LRMP2 corridors and KLAs by alternative. Alternative 4 would precommercial thin 38 acres or 1% of the LRMP2 corridors. A modified precommercial thin (SPC1) would reduce tree stocking, bark beetle risk, and fuel loads. Thinning prescriptions would maintain the minimum standards required for movement and dispersal. The treatment units are #'s 602 and 603. Harvest is proposed within the KLA; effects are similar to Alternative 2 except that fewer acres are treated. Following harvest activities and prescribed burning, 74% of the KLA would meet cover and density standards, well above the 33% level desired to ensure at least a 1-mile swath of the 3-mile KLA maintains sufficient cover for travel. Management activities would reduce the risk that uncharacteristically severe disturbance events could reduce or alter connectivity habitat and isolate populations.

New roads would be constructed across connectivity corridors at two locations. These roads would relocate roads outside of RHCAs. Both roads would remain open following harvest. The two roads would not be constructed at right angles to the corridor; rather, they would be *aligned* with the corridors, increasing potential effects. This will adversely affect the quality of the affected corridors. About 22 miles of road would be decommissioned or relocated outside RHCAs, improving riparian corridors for travel.

Hardwood Restoration

Effects of hardwood restoration would be as described for Alternative 2.

Road Densities

Changes in the road system would be similar to Alternative 2. Total road miles would be reduced by decommissioning 67 miles (see Table 3). Open road density would be reduced from 1.8 miles per square mile to 1.3 miles per square mile. Closing roads would reduce the risk of incidental lynx mortality if transient lynx were to pass through the area in the future. About 2 miles of roads would be constructed to relocate existing roads outside of RHCAs. New roads would be closed after the sale, but would remain on the transportation system. Winter harvest could occur with this project. Roads could be plowed. Because the duration of the project is relatively short,

usually 3-5 years, this is consistent with the LCAS. There will be no net increase in permanently plowed roads nor an increase in winter sports activities from this project.

Trail Construction

Proposed activities and effects would be as described for Alternative 2, except that the status of the Davis Creek Trail would be changed from motorized to non-motorized. Reconstruction would not be required along 8.3 miles of trail. Approximately 0.4 miles of trail passes through lynx habitat; the potential for disturbance would be reduced.

Pesticide and Herbicide Use

No pesticides or herbicides would be use to control competing vegetation, noxious weeds or pocket gophers (see Tables 7 and 8). No adverse effects to lynx would be expected.

Disturbance

Management activities would be prohibited within ¼ mile of lynx denning habitat from May 1 to August 30 to prevent disturbances to lynx raising their young. Effects would be as described for Alternative 2.

Cumulative Effects

Cumulative effects would be similar to those described in Alternative 2.

Determination of Effects – Alternative 4

This project meets the standards and guidelines in the LCAS. Based on the information provided in this assessment, I conclude that actions proposed under the action alternative may affect individuals, but are not likely to adversely affect the continued existence of the Canada lynx. Harvest would not occur in denning or foraging habitat. Treatment would be reduced in travel habitat as compared to Alternatives 2. In the KLA, effects would be considerably reduced from Alternative 2. In the LRMP2 corridors, effects from harvest activities would be negligible. Reduced open road densities would reduce opportunities for human-lynx interactions. No pesticides or herbicides would be used.

Alternative 5

Direct and Indirect Effects

Timber harvest

Timber harvest would similar to Alternative 2. Blowdown would be removed by helicopter on 317 acres; on 245 acres in foraging habitat and 72 acres in denning habitat. Salvage operations would have negative effects on lynx in the short-term by removing downed logs that could be used for security and in some places for denning. Removal of blowdown would not modifiy habitat classification in these areas; acres would not be converted to unsuitable.

Salvage operations would benefit lynx in the long-term. Removal of downed material would open up areas and expose mineral soil for planting and natural regeneration. Quality forage habitat would likely be restored more rapidly over more acres than if left untreated. Salvage of blowdown would reduce high fuel accumulations, and consequently reduce the risk of severe wildfires. Fire risk would be reduced within the units as well as in adjacent denning and foraging habitat.

Prescribed burning

No prescribed burning would be conducted with lynx denning or foraging habitat. No effects to lynx would occur. Treatment of slash in salvage units would be as described in the timber harvest section above.

Connectivity habitat

Tables 4 and 5 display proposed harvest acres within LRMP2 corridors and KLAs by alternative. Alternative 5 would harvest timber on 220 acres or 3% of the LRMP2 corridors. A modified

commercial thinning (HTH1) would reduce stocking, increase growth rates on the residual trees, and accelerate development of old forest structure, while maintaining connectivity. Thinning prescriptions would maintain the minimum standards in the LRMP required for movement and dispersal. Canopy closure would be maintained in the top 1/3 of site potential. Unlike Alternative 2, tree densities could be reduced below 180 trees per acres as long as the canopy closure standard is met. LRMP standards require that canopy closure meet the top 1/3 of site potential, but does not specify minimum tree density. Koehler (1990) reports that lynx may not use stands that are thinned below 180 trees per acre for movement and dispersal. Consequently, alternative 5 could create breaks in the corridors that lynx may not cross. Tops of trees would be yarded. Where understory stocking is high, precommercial thinning (SPC1) would also be used to reduce stocking. Clumps of small trees would be retained to provide connectivity and horizontal as well as vertical diversity. Treatment units are 43, 47,48, 49, 64, 600, 602, 603, 606 and 608. In units 64 and 606, slash would be hand piled and burned. Several travel corridors are being maintained in riparian areas.

Harvest and slash disposal would reduce tree density, and down wood that could have provided cover for lynx for a short time would be burned. Although this reduces the potential for lynx hiding cover, this is consistent with the LCAS because the stand would be managed within the HRV for these Forest types. Harvest on 220 acres would have negligible effects on the overall corridor system. These corridors would remain conducive to lynx travel (Koehler 1990).

In the proposed KLA, Alternatives 5 would treat 3,619 acres. Tree stocking and canopy closure would be reduced in all treatment units, likely reducing the quality of some habitats for wildlife movement and dispersal. Most stands are in Dry Forest types; priority would be given to restoring HRV. Densities would be reduced to levels that maximize tree growth and reduce bark beetle risk. Canopy closures in harvest units may fall below the top 1/3 of site potential. Tree stocking could fall below 180 trees oper acre with understory densities being reduced the most. Following treatment, approximately 56% of the KLA would have stands that are in the top 1/3 of potential canopy closure, a reduction of 20% from the existing condition. Management activities would reduce the risk that uncharacteristically severe disturbance events could reduce or alter connectivity habitat and isolate populations.

New roads would be constructed across connectivity corridors at four locations. Three of the six new roads would remain open following harvest; three roads would be closed. Four of the roads would be constructed as close to right angles to the corridors as possible to minimize effects. The other two roads would be constructed to relocate roads outside of RHCAs; these two roads would be *aligned* with the corridors, increasing potential effects. These two roads would remain open. This will adversely affect the quality of the affected corridors. About 22 miles of road would be decommissioned or relocated outside RHCAs, improving corridors for travel.

Hardwood Restoration

Effects of hardwood restoration would be as described for Alternative 2.

Road Densities

Changes in the road system would be similar to Alternative 2. Although 67 miles of road would be decommissioned (see Table 3), additional roads would be constructed and many left open. Open road density would increase from 1.8 miles per square mile to 2.14 miles per square mile. This alternative was designed to address public concern for reduced access. Increasing road densities could increase the risk of incidental lynx mortality if transient lynx were to pass through the area in the future. Open road densities are higher in the lower elevations than in the upper elevations where lynx habitat is located. As an action connected to the timber sale, 18 miles of roads would be constructed of which 0.14 miles would be through lynx foraging habitat. New roads would be closed after the sale, but remain on the transportation system. Winter harvest could occur with this project. Roads could be plowed. Because the duration of the project is

relatively short, usually 3-5 years, this is consistent with the LCAS. There will be no net increase in permanently plowed roads nor an increase in winter sports activities from this project.

Trail Construction

Proposed activities and effects would be as described for Alternative 2. In addition, 7.9 miles of trail would be added to create a loop trail system. The new trail would use a combination of existing roads and new road proposed under this project. The new trail would not be designated within lynx habitat. Motorized use of the trail would be expected to remain at current use levels.

Pesticide and Herbicide Use

Affects would be as described for alternative 2, except that additional acres would receive chemical treatments (see Tables 7 and 8). No effects would be anticipated.

Disturbance

Management activities would be prohibited within ¼ mile of lynx denning habitat from May 1 to August 30 to prevent disturbances to lynx raising their young. Effects would be as described for Alternative 2.

Cumulative Effects

Cumulative Effects would be similar to those described in Alternative 2.

Determination of Effects – Alternative 5

This project meets the standards and guidelines in the LCAS. Based on the information provided in this assessment, I conclude that actions proposed under the action alternative may affect individuals, but are not likely to adversely affect the continued existence of the Canada lynx. Thresholds for creation of unsuitable habitat are not exceeded. Although salvage of blowdown in denning and foraging habitat would reduce security cover, and denning and foraging opportunities, treatment intensity would not be sufficient to change habitat classification to unsuitable. Concentrations of blowdown would be retained on site on at least10% of the acres, as recommended by the LCAS. Salvage operations would benefit lynx in the long-term. Removal of downed material would open up areas and expose mineral soil for planting and natural regeneration. Quality forage habitat would likely be restored more rapidly over more acres than if left untreated. Salvage of blowdown would reduce high fuel accumulations, and consequently reduce the risk of severe wildfires. Fire risk would be reduced within the units as well as in adjacent denning and foraging habitat.

Harvest, thinning, and burning in LRMP2 corridor and KLAs would affect the lynx habitat by reducing the quality, less horizontal and vertical structure to hide a lynx, of connectivity habitat; however, standards for cover would be met. New road construction though corridors and habitat could degrade use locally, but would be offset by an overall reduction in open road density. The changes to the connectivity corridors would reduce their effectiveness, but would not preclude their use by lynx. Increasing road densities could increase the risk of incidental lynx mortality if transient lynx were to pass through the area in the future. Open road densities are higher in the lower elevations than in the upper elevations where lynx habitat is located. Disturbance for proposed activities could affect a lynx's movement and foraging patterns, but other options would remain allowing foraging and movement through the area.

IV. POTENTIAL EFFECTS OF THE PROPOSED ACTION AND ALTERNATIVES ON SENSITIVE SPECIES

American Peregrine Falcon (*Falco peregrinus*)

Status: Federal – Species of Concern
State - Threatened
Region 6 - Sensitive

Biology and Ecology

Peregrine falcons prefer a variety of open habitats near nesting cliffs or mountains (Snyder 1991). They usually inhabit areas near water, such as lakes, rivers, or oceans. Nest sites are often used for several years. They tend to choose overhanging cliffs with loose soil, sand, dead vegetation, or gravel, in which they can scrape a depression for their eggs. Peregrine falcons primarily eat birds. Secondary prey species include tree and ground squirrels, rabbits, various other small mammals (Snyder 1991).

The peregrine falcon's most destructive predator is man. Peregrine falcon populations in the United Sates were dramatically reduced by exposure to chlorinated hydrocarbon pesticides. These pesticides reduce eggshell thickness, thereby causing the eggs to break during incubation. These pesticides are now banned in the United States and Canada. The peregrine falcon has made a dramatic comeback in the past decade.

Environmental Baseline

Peregrine falcons have been observed in the Galena Watershed with most sightings occurring at Coyote Bluffs and Ragged Rocks. Coyote Bluffs is located within the project area on cliffs adjacent to the Middle Fork of the John Day River; cliff characteristics and close proximity to County Road 20 probably make this site low potential for nesting. Ragged rocks is located approximately 3 miles east of the SE Galena project area; this site has been identified as having good potential for falcon nesting. Nesting peregrines have not been documented at either site. Nesting habitat also occurs about one mile north of the project area on the Umatilla National Forest; peregrines have been reported there, but nesting has not been documented.

Effects Common to All Alternatives

Peregrine falcon presence in the area is transitory in nature and falcons would not likely be affected during implementation of the proposed activities. There would be no direct, indirect, or cumulative effects to falcons.

Effects of Pesticide/Herbicide Use:

Tables 7 and 8 display treatment acres. Chemicals would only be applied under Alternatives 2 and 5.

Strychnine baiting - There would be no risk of primary poisoning; peregrine falcons do not consume grains or seeds as part of their diets. There would be no risk of secondary poisoning. Although peregrine falcons will feed on small mammals, their diet consists predominantly of small birds. Raptors have a relatively high tolerance for strychnine (Anthony et al. 1984). If one applies the lowest lethal dosage for raptors of 7.7 mg/kg, a peregrine falcon would have to consume from 1 to 42 strychnine-killed mammals to be killed. Peregrine falcons are rare visitors to the project area. No impacts to peregrine falcons would be expected.

Aluminum phosphide fumigation – Because the effects of fumigation are limited to those animals which actually inhabit the underground burrows, no direct effects to peregrine falcons would occur. The potential for secondary toxicity would be highly unlikely. Phosphine does not accumulate in animal tissue. Due to the mode of action - phosphine reacting within the

respiratory system - and the extremely short half-life in target animals following death, residue levels present in animals directly killed by phosphine gas are not high enough to produce the same effect in a predator or scavenger.

Herbicide Applications –The US Forest Service contracted Syracuse Environmental Research Associates Inc. and the Syracuse Research Corporation to compile relevant studies on registered pesticides and to evaluate ecological risks (SERA, 1995, 1996 and 1997). Studies generally indicate that glypohosate, and hexazinine are characterized by relatively low toxicity to mammalian and avian species. These herbicides do not bioaccumulate in tissues of exposed animals, but rather are rapidly excreted in urine or feces (USDA 1992 and 1997).

See the Southeast Galena Restoration Project Wildlife Report for additional discussion on chemical effects.

Determination of Effects

There would be no impact (NI) to peregrine falcon by implementing any of the alternatives.

California Wolverine (Gulo gulo)

Status: Federal – Species of Concern
State - Threatened
Region 6 - Sensitive

Biology and Ecology

Unless other wise noted, information was taken from Ruggiero et al. (1994), which compiles and summarizes all of the existing information on wolverine. Research indicates that wolverines tend to prefer higher alpine areas with a mixture of habitats including dense mixed conifer forest as well as shale/rock slide areas for both denning and foraging habitat (Ruggiero et al., 1994). In presettlement times, wolverines were widespread but likely always occurred at low densities in the western United States. In general, wolverine densities are low relative to carnivores of similar size. Reproductive rates are low and sexual maturity delayed, even in comparison with other mammalian carnivores.

Wolverines generally are opportunistic omnivores in summer and primarily scavengers in winter. All studies have shown the paramount importance of large mammal carrion, and the availability of large mammals underlies the distribution, survival, and reproductive success of wolverines. They will eat smaller prey, but they are too large to survive on only small prey. However, a prey base diverse in size and species is important because large carrion is not always available. An abundance of large mammal carrion or a diverse prey base does not guarantee the presence of wolverines, especially if other life needs, such as denning habitat, are not met.

In North America, information on natal dens is biased to tundra regions. Above treeline, dens appear to require snow 1 to 3 meters deep that persists into spring. Proximity of rocky areas, such as talus slopes or boulder fields, for dens or rendezvous sites appeared to be important in Norway, Russia, and Idaho. Limited information is available on dens in forested habitat. Dens in forests have been in holes dug under fallen trees, in cavities of large standing trees, under fallen logs or the roots of upturned trees, and in accumulations of woody debris. Physical structure may be important for denning in forest habitats. Wolverines appear to be extremely sensitive to human disturbance during natal denning (prior to weaning). If females are disturbed, they will move their kits, possibly to unsuitable den sites.

Wolverine habitat is probably best defined in terms of adequate year-round food supplies in large, sparsely inhabited wilderness areas, rather than in terms of particular types of topography or plant associations. Preferences for some forest cover types, aspects, slopes, or elevations have been

primarily attributed to greater food abundance, but also to avoidance of high temperatures and humans. The perception that wolverines are a high-elevation species has arisen because where wolverines are surrounded by people, they are usually found in the most inaccessible habitats: the mountain ranges.

Apparently, wolverines do not tolerate land-use activities, such as agriculture or urban and industrial development that permanently alter habitats. The greatest impacts on wolverine possibly are habitat fragmentation and access from land-use activities. Because of the wolverine's large home range and extensive movements, it may appear that specific habitat attributes are not important and recolonization of vacant habitats is not a concern. However, natal and maternal dens may require much structural diversity and may be limiting in habitats that have been extensively modified by logging or other land-use practices. Insufficient denning habitat may decrease their already low reproductive potential.

Home ranges of adult wolverine in North America are approximately 100 km^2 to 400 km^2 for females, and approximately 200 km^2 to 1,600 km^2 for males. Home range size may vary due to differences in abundance and distribution of food. Habitat is reduced or degraded, primarily due to forest fragmentation and high road densities.

Environmental Baseline

There is little information in the Blue Mountains relative to population density and distribution of wolverines. Wolverine habitat occurs primarily in wilderness and large roadless areas. Areas of low human impacts, low human disturbance, and high deer and elk concentrations are preferred. Within the project area, the Vinegar Hill-Indian Rock Scenic Area and Dixie Butte Wildlife Emphasis Area exhibit these characteristics. Elsewhere on the District, the Strawberry Mountain Wilderness, Dry Cabin Wildlife Emphasis Area and the Shaketable, McClellan Mountain, and Aldrich Mountain Roadless Areas share these characteristics.

Periodically throughout the 1990s, wolverine surveys were conducted across the District, including areas in and near the project area. No wolverine tracks or individuals were found. A wolverine was confirmed from bones and fur found in the Strawberry Mountain Wilderness in 1992. Unconfirmed sightings of wolverine were reported in the project area near Dixie Mountain and to the northwest near Big Boulder Creek. Additional sightings of animals and tracks have occurred on the District, but none have been confirmed.

It is likely that a wolverine could use the project area, particularly the large, unroaded areas associated with the Vinegar Hill-Indian Rock Scenic Area and Dixie Butte Wildlife Emphasis Area.

The Cold, Moist and Lodgepole Forest types represent the highest quality habitat, particularly where they remain relatively undeveloped and undisturbed. Quality habitat includes both the OFMS and YFMS structural stages. Approximately 13,500 acres of these forest types exist. Of that, 9,895 acres, or 73%, are in OFMS or YFMS condition. Structural stage percentages are within the estimated HRV for OFMS and in excess of the estimated HRV for YFMS. Potential habitat by forest type is as follows:

- In the moist forest type, 11,500 acres of potential habitat exists. Of that, 8,395 aces, or 73%, are in the OFMS and YFMS structural stages.
- In the cold forest type, 2,000 acres of potential habitat exists. Of that, 1,500 aces, or 75%, classifies as OFMS or YFMS.
- Approximately 1,100 acres of lodgepole pine habitat exists with 615 acres, or 55% in OFMS or YFMS conditions.

Elsewhere, lesser quality habitat provides sufficient cover and security to meet landscape connectivity between potential home range areas.

Alternative 1- No Action Alternative

There would be no effects (NE) to wolverine or potential home range or movement corridors within the planning area. All of the connectivity and late and old structure (LOS) habitat would remain as currently exists.

Alternative 2 - Proposed Action

Direct and Indirect Effects

Timber harvest would occur primarily in lower elevation Dry Forests that have already been intensively managed; wolverines likely only use these areas as travel habitat. Approximately 980 acres or 8.5% of the Moist Forest types would be managed, primarily at mid to low elevations. No Cold or Lodegpole Forests would be entered. No harvest would occur within the large undisturbed areas in the Vinegar Hill-Indian Rock Scenic Area and Dixie Butte Wildlife Emphasis Area. After timber harvest, lower stand densities in stands currently providing dense conditions and travel habitat may affect individual wolverine. Similar to lynx, wolverines typically use ridges, saddles, and riparian areas for travel. Loss of travel habitat is expected to have similar impacts to wolverine as described for lynx. LRMP2 corridors and the Key Linkage Area maintained as described for lynx are expected to prevent impediments to wolverine travel and dispersal through the project area (see Canada lynx, Alternative 2, Connectivity Habitat). Reduced open road densities would reduce the potential for human-wolverine interaction.

Effects of Pesticide/Herbicide Use:

Tables 7 and 8 display treatment acres. Chemicals would only be applied under Alternatives 2 and 5.

Strychnine baiting - There would be no risk of primary poisoning. Wolverines do not consume grains or seeds as part of their diets. Although wolverines do feed on pocket gophers, there would be little to no risk of secondary poisoning. The bait would be applied below ground. Applicators would adhere to strict handling and storage procedures. Poisoned gophers typically die below ground. It is possible that a wolverine could pass through treated plantations, dig into gopher burrows and scavenge poisoned gophers or other non-target animals. If this would occur, it is estimated that for an average-sized wolverine to consume a lethal strychnine dose it would have to locate and consume approximately 5 to 50 poisoned carcasses within a short period of time without regurgitation (based on the lethal dose for medium sized carnivore, 35 to 45 pounds (Barnes et al. 1985). In the event that a wolverine did visit one or more treatment units during or immediately following baiting, it is likely that it would not occupy the area long enough to locate and consume sufficient carcasses to receive a lethal dose because of relatively high human disturbance in the area. It is more likely that an animal could opportunistically feed on a few isolated carcasses while passing through a treatment unit. The resulting dosage level could potentially cause some minor gastric problems until the toxin was metabolized or regurgitated, but it would not be life threatening. No substantial impacts to wolverines would occur.

Effects of Pesticide/Herbicide Use:

Tables 7 and 8 display treatment acres. Chemicals would only be applied under Alternatives 2 and 5.

Aluminum phosphide fumigation - Because the effects of fumigation are limited to those animals which actually inhabit the underground burrows, no direct effects to wolverines would occur. The potential for secondary toxicity would be highly unlikely. Phosphine does not accumulate in animal tissue. Due to the mode of action - phosphine reacting within the respiratory system - and the extremely short half-life in target animals following death, residue levels present in animals directly killed by phosphine gas are not high enough to produce the same effect in a predator or scavenger.

Herbicide Applications –The US Forest Service contracted Syracuse Environmental Research Associates Inc. and the Syracuse Research Corporation to compile relevant studies on registered pesticides and to evaluate ecological risks (SERA, 1995, 1996 and 1997). Studies generally indicate that glypohosate, and hexazinine are characterized by relatively low toxicity to mammalian and avian species. These herbicides do not bioaccumulate in tissues of exposed animals, but rather are rapidly excreted in urine or feces (USDA 1992 and 1997).

See the Southeast Galena Restoration Project Wildlife Report for additional discussion on chemical effects.

Cumulative Effects

Several timber sales are planned for the near future to the east and west of the project area. Without a large-scale habitat assessment conducted to determine current condition of wolverine habitat, the impacts of cumulative actions are unknown.

Determination of Impacts

Based on current information, implementation may impact individuals or habitat, but will not likely contribute to a trend toward federal listing or loss of viability to the population or species (MIIH).

Alternative 3

Effects would be similar to those described for Alternative 2. Fewer treatments are scheduled for upper elevation mixed conifer stands, therefore, the effect would be reduced. Approximately 700 acres or 6% of the Moist Forest types would be managed versus 8.5% under Alternative 2. More seclusion habitat due to higher tree densities would remain than in the proposed action. Loss of travel habitat is expected to have similar impacts to wolverine as described for lynx. LRMP2 corridors and the Key Linkage Area maintained as described for lynx are expected to prevent impediments to wolverine travel and dispersal through the project area (see Canada lynx, Alternative 3, Connectivity Habitat). Reduced open road densities would reduce the potential for human-wolverine interaction. No pesticides or herbicides would be used.

Cumulative Effects

Several timber sales are planned for the near future to the east and west of the project area. Without a large-scale habitat assessment conducted to determine current condition of wolverine habitat, the impacts of cumulative actions are unknown.

Determination of Impacts

Based on current information, implementation may impact individuals or habitat, but will not likely contribute to a trend toward federal listing or loss of viability to the population or species (MIIH).

Alternative 4

Direct and Indirect Effects

Impacts are low. No commercial timber harvest would occur. Precommercial thinning would be implemented primarily in Dry Forest types. Alternative 4 treats the least amount of upper elevation mixed conifer stands. Approximately 250 acres or 2.2% of the Moist Forest types would be precommercially thinned. Loss of travel habitat is expected to have similar impacts to wolverine as described for lynx. LRMP2 corridors and the Key Linkage Area maintained as described for lynx are expected to prevent impediments to wolverine travel and dispersal through the project area (see Canada lynx, Alternative 4, Connectivity Habitat). Reduced open road densities would reduce the potential for human-wolverine interaction. No pesticides or herbicides would be used.

Cumulative Effects

Several timber sales are planned for the near future to the east and west of the project area. Without a large-scale habitat assessment conducted to determine current condition of wolverine habitat, the impacts of cumulative actions are unknown.

Determination of Impacts

Based on current information, implementation may impact individuals or habitat, but will not likely contribute to a trend toward federal listing or loss of viability to the population or species (MIIH).

Alternative 5

Direct and Indirect Effects

Proposed management intensity is somewhat higher than under Alternative 2, the proposed action. Dry Forests would be more intensively managed. Approximately 1,150 acres or 10% of the Moist Forest types would be managed, primarily at mid to low elevations versus 8.5% under Alternative 2. No Cold or Lodegpole Forests would be entered. No harvest would occur within the large undisturbed areas in the Vinegar Hill-Indian Rock Scenic Area and Dixie Butte Wildlife Emphasis Area. Loss of travel habitat is expected to have similar impacts to wolverine as described for lynx (see Canada lynx, Alternative 5, Connectivity Habitat). LRMP2 corridors and the Key Linkage Area maintained as described for lynx are expected to prevent impediments to wolverine travel and dispersal through the project area for lynx. Alternative 5 reduces big game habitat effectiveness in some subwatersheds; potentially affecting movement and distribution of deer and elk (see Southeast Galena Wildlife Report). Wolverines may shift use areas in search of prey. Increased open road densities could increase the potential for human-wolverine interaction. The effects of pesticide and herbicide application are discussed in Alternative 2.

Cumulative Effects

Several timber sales are planned for the near future to the east and south of the planning area. Without a large-scale habitat assessment conducted to determine current condition of wolverine habitat, the impacts of cumulative actions are unknown.

Determination of Impacts

Based on current information, implementation may impact individuals or habitat, but will not likely contribute to a trend toward federal listing or loss of viability to the population or species (MIIH).

Pacific fisher (Martes pennanti)

Status: Federal – Species of concern
State - Sensitive
Region 6 - Sensitive

Biology and Ecology:

Authorship and citation for the following baseline data, unless indicated otherwise, is taken from http://www.livingbasin.com./endangered/Mammals/fisher.html

Fishers are medium sized carnivores that prey on a wide variety of foods including birds, rabbits, porcupines, and carrion. Distribution is likely governed by the availability of food but the presence of overhead cover may also be an important factor. Home range sizes of fishers vary up to 30 km^2 (about 7,400 acres) for adult males. The range of one male will overlap those of more than one female, but home ranges within adult sexes are exclusive.

Fishers are found only in North America. Their current range is reduced from that which occurred prior to European settlement of the continent, but most of this reduction has occurred in the United States (Ruggiero et al. 1994). Fisher's range is in forested areas of central and southern Canada, south in the east to Wisconsin, Minnesota, Michigan, New York, and New England. In the west, they range south into northern Idaho, western Montana, Oregon, Washington, and the Sierra Nevada in California (Marshall 1996).

In Oregon, their range is the coastal range, Klamath Mountains, Cascade Range, and east to the Blue Mountains, and Gearhart Mountain or farther. They occur, or are likely to occur, in Baker, Clackamas, Coos, Curry, Deschutes, Douglas, Jackson, Josephine, Klamath, Lake, Lane, Linn, Tillamook, Union, and Wallowa counties. They formerly occurred in all forested counties (Marshall 1996). Parts of the Malheur National Forest are delineated to be within the fisher's range in Grant County, Oregon, according to the map found in Csuti et al. (1997).

Fishers use primarily coniferous or mixed-wood habitats. Optimum Fisher habitat consists of a diversity of forest types and, therefore, greater prey abundance. Studies have shown a preference for forests dominated by multi-layered conifer stands, and in Idaho, they prefer mesic forest habitats (Witmer et al. 1998), but some hardwoods may be desirable for maximum prey numbers and diversity. A 70 to 80 percent canopy closure is believed optimum, but a California study showed a preference for 40 to 70 percent canopy cover areas. Fishers are known to inhabit second growth and even clearcuts after cover is established (Marshall 1996). It is not known whether the second growth and sparse overhead canopy habitats are used transiently or the basis of stable home ranges (Ruggiero et al. 1994). Large diameter trees with cavities, especially riparian cottonwoods in British Columbia, are important as natal den sites. Fishers move to larger cavities as the young grow. Dense forest stands in the latter successional stages provide the best quality habitat, particularly in western North America. Ruggiero et al. (1994) noted that fisher use riparian areas disproportionately more than their occurrence and exhibit a strong preference for habitats that have overhead tree cover.

In Ruggiero (1994) it has been hypothesized that the physical structure of the forest and prey associated with the structure are the critical features that explain fisher habitat use, not specific forest types. Forest structure needs to provide three important functions for fisher usage: 1) lead to a high diversity of dense prey populations, 2) lead to high vulnerability of prey to fisher, and 3) provide natal and maternal dens and resting sites.

Fishers are vulnerable to habitat loss through forestry, trapping, and hydroelectric development. Loss of habitat through the cutting of forests for timber or conversion to other land uses, over-trapping and the widespread use of poisons as a harvest and predator control method have also contributed to the reduction and extirpation of Fisher populations. Forest harvesting elsewhere also increases access for trappers, which is a particular concern because fishers are taken in marten sets. Marshall (1996) states that timber harvesting is not considered compatible with maintenance of maximum fisher numbers in most areas; and if severe, it will eliminate fishers. Degraded, destroyed, or fragmented habitat may result in isolated habitats that are too small to maintain viable fisher populations.

Environmental Baseline

Although habitat exists in the project area, fisher are not known or suspected to occur there. Fisher have been extirpated from much of their range due to trapping and loss of habitat due to logging (http://imnh.isu.edu/digital atlas/splash_navigate/pcmain.htm). They are considered extirpated from Oregon (Oregon Natural Heritage Program 2001).

The Moist Forest, Cold Forest and Lodgepole Pine Forest types represent the highest quality habitat for fisher based upon site capability. Quality habitat includes both the OFMS and YFMS structural stages. Approximately 14,600 acres of these forest types exist. Of that, 10,510 acres,

or 72%, are in OFMS or YFMS condition. Structural stage percentages are within the estimated HRV for OFMS and in excess of the estimated HRV for YFMS. Potential habitat by forest type is as follows:

- In the moist forest type, 11,500 acres of potential habitat exists. Of that, 8,395 aces, or 73%, are in the OFMS and YFMS structural stages.
- In the cold forest type, 2,000 acres of potential habitat exists. Of that, 1,500 aces, or 75%, classifies as OFMS or YFMS.
- Approximately 1,100 acres of lodgepole pine habitat exists with 615 acres, or 55% in OFMS or YFMS conditions.

The *warmer* Dry Forest typess likely provide fisher habitat as well, i.e., those plant associations with a notable grand fir component. Many of these stands have higher tree densities than they did historically. These conditions have resulted in the accumulation of dead wood habitat, both in the form of snags and down wood. These dead wood habitats, however, are generally smaller, and may provide a poorer quality of habitat. While fisher may use these areas for foraging, and possibly denning, over all use is likely less when compared to Moist forest, Cold forest and Lodgepole Pine Forest types. In addition, these drier habitats tend to be more fragmented and degraded by timber harvest. Approximately 17,500 acres of dry grand fir plant associations exist. Of that, 9,915 acres, or 57%, are in OFMS or YFMS structure habitat. This percentage is excess of the estimated HRV of 10% to 30% for OFMS and YFMS in dry forests.

No Action Alternative

Direct and Indirect Effects

No changes to fisher habitat would occur from timber management. Canopy closure will continue to increase in stands that currently have canopy closure less than 40%. As canopy closure increases above 40%, the risk of tree mortality due to insects and diseases increases. Stands on the dry end of the spectrum of capable fisher habitat probably cannot sustain canopy closure much above 40% because of the likelihood of insect- or disease-induced mortality. Stands on the moister end probably will continue to increase in canopy closure, but achieving or sustaining canopy closure above 60% for very long is unlikely.

Cumulative Effects

Cumulative effects include past timber sales that reduced canopy closure in fisher habitat. Most harvest treatments would require 20-50 years before the treated stands achieve at least 40% canopy closure.

Determination of Impacts

This alternative will *not impact (NI)* fisher or their habitat.

Alternative 2 - Proposed Action

Direct and Indirect Effects

Forest structure and species composition would change immediately following proposed timber harvest and prescribed burning activities. Habitat conditions would be modified accordingly. The majority or proposed treatments occur in the Dry Forest types (see Table 9), followed by the Moist Forest types. No timber harvest or burning activities would be implemented in Cold Forest types or Lodgepole Forest types under any action alternative.

BE Table 19—(Table 9) Acres of harvest treatment by Forest type and alternative. The table also displays % of total treatment acres in each Forest type.

FOREST TYPE	TOTAL ACRES IN FOREST TYPE	# OF TREATMENT ACRES (% OF TOTAL TREATMENT ACRES)			
		Alternative 2	Alternative 3	Alternative 4	Alternative 5
Dry Forest	29,000	9,700 (91%)	7,470 (91%)	2,460 (90%)	11,120 (91%)
Moist Forest	11,500	940 (9%)	740 (9%)	270 (10%)	1,100 (9%)
Lodgepole Forest	1,100	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Cold Forest	2,000	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Total Acres	43,600	10,640 (100%)	8,210 (100%)	2,730 (100%)	12,220 (100%)

Dry Forest Types

Tables 10 and 11 display changes to Dry Forest due to timber harvest. Table 10 displays treatment by harvest prescription. Table 11 displays percentage of each structural stage for each alternative. HRV is displayed to indicate desired distribution. Alternative 1 displays the existing structural stages. The easiest way to summarize alternative effects on Pacific fisher habitat is to review changes in structural stage distribution.

BE Table 20—(Table 10) Percentage of Dry Forest type treated by silvicultural prescription and alternative.

TREATMENT	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Dry Forest (29,000 acres)				
Commercial. Thinning (HTH)	14.7%	10.9%		15.8%
Comm. Thin & Precommercial Thin (HTH/SPC)	4.6%	3.7%		6.5%
Comm. Thin in Connectivity Corridors (HTH1)	1.8%	1.0%		0.5%
Comm. Thin & Precommercial. Thin in Connectivity Corridors. (HTH1/SPC1)	2.6%	2.1%		.1
Understory Removal (HUR)	3.0%	0.8%		4.0%
Shelterwood (HSH)	4.8%	3.3%		9.3%
Salvage (HSV)	0.2%	0.2%		0.2%
Precommercial Thinning (SPC)	2.0%	2.1%	6.2%	2.4%
Precommercial Thin in Connectivity Corridors (SPC1)	0.3%	0.4%	2.1%	
Total Treatment	35.0%	24.5%	8.3%	40.0%
No Treatment (HNT)	65.0%	75.5%	91.7%	60.0%

BE Table 21—(Table 11) Dry Forest Structural Stage Distribution by Alternative.

ALTERNATIVE	PRECENTAGE OF FOREST TYPE						
	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV Range	5-15%	5-25%	5-10%	5-10%	5-15%	30-55%	5-15%
1 – *Existing*	5%	42%	3%	7%	30%	1%	12%
2	5%	43%	2%	13%	24%	4%	9%
3	5%	42%	3%	11%	26%	2%	11%
4	5%	42%	3%	9%	28%	1%	12%
5	5%	43%	2%	17%	20%	5%	8%

Alternative 2 would treat approximately 9,700 acres of Dry Forest. All prescriptions would reduce canopy closure to below 40%. Habitat would be degraded or lost for species that prefer high canopy cover and complex structure stands, including the Pacific fisher. YFMS is noticeably reduced. Harvest treatment would convert most of these stands to UR and SEOC structural stages. There are three relatively large, contiguous blocks of YFMS that could provide sufficient habitat to support reproducing pairs of fisher. Two blocks in the Little Boulder/Deerhorn and Vinegar Creek Subwatersheds are each about 1,200 acres in size, although the block in Vinegar Creek is more fragmented. A third block of YFMS, 600 acres in size, is in the Butte Subwatershed. These YFMS blocks are not considered the highest quality habitat for Pacific fisher. They are in Dry Forest types, are not OFMS, likely have reduced canopy closure, have had past harvest, and are likely deficient in dead wood habitat. Elsewhere, smaller existing YFMS blocks are found along the periphery of larger contiguous blocks of OFMS, and probably provide foraging habitat for reproducing pairs in the adjacent OFMS blocks.

Alternative 2 essentially converts the entire Little Boulder and Butte blocks from YFMS to UR and SEOC structure, likely making these blocks unsuitable for denning. These alternatives also convert about ½ of the Vinegar block to UR and SEOC structure. Consequently, implementation would potentially reduce the project area carrying capacity for fishers. Although Alternatiev 2 enters additional smaller blocks of YFMS structure, many of these habitat blocks are isolated or heavily fragmented. Where these smaller habitat blocks are adjacent to larger contiguous blocks of OFMS, they may provide additional foraging habitat, but treatment is unlikely to exclude animals. Population viability for Pacifc fisher would be maintained via the old growth in the Cold, Moist and Lodgeploe Forest types as well as the proposed system of Dedicated Old Growth (DOG), Replacement Old Growth (ROG), and Pileated Woodpecker Feeding Areas (PWFAs), as prescribed by the LRMP. Although the DOGs, ROGs and PWFAs are not specifically established for Pacific fisher, they would provide fisher habitat.

Moist Forest Types

Tables 12 and 13 display changes to Moist Forest due to timber harvest. Table 12 displays treatment by harvest prescription. Table 13 displays percentage of each structural stage for each alternative. HRV is displayed to indicate desired distribution. Alternative 1 displays the existing structural stages. The easiest way to summarize alternative effects on Pacific fisher habitat is to review changes in structural stage distribution.

BE Table 22 —(Table 12) - Percentage of Moist Forest type treated by silvicultural prescription and alternative.

TREATMENT	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Moist Forest (11,500 acres)				
Commercial. Thinning (HTH)	1.6%	.7%		1.7%
Comm. Thin & Precommercial Thin (HTH/SPC)	0.8%	0.3%		2.0%
Comm. Thin in Connectivity Corridors (HTH1)	0.3%			0.3%
Comm. Thin & Precommercial. Thin in Connectivity Corridors (HTH1/SPC1)	0.1%			
Understory Removal (HUR)				0.5%
Shelterwood (HSH)	2.7%	2.1%		2.7%
Salvage (HSV)	1.6%	1.6%		1.6%
Precommercial Thinning (SPC)	1.3%	1.3%	2.1%	1.3%
Precommercial Thin in Connectivity Corridors (SPC1)			0.1%	
Total Treatment	8.5%	6.0%	2.2%	10.1%
No Treatment (HNT)	91.5%	94.0%	97.8%	89.9%

BE Table 23—(Table 13) - Moist Forest Structural Stage Distribution by Alternative

ALTERNATIVE	PRECENTAGE OF FOREST TYPE						
	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV Range	10-30%	5-10%	10-20%	10-20%	10-20%	5-15%	15-40%
1 – Existing	6%	6%	4%	6%	39%	5%	34%
2	6%	6%	4%	10%	35%	5%	34%
3	6%	6%	4%	9%	36%	5%	34%
4	6%	6%	4%	7%	38%	5%	34%
5	6%	6%	4%	11%	34%	6%	33%

None of the action alternatives have significant effects on Moist Forest types. Alternative 2 harvests 940 acres or 8.5% of the Moist Forest types. As in the Dry Forest, canopy closure would be reduced below 40%. The most noticeable effect of the action alternatives would be the conversion of YFMS stands to UR stands. Habitat would be degraded or lost for species that prefer high canopy cover and complex structure stands, including the Pacific fisher. Harvest treatment does not fragment any large blocks of OFMS habitat, so the highest quality habitat for would be maintained.

Overall, the existing distribution of structural stages reflects HRV relatively well. There is an excess of YFMS structural stands and a deficiency in younger structural stages, i.e., the SI, UR, and SECC stages. In the future, it may be desirable to convert some of the YFMS stands into the younger structural stages to provide the historic range of habitats. The best approach would be to mimic the natural fire regime for the Moist Forest type, which tended to convert large blocks of habitat, 200 to 2000 acres in size, into the SI stage in a single event.

Population viability for the Pacific fisher would be maintained via old growth in the Cold and Moist Forest types as well as the proposed system of Dedicated Old Growth, Replacement Old Growth, and Pileated Woodpecker Feeding Areas as prescribed by the LRMP.

Prescribed burning would not be used in the Moist Forest types except in harvest units to reduce activity fuels. Stands would remain at risk for stand replacement wildfires; as this type of fire

would remove much of the forest cover and stand structure required by species such as the pileated woodpecker and pine marten. This is not necessarily a negative habitat condition when disturbances are within the Historic Range of Variability. Pscofc fisher would be required to find habitats outside the burned areas. Given the low level of activity within the Moist Forest types, effects would be low and somewhat similar to those described in the no action alternative.

Connectivity Habitat

Alternative 2 would harvest timber on 171 acres or 2% of the LRMP2 corridors. A modified commercial thinning (HTH1) would reduce stocking, increase growth rates on the residual trees, and accelerate development of old forest structure, while maintaining connectivity. Thinning prescriptions would maintain the minimum standards required for movement and dispersal. Canopy closure would be maintained in the 1/3 of site potential; and a minimum of 180 trees per acre would be left on site. Whereas a standard thinning might leave about 60 square feet of basal area, the modified prescription could leave approximately 80 square feet. LRMP standards require that canopy closure meet the top 1/3 of site potential, but does not specify minimum tree density. Tops of trees would be yarded. Where understory stocking is high, a modified precommercial thinning (SPC1) would also be used to reduce stocking. Clumps of small trees would be retained to provide connectivity and horizontal as well as vertical diversity. Treatment units are 47,48, 49, 64, 600, 602, 603, 606 and 608. In units 64 and 606, slash would be hand piled and burned. Several travel corridors are being maintained in riparian areas. Timber harvest is being excluded within 100 feet of intermittent streams, 150 feet of perennial fish bearing, and 300 feet of major fish bearing streams. These riparian corridors would be widened to at least 400 feet to meet LRMP standards. Harvest on 171 acres would have negligible effects on the overall corridor system.

Prescribed burning would be conducted within LRMP2 corridors. Underburning would be used to reduce fine fuels. Burning could kill smaller trees or prune back branches that are near the ground, which could reduce hiding cover within corridors. Burning prescriptions would be designed to maintain canopy closure within the top 1/3 of site potential and stocking at a minimum of 180 trees per acre. Where these standards cannot be met, burning would be forgone. Several LRMP2 corridors are within RHCAs; fires would not be ignited within RHCAs, but would be allowed to creep in from the outer edges. Most of the area proposed for burning is in Dry Forest types with a history of high frequency/low intensity fires. Burning would begin to restore the natural fire regime, but it would reduce the quality of habitat in the corridor for at least few years. In the future, additional maintenance prescribed burning may occur in the project area and surrounding areas. This activity should remove accumulations of natural fuels from the uplands, remove decadent vegetation, stimulate regeneration of fire dependent plants, and maintain the area so natural fire cycles can be reestablished that create and retain mosaic habitat conditions.

New roads would be constructed across connectivity corridors at four locations. Three of the four new roads would remain open following harvest; one road would be closed. Two of the roads would be constructed as close to right angles to the corridors as possible to minimize effects. The other two roads would be constructed to relocate roads outside of RHCAs; these two roads would be *aligned* with the corridors, increasing potential effects. These two roads would remain open. This will adversely affect the quality of the affected corridors. About 22 miles of road would be decommissioned or relocated outside RHCAs, improving corridors for travel.

Management activities would reduce the risk that uncharacteristically severe disturbance events could reduce or alter connectivity habitat and isolate populations.

Pesticide and Herbicide Use

Tables 7 and 8 display treatment acres.

Strychnine baiting - Evans and Lindsey (1984) recommended using nontoxic alternatives in forest areas inhabited by special interest species such as fisher or marten. Although habitat exists in the project area, fisher are not known or suspected to occur in the project area. No impacts to Pacific fishers would occur.

Aluminum phosphide fumigation - Because the effects of fumigation are limited to those animals which actually inhabit the underground burrows, no direct effects to fishers would occur. The potential for secondary toxicity would be highly unlikely. Phosphine does not accumulate in animal tissue. Due to the mode of action - phosphine reacting within the respiratory system - and the extremely short half-life in target animals following death, residue levels present in animals directly killed by phosphine gas are not high enough to produce the same effect in a predator or scavenger.

Herbicide Applications –The US Forest Service contracted Syracuse Environmental Research Associates Inc. and the Syracuse Research Corporation to compile relevant studies on registered pesticides and to evaluate ecological risks (SERA, 1995, 1996 and 1997). Studies generally indicate that glypohosate, and hexazinine are characterized by relatively low toxicity to mammalian and avian species. These herbicides do not bioaccumulate in tissues of exposed animals, but rather are rapidly excreted in urine or feces (USDA 1992 and 1997).

See the Southeast Galena Restoration Project Wildlife Report for additional discussion on chemical effects.

Cumulative Effects

Similar activities - timber harvest, prescribed burning, and hardwood planting and protection - will be going on concurrently within the Middle Fork John Day Subbasin (see Appendix C- Projects Considered for Cumulative Effects).

The majority of the timber harvest and prescribed fire activities are being conducted in the Dry Forest types where much of the vegetation is outside HRV. Cumulatively, effects would be similar to those described in the previous section on direct/indirect effects, except they would be applied over a larger area. Treatments will reduce canopy closures and stand densities. Species, such as Pacific fisher could be affected by these activities. However, Dry Forests, even in the YFMS condition, are not particularly productive habitats for this species. Large diameter trees and dead wood habitats are notably lacking. Canopy closures are generally lower. Stands are dominated by ponderosa pine and Douglas-fir with a smaller component of grand fir. While structural stages will change from ones that are more suitable for theses species to ones that are less suitable, the overall impact will be much less because of the poorer quality of habitat as it currently exists. Impacts will be primarily to habitats used more for foraging than denning purposes. Cumulative impacts to higher quality Moist and Cold Forest habitats are low. Population viability for Pacific fisher would be maintained via old growth in the Moist, Cold and Lodgepole Pine Forest types as well as a system of Dedicated Old Growth (DOG), Replacement Old Growth (ROG), and Pileated Woodpecker Feeding Areas (PWFAs).

Determination of Impacts

This alternative may impact habitat, but because fisher have been extirpated from Oregon, this alternative will not contribute to the loss of species viability or contribute to federal listing (FSM 2670.24 – Exhibit 1. BIOLOGICAL EVALUATION PROCESS – THREATENED, ENDANGERED, PROPOSED AND SENSITIVE SPECIES PROJECT PROPOSAL). This alternative impact habitat, but will not likely contribute toward federal listing or loss of viability to the population or species (MIIH).

Alternative 3

Direct and Indirect Effects

Timber Harvest

The effects of timber harvest would be similar to Alternative 2, except less acres would be treated (see Tables 9, 10, 11, 12 and 13). In the Dry Forest types, 7,470 acres or 24.5% of the Dry Forest types would be treated. Alternative 3 converts ½ or less of each of the three large blocks of YFMS to UR and SEOC structure; implementation would potentially reduce the project area carrying capacity for fisher by one to two reproducing pairs of fisher. In the Moist Forest types, habitat for fisher would be degraded or lost on 740 acres or 6% of the Moist Forest types. Harvest treatment does not fragment any large blocks of OFMS habitat, so the highest quality habitat for fisher would be maintained.

Population viability for the Pacific fisher would be maintained via old growth in the Cold and Moist Forest types as well as the proposed system of Dedicated Old Growth, Replacement Old Growth, and Pileated Woodpecker Feeding Areas as prescribed by the LRMP.

Connectivity habitat

Alternative 3 does not propose harvest activities within LRMP2 corridors. Prescribed burning would be used to reduce fine fuels. Burning could kill smaller trees or prune back branches that are near the ground, which could reduce hiding cover within corridors. Burning prescriptions would be designed to maintain canopy closure within the top 1/3 of site potential and stocking at a minimum of 180 trees per acre. Where these standards cannot be met, burning would be forgone. Effects would be as described for Alternative 2.

New roads would be constructed across connectivity corridors at four locations. Three of the four new roads would remain open following harvest; one road would be closed. Two of the roads would be constructed as close to right angles to the corridors as possible to minimize effects. The other two roads would be constructed to relocate roads outside of RHCAs; these two roads would be *aligned* with the corridors, increasing potential effects. These two roads would remain open. This will adversely affect the quality of the affected corridors. About 22 miles of road would be decommissioned or relocated outside RHCAs, improving corridors for travel.

Pesticide and Herbicide Use

No pesticides or herbicides would be use to control competing vegetation, noxious weeds or pocket gophers (see Tables 7 and 8). No adverse effects to lynx would be expected.

Cumulative Effects

Cumulative effects would be similar to those described in Alternative 2.

Determination of Impacts

This alternative may impact habitat, but because fisher have been extirpated from Oregon, this alternative will not contribute to the loss of species viability or contribute to federal listing (FSM 2670.24 – Exhibit 1. BIOLOGICAL EVALUATION PROCESS – THREATENED, ENDANGERED, PROPOSED AND SENSITIVE SPECIES PROJECT PROPOSAL). This alternative impact habitat, but will not likely contribute toward federal listing or loss of viability to the population or species (MIIH).

Alternative 4

Direct and Indirect Effects

Timber Harvest

The effects of timber harvest would be somewhat similar to Alternative 2 and 3, except substantially less acres would be treated (see Tables 9, 10, 11, 12 and 13). In the Dry Forest types, 2,460 acres or 8.3% of the Dry Forest types would be treated. Alternative 4 treats only 2 of the 3 large blocks of YFMS. Treatment would fragment the Little Boulder and Vinegar blocks, but does not enter the Butte block; implementation would possibly reduce carrying capacity by one reproducing pair. In the Moist Forest types, 270 acres or 2.2% of the Moist Forest types would be treated. Harvest treatment does not fragment any large blocks of OFMS habitat, so the highest quality habitat for fisher would

be maintained. In addition, precommercial thinning would limit tree removal to the smaller trees, so impacts to crown closure would be reduced compared to effects from a commercial harvest.

Population viability for the Pacific fisher would be maintained via old growth in the Cold and Moist Forest types as well as the proposed system of Dedicated Old Growth, Replacement Old Growth, and Pileated Woodpecker Feeding Areas as prescribed by the LRMP.

Connectivity habitat

Alternative 4 would precommercial thin 38 acres or 1% of the LRMP2 corridors. A modified precommercial thin (SPC1) would reduce tree stocking, bark beetle risk, and fuel loads. Thinning prescriptions would maintain the minimum standards required for movement and dispersal. The treatment units are #'s 602 and 603.

Prescribed burning would be used to reduce fine fuels. Burning could kill smaller trees or prune back branches that are near the ground, which could reduce hiding cover within corridors. Burning prescriptions would be designed to maintain canopy closure within the top 1/3 of site potential and stocking at a minimum of 180 trees per acre. Where these standards cannot be met, burning would be forgone. Effects would be as described for Alternative 2. Management activities would reduce the risk that uncharacteristically severe disturbance events could reduce or alter connectivity habitat and isolate populations.

New roads would be constructed across connectivity corridors at two locations. These roads would relocate roads outside of RHCAs. Both roads would remain open following harvest. The two roads would not be constructed at right angles to the corridor; rather, they would be *aligned* with the corridors, increasing potential effects. This will adversely affect the quality of the affected corridors. About 22 miles of road would be decommissioned or relocated outside RHCAs, improving riparian corridors for travel.

Pesticide and Herbicide Use

No pesticides or herbicides would be use to control competing vegetation, noxious weeds or pocket gophers (see Tables 7 and 8). No adverse effects to lynx would be expected.

Cumulative Effects

Cumulative effects would be similar to those described in Alternative 2.

Determination of Impacts

This alternative may impact habitat, but because fisher have been extirpated from Oregon, this alternative will not contribute to the loss of species viability or contribute to federal listing (FSM 2670.24 – Exhibit 1. BIOLOGICAL EVALUATION PROCESS – THREATENED, ENDANGERED, PROPOSED AND SENSITIVE SPECIES PROJECT PROPOSAL). This alternative impact habitat, but will not likely contribute toward federal listing or loss of viability to the population or species (MIIH).

Alternative 5

Direct and Indirect Effects

Timber Harvest

The effects of timber harvest would be similar to Alternative 2, except additional acres would be treated (see Tables 9, 10, 11, 12 and 13). In the Dry Forest types, 11,120 acres or 40% of the Dry Forest types would be treated. Alternative 5 degrades potential fisher habitat within the there large blocks of YFMS. Treatment essentially converts the entire Little Boulder and Butte blocks from YFMS to UR and SEOC structure, likely making these blocks unsuitable for denning. Alternative 5 also converts about ½ of the Vinegar block to UR and SEOC structure. Consequently, as in Alternative 2, implementation would potentially reduce the project area carrying capacity for fishers. In the Moist Forest types, 1,100 acres or 10% of the Moist Forest

types would be treated. Harvest treatment does not fragment any large blocks of OFMS habitat, so the highest quality habitat for fisher would be maintained.

Population viability for the Pacific fisher would be maintained via old growth in the Cold and Moist Forest types as well as the proposed system of Dedicated Old Growth, Replacement Old Growth, and Pileated Woodpecker Feeding Areas as prescribed by the LRMP.

Connectivity habitat

Alternative 5 would harvest timber on 220 acres or 3% of the LRMP2 corridors. A modified commercial thinning (HTH1) would reduce stocking, increase growth rates on the residual trees, and accelerate development of old forest structure, while maintaining connectivity. Thinning prescriptions would maintain the minimum standards in the LRMP required for movement and dispersal. Canopy closure would be maintained in the top 1/3 of site potential. Unlike Alternative 2, tree densities could be reduced below 180 trees per acres as long as the canopy closure standard is met. LRMP standards require that canopy closure meet the top 1/3 of site potential, but does not specify minimum tree density. Tops of trees would be yarded. Where understory stocking is high, precommercial thinning (SPC1) would also be used to reduce stocking. Clumps of small trees would be retained to provide connectivity and horizontal as well as vertical diversity. Treatment units are 43, 47,48, 49, 64, 600, 602, 603, 606 and 608. In units 64 and 606, slash would be hand piled and burned. Harvest on 220 acres would have negligible effects on the overall corridor system.

Prescribed burning would be used to reduce fine fuels. Burning could kill smaller trees or prune back branches that are near the ground, which could reduce hiding cover within corridors. Burning prescriptions would be designed to maintain canopy closure within the top 1/3 of site potential and stocking at a minimum of 180 trees per acre. Where these standards cannot be met, burning would be forgone. Several LRMP2 corridors are within RHCAs; fires would not be ignited within RHCAs, but would be allowed to creep in from the outer edges. Most of the area proposed for burning is in Dry Forest types with a history of high frequency/low intensity fires. Burning would begin to restore the natural fire regime, but it would reduce the quality of habitat in the corridor for at least few years. In the future, additional maintenance prescribed burning may occur in the project area and surrounding areas. This activity should remove accumulations of natural fuels from the uplands, remove decadent vegetation, stimulate regeneration of fire dependent plants, and maintain the area so natural fire cycles can be reestablished that create and retain mosaic habitat conditions.

New roads would be constructed across connectivity corridors at four locations. Three of the six new roads would remain open following harvest; three roads would be closed. Four of the roads would be constructed as close to right angles to the corridors as possible to minimize effects. The other two roads would be constructed to relocate roads outside of RHCAs; these two roads would be *aligned* with the corridors, increasing potential effects. These two roads would remain open. This will adversely affect the quality of the affected corridors. About 22 miles of road would be decommissioned or relocated outside RHCAs, improving corridors for travel.

Management activities would reduce the risk that uncharacteristically severe disturbance events could reduce or alter connectivity habitat and isolate populations.

Pesticide and Herbicide Use

Affects would be as described for alternative 2, except that additional acres would receive chemical treatments (see Tables 7 and 8). No effects would be anticipated.

Cumulative Effects

Cumulative effects would be similar to those described in Alternative 2.

Determination of Impacts

This alternative may impact habitat, but because fisher have been extirpated from Oregon, this alternative will not contribute to the loss of species viability or contribute to federal listing (FSM 2670.24 – Exhibit 1. BIOLOGICAL EVALUATION PROCESS – THREATENED, ENDANGERED, PROPOSED AND SENSITIVE SPECIES PROJECT PROPOSAL). This alternative impact habitat, but will not likely contribute toward federal listing or loss of viability to the population or species (MIIH).

Bobolink (Dolichonyx oryzivorus)

Status: Federal - None
State - Sensitive
Region 6 - Sensitive

Biology and Ecology

Unless otherwise mentioned, the following information on bobolinks was derived from Dechant et al. (2001). Bobolinks breed from southern British Columbia across southern Canada to Nova Scotia, and south to eastern Oregon, central Colorado, central Illinois, western Virginia, and western North Carolina.

Bobolinks are found in native and tame grasslands, haylands, lightly to moderately grazed pastures, no-till cropland, small-grain fields, wet meadows, and planted cover. Bobolinks prefer habitat with moderate to tall vegetation, moderate to dense vegetation, moderately deep litter, and without the presence of woody vegetation (Dechant et al., 2001). They are found in areas with high percent grass cover and moderate percent forb cover, and avoid haylands with high legume-to-grass ratios; however, a forb component is beneficial for nesting cover. If habitat is not maintained, use by bobolinks declines significantly, possibly due to the accumulation of litter and encroachment of woody vegetation. Bobolinks respond positively to properly timed burning or mowing treatments, and moderate grazing.

Bobolink territories include both foraging and nesting areas. Average territory size ranged from 0.45 to 2.5 ha, depending on habitat variables. Bobolinks appear to prefer large grassland areas to small, having a minimum size of approximately 10-45 ha. Studies suggest bobolink abundance in tallgrass prairie fragments was positively related to area and/or fragment size.

Bobolinks generally are considered an uncommon or rare host of the brown-headed cowbird (*Molothrus ater*), but their nests may be multiply-parasitized as well. Nest depredation and brown-headed cowbird brood parasitism generally decreased farther from woody edges, and nest depredation rates were lower on large (130-486 ha) than on small (16-32 ha) grasslands. Nest productivity is usually highest in habitats far (>45 m) from a forest edge.

Keys to management are providing large areas of suitable habitat (native and tame grasslands of moderate height and density, with adequate litter), controlling succession, and protecting nesting habitat from disturbance during the breeding season. Avoid disturbing (e.g., haying, burning, moderately or heavily grazing) nesting habitat during the breeding season, approximately early May to mid-July. Treatments can be done in early spring (several weeks prior to the arrival of adults on the breeding grounds) or in the fall after the breeding season.

Environmental Baseline

Bobolinks are very local and scattered in the eastern one-third of Oregon and are known to breed on the Malheur National Wildlife Refuge, south end of Blitzen Valley, Harney County, Union County, and Wallowa County (Marshall 1996). Locally, sporadic nesting occurs in the Prairie

City, Mt. Vernon, Silvies Valley, and Bear Valley areas (Sweeney, 2001; Winters 2001). In the SE Galena project area, there has only been one reported sighting on the Middle Fork of the John Day River.

Bobolinks appear to prefer large grassland areas to small, requiring approximately 25-110 acres depending on habitat quality. Consequently, in SE Galena, habitat is likely limited to meadows and grasslands along the Middle Fork of the John Day River. About 615 acres of capable habitat exist, with the majority of the acres on private land. On National Forest Lands potential habitat is associated with the tributary streams and only at the lower reaches where they enter the Middle Fork. Along the tributary steams, habitat is considered marginal. Many of these acres are grazed and may not be providing tall enough grass for bobolinks. Meadows exit in the uplands, but they tend to be small or habitat is naturally dry and low in productivity.

Direct and Indirect Effects – No Action
No new activities would occur with this alternative.

Determination of Impacts

This alternative would not impact (NI) bobolinks or their habitat.

Direct and Indirect Effects – All Action Alternatives
In Alternatives 2 and 5, channel/floodplain rehabilitation projects would be conducted on 2 miles of Vinegar Creek and 1 mile of Deerhorn Creek. Projects would entail the use of heavy equipment to reestablish channels and floodplains by connecting relic channels or constructing new channels. Bobolinks may use open areas along tributary streams immediately adjacent to the Middle Fork of John Day River, including areas along Vinegar and Deerhorn Creeks. The channel/floodplain projects would be implemented in July and August. Effects would likely not last more than a year. Higher quality habitat on private lands along the Middle Fork of the John Day River would not be affected. Alternatives 3 and 4 would not implement these channel/floodplain rehabilitation projects.

Prescribed burning would occur only on National Forest Lands. Because little to no bobolink habitat is present on National Forest lands, effects would be inconsequential. Prescibed burning is proposed primarily in forested areas; it is unlikely that fire would be used in the floodplains of streams tributary to the Middle Fork. If fire does enter these streams, burning should stimulate grasses, which should improve the potential for bobolink habitat, and the effect should last for about 5 years post burn. Subsequent burns should have the same effect. Riparian openings probably would not burn during a spring burn, but would if burned during the fall. Upland meadows could also be improved by burning, but these meadows are smaller and considered unsuitable for bobolink.

Effects of Pesticide/Herbicide Use:

Tables 7 and 8 display treatment acres. Chemicals would only be applied under Alternatives 2 and 5.

Strychnine baiting and Aluminum phosphide fumigation – Animal control would not be conducted in RHCAs. No effects would occur.

Herbicide Applications –There would be no effects bobolinks from herbicide application; herbicides would not be applied near any suspected habitat.

Determination of Impacts

Channel/floodplain rehabilitation projects proposed under the Alternatives 2 and 5 may impact individual bobolinks and their habitat in the short-term, (MIIH) but will not likely contribute toward federal listing or loss of viability to the population or species. Under Alternatives 3 and 4, there will be no impacts to bobolinks; management activities would not be implemented within suspected habitat in the area. Prescibed burning could improve potential habitat in smaller upland

meadows, but effects would be inconsequential. Other proposed activities occur outside bobolink habitat, and will not affect bobolink or their habitat.

Sandhill Crane (Grus canadensis) and Long-billed curlew (Numenius americanus)

Status: Federal - None
State - Sensitive
Region 6 - Sensitive

Biology and Ecology

Both the sandhill crane and long-billed curlew use larger meadow habitats for their breeding, nesting and feeding needs. Sandhill crane habitat includes large, undisturbed wetlands with vigorous wetland vegetation, such as sedges and cattails. Foraging habitat includes grains, seedlings and animal matter found in agricultural fields and large wetlands. Long-billed curlews construct nests on the ground in short vegetation, usually grasses and annual forbs, on rolling topography (Bicak etal. 1980). They also need areas of tall vegetation to provide hiding cover for chicks.

Environmental Baseline

On the Malheur National Forest, these species have been seen at various locations, including Bear Valley and Logan Valley to the south and Phipps Meadow, Bridge Creek Meadow and Lobelia Meadow to the east. In the project area, cranes and curlews have been sighted along the Middle Fork of the John Day River, predominantly on private land. This area likely provides feeding habitat in the spring. None of the reported sightings along the Middle Fork confirmed nesting animals.

Direct and Indirect Effects – No Action

No new activities would occur with this alternative.

Determination of Impacts

This alternative would not impact (NI) sandhill cranes or long-billed curlews or their habitat.

Direct and Indirect Effects – All Action Alternatives

In Alternatives 2 and 5, channel/floodplain rehabilitation projects would be conducted on Vinegar and Deerhorn Creeks. Projects would be implemented on 2 miles in Vincent Creek and 1 mile in Deerhorn Creek and would entail the use of heavy equipment to reestablish channels and floodplains by connecting relic channels or constructing new channels. Cranes and curlews may use open areas along tributary streams immediately adjacent to the Middle Fork of John Day River, including areas along Vinegar and Deerhorn Creeks. The channel/floodplain projects would be implemented in July and August. No nesting individuals have been identified in the project area, but individuals may forage and could be displaced during operations. Effects would likely not last more than a year. Higher quality habitat on private lands along the Middle Fork of the John Day River would not be affected. Alternatives 3 and 4 would not implement these channel/floodplain rehabilitation projects.

Effects of Pesticide/Herbicide Use:

Tables 7 and 8 display treatment acres. Chemicals would only be applied under Alternatives 2 and 5.

Strychnine baiting and Aluminum phosphide fumigation – Animal control would not be conducted in RHCAs. No effects would occur.

Herbicide Applications –There would be no effects to these species from herbicide application; herbicides would not be applied near any suspected habitat.

Determination of Impacts

Channel/floodplain rehabilitation projects proposed under the Alternatives 2 and 5 may impact individual sandhill cranes or long-billed curlews and their habitat in the short-term, (MIIH) but will not likely contribute toward federal listing or loss of viability to the population or species. Under Alternatives 3 and 4, there will be no impacts to sandhill crane or long-billed curlew; management activities would not be implemented within suspected habitat in the area.

Tricolored blackbird (Agelaius tricolor)

Status: Federal - None
State - Undetermined
Region 6 - Sensitive

Biology and Ecology

The average tricolor colony size has decreased dramatically (from 300,000 to 10,000 birds) since the 1930's. Overall population has decreased 89 percent during the approximate 50 year span from the 1930's to the 1980's. Despite the reductions in colony size and numbers, the distribution of tricolored blackbirds has not changed significantly since the 1930's.

The present winter range of the tricolored blackbird encompasses the San Francisco Bay area (including the Delta) and the central California coast (DFG 1990a).

Tricolored blackbirds feed on both plant and animal matter, depending mostly on season. In spring and summer the majority of their diet is composed of insects, grasshoppers, and spiders; in fall and winter, seeds and grain crops such as oats and rice constitute the dominant food items. Abundant, concentrated supply of insects is important to the success of tricolor breeding colonies. Foraging occurs on the ground in croplands, grassy fields, flooded land, and along edges of ponds.

Nesting usually occurs in dense stands of cattails (*Typha* sp.) and tules (*Scirpus* spp.), with nests located a few feet above water. Nesting colonies are sometimes transient, frequenting emergent marsh, blackberry thickets, or fallow agricultural fields overgrown with mustards (*Brassica* spp.). The nests are built out of mud and plant materials, and may be located as far as 6.4 km (4mi) from foraging areas. Tricolored blackbirds are highly colonial nesters, requiring nesting areas large enough to support at least 50 pairs. Colonies may breed in different locations from year to year. Roosting areas for large winter flocks usually are in extensive stands of marsh vegetation in the Delta.

Tricolored blackbirds are not migratory over most of their range. Breeding season ranges from mid April through mid July. Nomadic flocks occur in fall seeking food. Tricolored population declines are primarily due to the elimination of wetland habitat, which has decreased from 4 million acres in the 1850's to less than 245,000 acres today. The conversion of wetlands to agricultural and urban uses coupled with the control of formerly abundant insects by pesticides has reduced the reproductive success of tricolor colonies. In one older study conducted in the 1930s, over 90 percent of 250 plus observed breeding colonies were in freshwater marshes dominated by tules and cattails. By contrast, a little over 50 percent of reported colonies were in tules and cattails during the 70's and 80's. A higher percentage of observed colonies existed in marginal habitats with blackberry brambles, thistles, nettles, and other vegetation.

Because of their proximity to open water, marshes serve as a protective barrier for tricolor nesting colonies. As these optimal nesting sites decline in size and numbers, predation becomes more repetitive, resulting in increased loss and abandonment of colonies. In smaller marshes, many nests must be situated near edges that offer easy access for ground predators and humans. Increased competition with other species of marsh nesting birds also results from the decrease in habitat size. Enormous breeding colonies that once typified tricolor populations have been replaced by smaller, fragmented colonies, where higher rates of nesting failures and lower rates of reproductive success occur.

Tricolored blackbirds breed from southern Oregon east of the coast range south through interior California along the Pacific Coast from central California to northwest Baja California. They are Resident from northern California south throughout breeding range and adjacent agricultural areas. Some northern birds are migratory.

Their status is common in the heart of their breeding range such as in California. There are no known sitings on the Malheur National Forest. (Sweeney, Hunt 2001, pers. comm.)

Commonly breed in freshwater marshes of cattail, tule, bulrush, and sage. Roost in the strips along marshes between rice fields. Feed and roost in dense flocks, ranging from a few to 20,000 in a colony, throughout the year. In winter, they move through marshes, open cultivated lands, and pastures. Tricolored blackbirds require cattail or tule marshes as specific habitat needs.

Nests are built of cattails, sedges, grasses, or other aquatic vegetation collected from the surface or in shallow water, and attached to cattails or twigs in shrubs and blackberry thickets, usually near water. They prefer live emergent vegetation for nesting.

Food is gleaned from the ground and low vegetation, consisting of insects, spiders, and occasionally small tadpoles and snails. In winter, they eat rice and a variety of grain crops.

Environmental Baseline

In the Southeast Galena project area, habitat is considered limited. Habitat may be associated with the Middle Fork of the John Day River, but has not been confirmed. There are no known sightings on the Malheur National Forest (Sweeney, Hunt 2001, pers. comm.).

Direct and Indirect Effects – No Action

No new activities would occur with this alternative.

Determination of Impacts

This alternative would not impact (NI) tricolored blackbirds or their habitat.

Direct and Indirect Effects – All Action Alternatives

Habitat is on private land. All proposed activities would occur outside suspected habitat in the area.

Effects of Pesticide/Herbicide Use:

Tables 7 and 8 display treatment acres. Chemicals would only be applied under Alternatives 2 and 5.

Strychnine baiting and Aluminum phosphide fumigation – Animal control would not be conducted in RHCAs. No effects would occur.

Herbicide Applications –There would be no effects tricolored blackbirds from herbicide application; herbicides would not be applied near any suspected habitat.

Determination of Impacts

There will be no impacts (NI)to tricolored blackbirds with the implementation of any of the action alternatives. Habitat is on private land. All proposed activities would occur outside suspected habitat in the area.

Columbia Spotted Frog (Rana luteiventris)

Status: Federal - None
State - Undetermined
Region 6 - Sensitive

Biology and Ecology

Spotted frogs are moderately threatened range-wide; habitat or community lends itself to alternate use. Great Basin population has been adversely affected by habitat degradation resulting from mining, livestock grazing, road construction, agriculture, and direct predation by bullfrogs and non-native fishes (NatureServe 2000). They are fairly resistant and tolerant of nondestructive intrusion. Recent intensive surveys indicate severe declines in the Great Basin populations.

Spotted frogs are highly aquatic and are rarely found far from permanent water. Breeding habitat is usually in shallow water in ponds or other quiet waters along streams. Breeding may also occur in flooded areas adjacent to streams and ponds. Adults may disperse overland in the spring and summer after breeding.

This species occurs in extreme southeastern Alaska, southwestern Yukon, northern British Columbia, and western Alberta south through Washington east of the Cascades, eastern Oregon, Idaho, and western Montana to Nevada (disjunct, Mary's, Reese, and Owyhee river systems), southwestern Idaho (disjunct), Utah (disjunct, Wasatch Mountains and west desert), and western and north-central (disjunct) Wyoming. Disjunct populations occur on isolated mountains and in arid-land springs. In Oregon, Columbia spotted frogs appear to be widely distributed east of the Cascade Mountains.

Environmental Baseline

The spotted frog is considered present in all subbasins on the Malheur National Forest. It is assumed widely distributed in the project area. No habitat surveys have been conducted specifically for spotted frog; however, habitat probably exists along most perennial and some intermittent streams. Fish surveys record incidental sightings of non-fish species. During 1996 fish surveys, spotted frogs were reported in the Davis/Placer subwatershed, along the Davis and Placer Creeks. It is likely that spotted frogs occur in other stream reaches.

Direct and Indirect Effects – No Action Alternative

No direct impacts would occur with this project. Roads in RHCAs would continue to confine stream channels and restrict frog habitat by inhibiting the expansion of wetlands that were reduced or degraded by road construction where these habitats were.

Cumulative Effects

Road construction, grazing, and logging within RHCAs have removed spotted frog habitat. Through various mechanisms, these activities have contributed to a lower water table, and some habitat has dried. This alternative will not contribute to cumulative effects.

Determination of Impacts

This alternative would not impact (NI) Columbia spotted frogs or their habitat.

Direct and Indirect Effects – All Action Alternatives

Commercial and precommercial harvest would have minimal adverse effects to Columbia spotted frogs of or their habitat. Overall, streams would be protected with PACFISH RHCA buffers. There will be limited commercial/precommercial thinning of conifer trees on 28 acres associated with aspen restoration. In the Vincent and Vinegar subwatersheds, trees blown down in a 1998 windstorm would be removed from 72 acres in the outer half of RHCAs in the headwaters of Vincent Creek. Felling or removal of trees may result in direct mortality to spotted frogs. Effects to habitat would be considered minimal.

Several road-related activities would be conducted within RHCAs. Approximately 0.12 miles of open road would be constructed, about 23 miles of road would be reconstructed or maintained, and about22 miles of road would be decommissioned. These activities have the potential to adversely affect spotted frog habitat by increasing fine sediments in the short-term. Best management practices (BMPs) are incorporated into standard road maintenance and reconstruction practices, and standard contact language. The proposed design criteria and application of BMPs would reduce the probability and magnitude of the short-term risks. In the mid- to long-term, reconstruction and maintenance would reduce the chronic sediment production of existing roads by improving drainage, removing ruts and rills from the driving surface, replacing or adding drainage structures, and adding less erosive surfacing material. Road decommissioning is designed to benefit water quality and habitat in the mid- to long-term by improving filtration, restoring ground cover, and reducing sediment yield. Actions that reduce sedimentation, such as dust abatement, would remove adverse affects of these alternatives.

Channel/floodplain rehabilitation projects on 2 miles in Vincent Creek and 1 mile in Deerhorn Creek would entail the use of heavy equipment in RHCAs to reestablish channels and floodplains by connecting relic channels or constructing new channels. Channel/floodplain rehabilitation would occur only in Alternatives 2 and 5. Seventy-two instream structures would be installed and 36 existing structures would be improved. In the short-term, these projects would create short-term sediment increases. Instream projects would improve aquatic habitat by creating deep, self-maintaining pools, decreasing width to depth ratios, reconnecting floodplains, improving base flows and maintaining stream temperatures.

Prescribed burning would occur in RHCAs. Ignition is not planned within RHCAs; rather, fire from upslope burning units would be allowed to back into RHCAs. This activity has low potential for causing adverse effects to spotted frogs and their habitats. Design criteria include retention of at least 95% of stream shade. The prescribed burning would be conducted under moisture and temperature conditions that would minimize the potential for a hot fire. With these planned low intensity burns, very little stream vegetation cover would be expected to burn under the more moist conditions encountered in riparian areas.

Riparian plantings and protection along 21 miles of stream would improve riparian habitat.

Effects of Pesticide/Herbicide Use:

Tables 7 and 8 display treatment acres. Chemicals would only be applied under Alternatives 2 and 5.

Strychnine baiting and Aluminum phosphide fumigation – Animal control would not be conducted in RHCAs. No effects would occur.

Herbicide Applications –The US Forest Service contracted Syracuse Environmental Research Associates Inc. and the Syracuse Research Corporation to compile relevant studies on registered pesticides and to evaluate ecological risks (SERA, 1995, 1996 and 1997). Research on effects on amphibians is limited. For glyphosate, non-lethal or behavior effects on rough-skinned newts could not be detected following applications in Pacific Northwest forests (McComb 1990). Only one hexazinone study on amphibians is available in the literature and it suggest that amphibians are less sensitive to hexazinone than fish or aquatic invertebrates (SERA 1997). The SE Galena Restoration Project Fisheries Report indicated that risks to aquatic species would be low. In RHCAs, herbicides would be used on only 1.5 acres, using a wick applicator. No effects to Columbia spotted frogs would be expected.

See the Southeast Galena Restoration Project Wildlife and Fisheries Reports for additional discussion on chemical effects.

Cumulative Effects

Cumulative effects are the same as the no action alternative. These alternatives will reduce, but not eliminate, the cumulative effects of roads on spotted frog habitat by closing or decommissioning roads.

Determination of Impacts

The action alternatives may impact individuals or habitat in the short-term, (MIIH) but will not likely contribute toward federal listing or loss of viability to the population or species. In the long-term, riparian restoration would likely have a beneficial effect (BI) on spotted frogs.

Western sage grouse (Centrocercus urophasianus phaios)

Status: Federal – Species of Concern

State - Undetermined

Region 6 – Sensitive

Biology and Ecology

Sage grouse are residents of sagebrush habitat, usually inhabiting sagebrush-grassland or juniper (Juniperus spp.)-sagebrush-grassland communities. Meadows surrounded by sagebrush may be used as feeding grounds (Johnsgard 1973). Sage grouse use sagebrush of different age classes and stand structures as lekking, nesting, brooding, and wintering grounds. Neither expansive dense sagebrush nor expansive open areas constitute optimal sage grouse habitat. Sage grouse once occurred virtually everywhere there was sagebrush. Habitat loss, primarily due to overgrazing, sagebrush elimination, and land development, caused their decline (Hamerstrom and Hamerstrom 1961).

Environmental Baseline

On the Malheur National Forest, sage grouse habitat is primarily associated with the larger expanses of sagebrush habitat located on the southern end of the Forest. In the Southeast Galena project area, sagebrush habitats and juniper/sagebrush habitats are very limited, probably providing marginal habitat at best. About 1,650 acres of dry shrublands and 1,400 acres of juniper woodlands could potentially support sage grouse.

Direct and Indirect Effects – No Action

No new activities would occur with this alternative.

Determination of Impacts

This alternative would not impact (NI) western sage grouse or their habitat.

Direct and Indirect Effects – All Action Alternatives

Prescribed burning would be used primarily in forested areas. Fire may burn along perimeters of juniper/sagebrush openings, but the general intent is to not burn through these habitats. The more significant sagebrush areas are located at higher elevations, where prescribed fire is not prescribed. Habitat for western sage grouse is very limited in the project area and likely of low quality.

Effects of Pesticide/Herbicide Use:

Tables 7 and 8 display treatment acres. Chemicals would only be applied under Alternatives 2 and 5.

Strychnine baiting and Aluminum phosphide fumigation – Animal control would not be conducted in habitat. No effects would occur.

Herbicide Applications –There would be no effects to grouse from herbicide application; herbicides would not be applied near any suspected habitat.

Determination of Impacts

The action alternatives would not impact (NI) western sage grouse or their habitat.

Gray flycatcher (Empidonax wrightii)

Status: Federal - N/A
State - N/A
Region 6 - Sensitive

Biology and Ecology

The gray flycatcher prefers relatively treeless areas with tall sagebrush, bitterbrush, or mountain mahogany communities, but is also associated with pinyon-juniper woodland with understory sagebrush, and open ponderosa pine forests (Csuti et al. 1997). This species in most abundant in extensive tracts of big sagebrush, often selecting areas along washes where the sagebrush is especially tall. In the western Great Basin, this species nests in tall big sagebrush shrublands (Ryser 1985).

During the nonbreeding season, this species commonly inhabits arid scrub, riparian woodland, and mesquite (NatureServe 2000).

Breeding range covers extreme southern British Columbia and south-central Idaho south to southern California, southern Nevada, central Arizona, south-central New Mexico, and locally western Texas (NatureServe 2000). In Oregon, this species is typically found east of the Cascade Mountains (Csuti et al. 1997).

Birds winter in southern California, central Arizona, south to Baja California and south-central mainland of Mexico (NatureServe 2000).

North American BBS (Breeding Bird Survey) shows a survey-wide significantly increasing trend of 10.2 percent average per year (n = 89) during the 1966-1996 sample period; a nonsignificant decline of -1.0 percent average per year (n = 22) during 1966-1979; and a significant increase from 1980 to 1996 of 10.0 percent average per year (n = 84) (Sauer et al. 1997). Data for Oregon reflects a strong long-term increase of 7.9 percent average per year (n = 29) during the 1966-1996 period (Sauer et al. 1997).

This species would be vulnerable to land clearing, but generally found in very arid environments that are not usually converted to agriculture (USDA Forest Service 1994). Clearing of pinyon-juniper in favor of grassland for livestock grazing or widespread harvesting of pinyon-juniper could be detrimental.

Environmental Baseline

About 1,400 acres of juniper woodlands, 1,450 acres of dry meadows and grasslands, 1,650 acres of dry shrublands, and 860 acres of moist meadows that could provide gray flycatcher habitat occur in the project area. All of these acres are not necessarily in a condition that will support this species. Quality sagebrush communities, for example, are relativity rare. Numerous mountain mahogany stands and some bitterbrush occur as small inclusions in other forested habitat types. Because they are small, they were not mapped separately; therefore, acres for these types are not available.

Direct and Indirect Effects – No Action alternative

No new activities would occur with this alternative.

Determination of Impacts

This alternative would not impact (NI) gray flycatchers or their habitat.

Direct and Indirect Effects – Common to all action alternatives

No commercial harvest is planned within gray flycatcher habitat. Prescribed burning is generally not proposed for woodland habitats. If prescribed fire in conifer forests does burn through adjacent woodlands, effects would be minimal. Because of the limited continuity of fuels, low to moderate burning would have little effect on junipers, grasses and forbs. Burning under these site conditions would result in a mosaic burn that would enhance conditions for the gray flycatcher. Hardwood, aspen and cottonwood, protection and restoration are planned and would be implemented by each action alternative. Hardwood sites are quite small, usually less than two acres. As hardwood reproduction matures and becomes suitable for perching and nesting, more habitat would be created by this activity. Aspen is expected to increase in stem density and, in some cases, the acreage covered by the stand will increase also.

Effects of Pesticide/Herbicide Use:

Tables 7 and 8 display treatment acres. Chemicals would only be applied under Alternatives 2 and 5.

Strychnine baiting and Aluminum phosphide fumigation – Animal control would not be conducted in habitat. No effects would occur.

Herbicide Applications –There would be no effects to flycatchers from herbicide application; herbicides would not be applied near any suspected habitat.

Determination of Impacts

Because habitat acreage would not change, this project will not impact (NI) the gray flycatcher or its habitat.

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Past, Ongoing, and Reasonably Foreseeable Activities in the Galena Watershed

Special Use Permits	General Location	Activities/Description
Communication Facilities	Top of Dixie Butte	Lease for use and maintenance of communication facilities on top of Dixie Butte. Site occupies about 0.4 acres and is in the corner of Butte, Tincup/Little Butte, and Deerhorn/Little Boulder subwatersheds (SWSs). Activity is not within an RHCA.
Gauging Station	Confluence of Middle Fork John Day (MFJD) River and Camp Creek	Permit for river future gauging station. Site occupies about 0.1 acres and is within the Coyote/Balance SWS. Activity is within an RHCA.
Overhead Power Lines	Southeast portion of Galena Watershed (near Highway 26)	Permit is for use and maintenance of Prairie City-Sumpter power lines. Permit allows use of pole trucks, pickups, backhoes, and other line maintenance and equipment to replace power poles, repair lines, and cut hazard trees. Power line corridor occupies about 18 acres and is within the Davis/Placer SWS. A portion of the activity is within RHCAs.
Overhead Power Lines	Along the MFJD River and County Road 20	Permit is for Mosquito Creek-Granite Boulder Creek power lines. Permit allows use of pole trucks, pickups, backhoes, and other line maintenance and equipment to replace power poles, repair lines, and cut hazard trees. Power line corridor occupies about 26 acres and is within the Mosquito/Bear, Elk/Jungle, Coyote/Balance, Sunshine/Dry, Ruby/Beaver, and Granite Boulder SWSs. A portion of the activity is within RHCAs.
Overhead Power Lines	Near confluence of Cress Creek and MFJD River	Permit is for Cress Creek power lines. Permit allows use of pole trucks, pickups, backhoes, and other line maintenance and equipment to replace power poles, repair lines, and cut hazard trees. Power line corridor occupies about 2 acres and is within the Coyote/Balance SWS. A portion of the activity is within RHCAs.
Overhead Power Lines	Southeast portion of Galena Watershed (near Highway 26)	Permit is for Austin-Long Creek power lines. Permit allows use of pole trucks, pickups, backhoes, and other line maintenance and equipment to replace power poles, repair lines, and cut hazard trees. Power line corridor occupies about 11 acres and is within the Davis/Placer SWS. A portion of the activity is within RHCAs.
Buried Telephone Cable	Near County Road 20 and Forest Road 4550018	Permit is for buried telephone cable. Permit allows use of backhoe, cable plow, and shovels to install and repair buried line. Buried line occupies about 16 acres and is within the Coyote/Balance and Sunshine/Dry SWSs. A portion of the activity is within RHCAs
Pasture Grazing	County Road 20 and Cress Creek	Permit is for allows nine animals for one animal unit month (AUM) to graze 19 acres of pasture from June 1 to October 30—not to exceed one AUM in any one year between the stated dates. Maintenance of fence line is allowed from Forest Road 2000385. Activity is not within RHCAs.
Galena Cemetery	Near the town of Galena on County 20	Permit allows fence repair, lawn mowing, and a backhoe to dig new graves. Site occupies about 2 acres and is within the Elk/Jungle SWS. Activity is not within RHCAs.
Domestic Water/Spring Development	Near the town of Galena on County 20	Permit allows maintenance of domestic water transmission lines, spring boxes, and storage tanks with backhoes and shovels. Sites occupy about 1 acre and are within Elk/Jungle SWS. Activity is within an RHCA.
Domestic Water/Spring Development	Near the town of Galena on County 20	Permit allows development and operation of a new spring to supplement existing spring development. Site occupies about 1 acre and is within the Elk/Jungle SWS. Activity is within an RHCA.

Irrigation Ditch	Near confluence of Jungle Creek and MFJD River	Permit allows maintenance of water diversion structures with backhoes and shovels in Elk/Jungle SWS. Site occupies about 1 acre. Fish bearing streams will have fish screen installed and maintained by Oregon Department of Fish and Wildlife. Water use is regulated by State water rights and is generally from April-September each year. Activity is within an RHCA.
Irrigation Ditches	Near Vinegar Creek	Permit allows maintenance of water diversion structures with backhoes and shovels in Vinegar SWS. Site occupies about 3 acres. Fish bearing streams will have fish screen installed and maintained by Oregon Department of Fish and Wildlife. Water use is regulated by State water rights and is generally from April-September each year. Activity is within an RHCA.
Irrigation Ditches	Near Granite Boulder Creek	Permit allows maintenance of water diversion structures with backhoes and shovels in Granite Boulder SWS. Site occupies about 15 acres. Fish bearing streams will have fish screen installed and maintained by Oregon Department of Fish and Wildlife. Water use is regulated by State water rights and is generally from April-September each year. Activity is within an RHCA.
Irrigation Ditches	Near Vincent Creek and Vinegar Creek	Permit allows maintenance of water diversion structures with backhoes and shovels in Vincent and Vinegar SWSs. Site occupies about 2 acres. Fish bearing streams will have fish screen installed and maintained by Oregon Department of Fish and Wildlife. Water use is regulated by State water rights and is generally from April-September each year. Activity is within an RHCA.
Private Road Access	Near Pizer Creek and Forest Road 2090048 in NW portion of watershed	Permit allows use and maintenance of Forest Road 2090048. Road is currently gated at the junction of 2090048 and 2090199. Use is restricted to permittee and authorized Forest personnel. Site occupies about 1 acre and is in Big SWS. Activity is within an RHCA.
Private Road Access	Near Mosquito Creek and Forest Road 2000665	Permit allows construction and use of Forest Road 2000665 to access private land. Site occupies about ½ acre and is in the Mosquito/Bear SWS. Activity is not within an RHCA
Private Road Access	Near Sunshine Creek	Permit allows cross-country access on existing skid trail to walk logging equipment to private lands. Permit was authorized from 1/7/00 to 8/31/00. Site occupies about 2 acres and is within the Sunshine/Dry SWS. Activity is not within an RHCA.

Engineering Activities	**General Location**	**Activities/Description**
Middle Fork John Day Bridge	Bridge across MFJD River on Forest Road 36	Replacement of existing single-lane bridge constructed in 1957 with a new double-lane bridge in Coyote/Balance SWS. New bridge will handle 100-year flows and debris passage, while enhancing user safety. Associated activities include installing a temporary bridge while permanent one is being installed, in-stream placement of four bendway weirs (using boulders) to halt channel migration at and near the bridge, and asphalt paving of the bridge approaches. Activity is within an RHCA and scheduled for completion in 2000 or 2001.
Surface Rock Replacement	Summit Fire Area	Replace surface rock on portions of the 45, 4550, 4560, 4555350, 2000045, and 2000893 roads. Activities include crushing and stockpiling about 50,000 cubic yards. About half of this aggregate will be placed on the roads in 2000, with the other half placed in 2001. The layer of rock placed will range from four to eight inches in thickness and will be placed on the roads following blading and shaping. Activity is within the Mosquito/Bear, Coyote/Balance, Big Boulder, Elk/Jungle, Sunshine/Dry, Tincup/Little Butte, and Beaver/Ruby SWSs and is also within RHCAs.

Highway 26 Reconstruction	Highway 26 from Austin Junction to Blue Mountain Summit	Reconstruct 10 miles of Highway 26 to meet current State highway standards. Activities include widening, minor horizontal and vertical grade adjustments, slope stabilization, improve some road junctions and close others, replace all cross drainages, place base rock, and lay new asphalt. All fish bearing stream crossings will be designed for fish passage and 100-year flow events. Activity is complete and is within the Clear, Dry Fork, Phipps Meadow, Squaw Creek, Idaho Creek, and Summit Creek SWSs—these subwatersheds are not within the Southeast Galena Project Area, but are within the MFJD River sub-basin. Activities are also within RHCAs.
Jet Fuel Spill Cleanup	County 20 near Galena	Continued monitoring and cleanup of November 1998 jet fuel spill. Activities include replacement of soil removed and cleaned Fall 2000 and two or three years of monitoring to ensure no chemical is leaching out of replaced soil. Activity is located in Mosquito/Bear SWS.

Forest Products & Other Related Activities	**General Location**	**Activities/Description**
V V Beetle Reduction	Headwaters of Vinegar Creek near Vinegar Hill	Beetle reduction project located in the blow down area following the July 1998 windstorm. Activities include placing about 150 beetle traps treated with pheromones to attract and capture bark beetles and placing bubble caps of MCH to repel insects from riparian areas. Project is scheduled to be completed xx years. Activities are located in Vincent and Vinegar SWSs and RHCAs.
Moe Timber Sale	Near Little Boulder Creek and Forest Road 2055	Timber sale was sold in 1997 and is about 20 percent completed. Sale was for about 8 million board feet of thinning and salvage harvesting over about 2,500 acres. Remaining activities include harvesting, implementing road closures, and brush disposal.
NW Galena Restoration	NW portion of Galena Watershed	Analysis is expected in 2002 and 2003 with implementation in 2004. Activities are expected to include thinning, harvesting, prescribe fire, riparian enhancement, and update existing access and travel management plans. Analysis area may include Big, Balance, Sunshine, and Ruby SWSs and may include RHCA enhancement. A mix of helicopter, skyline, and tractor logging systems would be used.
Mushroom Collecting	All areas of the watershed	Use is generally in moist forest types and during the late spring and early summer. Impacts to the watershed usually include erosion and sedimentation caused by vehicles breaching closed roads during wet periods. Use has tapered off over the last few years.
Horn Collecting	All areas of the watershed	Use is generally during the spring and early summer. Impacts to the watershed usually include erosion and sedimentation caused by vehicles breaching closed roads during wet periods and ATVs driving cross-country. Use has increased over the last few years.
Firewood Cutting	All areas of the watershed	Use is generally late spring through late fall. Impacts to the watershed usually include erosion and sedimentation caused by vehicles breaching closed roads during wet periods and a reduction in suitable snags for wildlife, especially along open roads. Use has tapered off over the last few years.

Mining Activities	**General Location**	**Activities/Description**
42 Placer Claims	Across the project area	Includes deposits of unconsolidated materials, such as sand and gravel containing free gold or other minerals and many nonmetallic bedded or layered deposits. The maximum size of a placer claim is 20 acres per locator.

20 Lode Claims	Across the project area	These claims are usually parallelogram with the longer side lines parallel to the vein or lode. They are located by metes and bounds (giving length and direction by each boundary line). They are limited by stature to a maximum of 1,500 feet in length along the vein or lode and 300 feet on either side.

Grazing Activities	**General Location**	**Activities/Description**
Lower Middle Fork Allotment	North half of Galena Watershed	Allotment is about 58,000 acres in size and has a carrying capacity of about 550 cows and about 3,700 animal unit months (AUMs). Grazing activity is within the Big, Mosquito/Bear, Jungle/Elk, Big Boulder, Coyote/Balance, Dry/Sunshine, Beaver/Ruby, and Granite Boulder SWSs. Activity is permitted for about four months a year (usually May-September) and is within RHCAs.
Upper Middle Fork Allotment	South half of Galena Watershed	Allotment is about 55,000 acres in size and has a carrying capacity of about 475 cows and about 2,900 AUMs. Grazing activity is within Beaver/Ruby, Butte, Tincup/Little Butte, Deerhorn/Little Boulder, Davis/Placer, Vincent, and Vinegar SWSs. Activity is permitted for about four months a year (usually May-September) and within RHCAs
Slide Creek Allotment	Western portion of Galena Watershed—not all of the allotment is within the Galena Watershed	Allotment is about 8,500 acres in size and has a carrying capacity of about 775 cows and about 4,600 AUMs. Grazing activity is within the Mosquito/Bear and Jungle/Elk SWSs. Activity is permitted for about four months a year (usually May-September) and within RHCAs
Bear Creek Allotment	Western portion of Galena Watershed near Mosquito Creek and County Road 20	Allotment is about 1,600 acres in size and has a carrying capacity of about 80 cows and about 500 AUMs. Grazing activity is within the Mosquito/Bear SWS. Activity is permitted for about four months a year (usually May-September) and within RHCAs
Balance Creek Allotment	Near Balance Creek and County Road 20—not all of the allotment is within the Galena Watershed	Allotment is about 300 acres in size and has a carrying capacity of about 10 cows and about 60 AUMs. Grazing activity is within the Coyote/Balance SWS. Activity is permitted for about four months a year (usually May-September) and within RHCAs
Camp Creek Allotment	Near Camp Creek and Forest Road 36—not all of the allotment is within the Galena Watershed	Allotment is about 300 acres in size and has a carrying capacity of about 50 cows and about 250 AUMs. Grazing activity is within the Jungle/Elk SWS. Activity is permitted for about four months a year (usually May-September) and within RHCAs

Watershed Improvement	**General Location**	**Activities/Description**
Riparian Enhancement	Summit Fire area	Within portions of Beaver, Dry, Big Boulder, Coyote, Elk, and Big subwatersheds, plant hardwoods and protect them (cage/fence) on about 10 miles of riparian area; protect about 5 miles of naturally growing hardwoods; place stream baffles and large wood on about 5 miles of stream; rehabilitate about 50 acres of moist meadows.
Water Quality Monitoring	Galena Watershed and adjoining watersheds	Through Spring 2001, monitor water quality (including sediment) in the Summit Fire area and throughout the MFJD sub-basin.

NW Galena Riparian Enhancement	NW portion of Galena Watershed	Projects may be included in the Big, Balance, Sunshine, Ruby, and Granite Boulder subwatersheds. Proposals may include 30 miles of hardwood and conifer planting and protecting (fence/cage). Another 30 miles of naturally growing hardwoods would be protected (fence/cage). About 200 acres of wet meadows would be rehabilitated. Stream baffles and large wood on about 30 miles of stream may be included along with rehabilitation of about 30 former log landing sites located within riparian areas. Proposal may include less than a mile of heavy equipment to improve stream meander within the tailings on the Middle Fork. Analysis is expected to begin in 2003.
Riparian Enhancement/Channel Restoration	Middle Fork of John Day River	Confederate Tribes of Warm Springs has entered into a long-term lease of riparian area along the Middle Fork. These area have been excluded from cattle use and will receive channel restoration work with purpose of improving connectivity of streams for fish passage.
Riparian Enhancement	In Southeast Galena Project Area	Plant and protect hardwoods (cage/fence) on about 12 miles of stream in Vinegar, Tincup, Placer, and Deerhorn drainages.

Other Actions	**General Location**	**Activities/Description**
Noxious Weed Spraying	Along County Road 20	Ongoing spaying weed killer of noxious weed by the County.
Malheur Noxious Weed Control	Forest Wide	The Southeast Galena Project Area is located within the Middle Fork John Day Sub-Basin of which was included within this Forest Wide analysis. Treatments of noxious weeds in the Middle Fork John Day Sub-Basin include about 94 acres of biological control, 81 acres of herbicide control, and 15 acres of manual control equaling about 190 acres.

Activities on Private Land	**General Location**	**Activities/Description**
Grazing	Along MFJD River and County Road 20	Livestock grazing is expected to continue along the MFJD River on private lands.
Timber Harvest	The Nature Conservancy Lands along the MFJD River	The majority of the harvesting has taken place. Activities included partial removal salvage of about 130 acres burned by the Summit Fire.

Appendix "D" Recommended Silvicultural Treatments

Alternative 2

February 22, 2002

Unit	Acres	Harvest Rx	Harvest System	Volume Per Acre	Unit Volume (MBF)	Precommercial Thinning (acres)	Remarks
2	6	HSH	S	5	30		
3	7	HSH	T	5	35		
4	12	HSH	H	5	60		
6	70	HSH	S	5	350		
7	29	HSH	S	4	116		
8	26	HSH	S	5	130		
9	24	HSH	S	3	72		
10	22	HSH	T	3	66		
11	45	HSH	T	4	180		
12	32	HSH	T	3	96		
13	60	HSH	S	3	180		
15	42	HSH	S	2	84		
17	16	HUR	H	4	64		
18	10	HUR	S	4	40		
21	15	HTH	T	3	45	15	
23	4	HTH	T	4	16		
24	7	HTH	T	3	21		
25	86		T		0	86	SPC1
26	5	HTH	T	2	10	5	
27	55	HTH	T	6	330		
28	66	HTH	T	3	198		
29	73	HTH	S	4	292		
30	26	HTH	T	4	104		
32	17	HTH	S	5	85		
33	13	HTH	T	4	52		
34	19	HTH	T	2	38		
35	54	HTH	T	4	216		
36	128	HTH	T	5	640		
37	48	HTH	T	3	144		
38	17	HTH	T	5	85		
40	34	HTH	T	2	68		
41	17	HTH	S	2	34		
44	18	HTH	T	2	36		
45	60	HTH	T	4	240		
46	28	HTH	T	3	84		
47	5	HTH1	T	5	25		
48	21	HTH1	T	4	84		
49	21	HTH1	S	2	42		
60	40	HTH	H	6	240		
62	13	HTH	H	4	52		
64	18	HTH1	H	4	72		
66	23	HTH	H	4	92		
100	69	HTH	T	4	276	69	

102	125	HTH	T	5	625		
104	73	HTH	T	4	292	73	
106	114	HTH	T	6	684		
108	88	HTH	T	3	264		
109	32		T		0	32	
110	47	HTH	T	2	94		
114	93	HSH	T	3	279		
116	99	HTH	T	3	297		
117	210		T		0	210	
118	32	HTH	T	2	64		
119	11	HTH	T	3	33		
120	11	HTH	T	2	22		
121	106		T		0	106	
122	79	HSH	T	8	632		
125	24		T		0	24	
126	68	HTH	T	2	136	68	
130	40	HSH	T	5	200		
132	51	HTH	T	8	408		
134	44	HSH	T	8	352		
136	19	HTH	T	3	57		
138	99	HSH	T	2	198		
144	45	HUR	T	2	90		
150	20	HSH	H	5	100		
152	10	HUR	H	9	90		
154	10	HUR	S	9	90		
156	18	HSH	S	7	126		
160	10	HSH	H	7	70		
162	35	HUR	H	7	245		
170	54	HUR	S	6	324		
172	11	HUR	T	2	22		
174	7	HUR	T	6	42		
176	14	HUR	S	6	84		
178	16	HUR	S	6	96		
180	21	HUR	S	7	147		
182	8	HTH	S	8	64		
184	17	HTH	T	8	136		
186	33	HUR	T	5	165		
188	39	HUR	S	5	195		
194	31	HUR	S	5	155		
195	43				0	43	
196	65	HTH	T	3	195		
198	191	HTH	T	3	573		
200	68	HTH	T	5	340		
201	37	HTH	T	5	185		
202	22	HTH	S	5	110		
203	11	HTH	T	5	55		
206	11	HTH	T	5	55	11	
208	11	HTH	T	5	55		
220	5	HTH	T	3	15		
222	18	HTH	S	3	54		
224	46	HTH	S	3	138		
226	13	HTH	T	3	39		

232	45	HTH	T	7	315		
236	48	HSH	T	9	432		
237	42		T		0	42	
242	13	HTH1	S	5	65	13	SPC1
244	27	HTH1	T	5	135		
246	23	HTH1	T	5	115	23	SPC1
252	22	HTH1	S	5	110	22	SPC1
254	44	HTH1	T	5	220		
256	64	HTH1	T	3	192	64	SPC1
271	16				0	16	SPC1
272	35	HTH1	T	4	140		
275	54				0	54	SPC1
276	9	HTH1	H	4	36	9	SPC1
278	14	HTH1	T	4	56	14	SPC1
279	69	HTH1	T	1	69	69	Aspen Enhancement/SPC1
283	22	HTH1	T	2	44	22	SPC1
284	42	HTH	S	3	126	42	
286	30	HTH	H	3	90	30	
288	24	HTH	S	3	72	24	
290	32	HTH	T	4	128	32	
292	7	HTH	S	3	21	7	
294	37	HTH	H	7	259	37	
296	13	HTH	T	7	91	13	
298	20	HTH	H	3	60	20	
300	15	HTH	S	3	45	15	
304	8	HTH1	T	3	24	8	SPC1
306	11	HTH1	S	3	33	11	SPC1
308	6	HTH1	S	6	36	6	SPC1
310	59	HTH1	T	6	354	59	SPC1
316	31	HUR	S	5	155		
318	17	HTH	S	5	85	17	
320	44	HUR	S	5	220		
322	33	HUR	T	5	165		
324	44	HTH	T	5	220	44	
326	16	HUR	T	5	80		
328	11	HUR	S	3	33		
330	6	HSH	S	6	36		
332	50	HUR	T	3	150		
334	28	HSH	H	7	196		
336	20	HSH	S	6	120		
338	34	HSH	H	4	136		
340	84	HSH	S	8	672		
344	26	HSH	H	9	234		
346	12	HSH	S	6	72		
348	35	HUR	H	2	70		
350	57	HSV	H	6	342		
352	45	HSV	H	7	315		
354	61	HSV	H	5	305		
356	50	HSV	H	4	200		
358	20	HSV	H	4	80		
360	12	HSV	H	5	60		
400	19	HTH	T	3	57		

402	15	HTH	T	3	45		
404	30	HTH	T	3	90		
406	102	HTH	T	5	510		
408	103	HTH	T	3	309		
410	28	HTH	T	4	112		
412	17	HTH	T	3	51		
414	41	HTH	T	3	123		
416	11	HTH	T	3	33		
418	32	HTH	T	3	96		
420	20	HSH	T	9	180		
428	28	HTH	S	4	112		
430	9	HTH	T	3	27		
432	104	HTH	T	3	312		
436	58	HTH	T	3	174		
442	43	HTH	T	5	215		
448	24	HTH	T	6	144		
450	62	HTH	S	6	372		
454	16	HTH	T	6	96		
456	19	HSH	T	6	114		
458	40	HSH	T	6	240		
460	49	HSH	T	8	392		
462	11	HTH	S	2	22		
464	9	HTH	T	5	45		
466	38	HTH	S	2	76		
468	26	HTH	T	2	52		
470	25	HTH	H	5	125		
472	31	HTH	H	5	155		
474	23	HSH	H	5	115		
480	17	HTH	H	5	85	17	
482	39	HTH1	T	4	156		
484	32	HTH1	T	6	192		
488	45	HTH1	S	3	135	45	SPC1
490	70	HTH1	H	8	560	70	SPC1
492	37	HTH1	S	5	185	37	SPC1
494	6	HTH1	T	4	24	6	SPC1
496	18	HTH1	T	3	54		
500	36	HTH1	H	4	144	36	SPC1
502	16	HTH1	T	3	48		
504	30	HTH1	S	3	90		
510	72	HTH1	S	2	144	72	SPC1
512	8	HTH1	H	2	16	8	SPC1
514	24	HTH1	S	4	96	24	SPC1
516	17	HTH1	T	4	68	17	SPC1
518	26	HTH1	S	3	78		
520	46	HTH1	S	5	230	46	SPC1
522	32	HTH1	S	4	128		
526	9	HTH1	S	3	27	9	SPC1
528	10	HTH1	T	3	30	10	SPC1
529	46		T		0	46	SPC1
531	8	HTH1	T	2	16	8	Aspen Enhancement/SPC1
600	50	HTH1	T	3	150		
602	13	HTH1	T	2	26	13	SPC1

603	25	HTH1	T	2	50	25	SPC1
604	46	HTH	T	3	138		
606	13	HTH1	T	16	208		
608	23	HTH1	H	16	368		
612	19	HTH	T	4	76	19	
614	40	HTH	T	3	120	40	
616	14	HTH	S	2	28	14	
618	122	HTH	T	7	854		
620	160	HTH	T	2	320	160	
622	26	HTH	T	5	130		
624	43	HTH	T	2	86	43	
626	41	HTH	H	2	82	41	
628	11	HTH	H	4	44		
630	14	HTH	S	5	70	14	
632	119	HTH	T	5	595	119	
634	47	HTH	S	7	329		
636	85	HTH	T	5	425	85	
642	20	HUR	H	3	60		
643	45	HTH	H	4	180	45	
644	19	HTH	T	4	76	19	
646	46	HTH	H	4	184	46	
648	27	HTH	S	7	189	27	
649	7	HTH	S	6	42	7	
650	55	HTH	S	6	330		
651	58	HTH	S	6	348		
652	84	HTH	H	7	588		
654	50	HTH	H	7	350	50	
656	11	HTH	T	4	44		
658	146	HTH	T	6	876		
660	27	HTH	H	6	162		
666	14	HTH	H	6	84		
672	62	HSH	H	4	248		
673	25	HSH	H	5	125		
674	20	HSH	H	4	80		
675	29	HTH	H	6	174	29	
676	31	HTH	H	5	155	31	
678	53	HSH	H	4	212		
680	45	HUR	H	3	135		
702	111	HTH	H	11	1221		
704	22	HUR	H	7	154		
706	40	HUR	H	7	280		
708	9	HTH	H	5	45		
710	60	HUR	H	5	300		
714	47	HTH	H	4	188		
715	60	HUR	H	4	240		
716	35	HSH	H	5	175		
718	43	HTH	H	4	172		
720	92	HTH	H	4	368		
722	38	HTH	H	3	114		
724	34	HTH	H	5	170		
726	39	HTH	H	4	156		
728	67	HTH	H	5	335	67	ROG - Modified Rx

730	70	HTH	H	4	280		
732	46	HTH	H	4	184		
734	67	HTH	H	4	268		
800	16	HTH	T	2	32	16	
802	3	HTH	S	2	6		
804	27	HUR	S	4	108		
805	39				0	39	
806	33	HSH	S	5	165		
808	23	HSH	H	4	92		
810	15	HSH	H	3	45		
815	154				0	154	
816	36	HSH	S	8	288		
818	6	HSH	S	5	30		
820	26	HSH	T	6	156		
822	38	HSH	S	6	228		
824	55	HSH	S	4	220		
826	7	HSH	H	7	49		
830	26	HSH	H	4	104		
832	18	HSH	S	6	108		
834	13	HSH	T	6	78		
836	11	HSH	S	6	66		
838	7	HUR	S	4	28		
840	26	HUR	T	4	104		
842	5	HTH	H	6	30	5	
844	19	HTH	T	6	114	19	
845	27		T		0	27	
846	30	HTH	H	3	90	30	
848	17	HTH	H	3	51	17	
850	21	HTH	S	2	42		
852	96	HTH	H	2	192		
854	6	HTH	S	2	12		
856	13	HTH	S	8	104		
858	64	HTH	H	2	128		
862	29	HTH	H	5	145		
Totals	**10641**			**4.15**	**44136**	**3107**	

Treatment Summary by Subwatershed

HSH	HSV	HTH	HTH1	HUR	SPC	SPC1	Subwatershed
403		1088		326	625		**30201**
258	245	568	426	220	334	390	**30203**
151		899	581		17	434	**30205**
276		1436	124	65	789	38	**30207**
294		1185	97	208	87	86	**30209**
307		545		60	307		**30211**
0	0	0	0	0	0	0	**30213**
1689	**245**	**5721**	**1228**	**879**	**2159**	**948**	**Treatment Totals**

Total Harvest	Total SPC	Total Acres Treated *	Subwatershed
1817	625	2232	**30201**
1717	724	1829	**30203**
1631	451	1677	**30205**
1901	827	1901	**30207**
1784	173	2096	**30209**
912	307	906	**30211**
0	0	0	**30213**
9762	**3107**	**10641**	**Totals**

* Harvest and SPC Acres not totally additive due to SPC in some harvest units.

** Precommercial thin units that show tractor logging system are potential biomass units.

SE Galena Silvicultural Treatments
Alternative 3

February 22, 2002

Unit	Acres	Harvest Rx	Harvest System	Volume Per Acre	Unit Volume (MBF)	Precommercial Thinning (acres)	Remarks
2	6	HSH	S	5	30		
3	7	HSH	T	5	35		
4	12	HSH	H	5	60		
6	70	HSH	S	5	350		
7	29	HSH	S	4	116		
8	26	HSH	S	5	130		
9	24	HSH	S	3	72		
10	22	HSH	T	3	66		
11	45	HSH	T	4	180		
12	32	HSH	T	3	96		
13	60	HSH	S	3	180		
15	42	HSH	S	2	84		
17	16	HUR	H	4	64		
18	10	HUR	S	4	40		
21	15	HTH	T	3	45	15	
23	4	HTH	T	4	16		
24	7	HTH	T	3	21		
25	86		T		0	86	SPC1
26	5	HTH	T	2	10	5	
27	55	HTH	T	6	330		
28	66	HTH	T	3	198		
29	73	HTH	S	4	292		
30	26	HTH	T	4	104		
32	17	HTH	S	5	85		
33	13	HTH	T	4	52		
34	19	HTH	T	2	38		
35	54	HTH	T	4	216		
36	128	HTH	T	5	640		
37	48	HTH	T	3	144		
38	17	HTH	T	3	51		
40	34	HTH	T	2	68		
41	17	HTH	S	2	34		
44	18	HTH	T	2	36		
45	60	HTH	T	4	240		
46	28	HTH	T	3	84		
60	40	HTH	H	6	240		
62	13	HTH	H	4	52		
66	23	HTH	H	4	92		
100	69	HTH	T	4	276	69	
102	125	HTH	T	5	625		
104	73	HTH	T	4	292	73	
106	114	HTH	T	6	684		
108	88	HTH	T	3	264		

109	32		T		0	32	
116	99	HTH	T	3	297		
117	210		T		0	210	
118	32	HTH	T	2	64		
119	11	HTH	T	3	33		
121	106		T		0	106	
125	24		T		0	24	
126	68	HTH	T	2	136	68	
130	40	HSH	T	5	200		
132	51	HTH	T	8	408		
134	44	HSH	T	8	352		
136	19	HTH	T	3	57		
138	99	HSH	T	2	198		
144	45	HSH	T	2	90		
150	20	HSH	H	5	100		
152	10	HUR	H	9	90		
154	10	HUR	S	9	90		
170	54	HUR	S	6	324		
172	11	HUR	T	2	22		
174	7	HUR	T	6	42		
176	14	HUR	S	6	84		
178	16	HUR	S	6	96		
180	21	HUR	S	7	147		
182	8	HTH	S	8	64		
184	17	HTH	T	8	136		
186	33	HUR	T	5	165		
188	39	HUR	S	5	195		
194	31	HUR	S	5	155		
195	43				0	43	
196	65	HTH	T	3	195		
198	191	HTH	T	3	573		
200	68	HTH	T	5	340		
201	37	HTH	T	5	185		
202	22	HTH	S	5	110		
203	11	HTH	T	5	55		
206	11	HTH	T	5	55	11	
208	11	HTH	T	5	55		
220	5	HTH	T	3	15		
222	18	HTH	S	3	54		
224	46	HTH	S	3	138		
226	13	HTH	T	3	39		
232	45	HTH	T	7	315		
237	42		T		0	42	
242	13	HTH1	S	7	91	13	SPC1
244	27	HTH1	T	7	189		
246	23	HTH1	T	7	161	23	SPC1
252	22	HTH1	S	7	154	22	SPC1
254	44	HTH1	T	7	308		
256	64	HTH1	T	3	192	64	SPC1
271	16				0	16	SPC1
272	35	HTH1	T	4	140		
275	54				0	54	SPC1

276	9	HTH1	H	4	36	9	SPC1
278	14	HTH1	T	4	56	14	SPC1
279	69	HTH1	T	1	69	69	Aspen Enhancement/SPC1
283	22	HTH1	T	2	44	22	SPC1
284	42	HTH	S	3	126	42	
286	30	HTH	H	3	90	30	
288	24	HTH	S	3	72	24	
290	32	HTH	T	4	128	32	
292	7	HTH	S	3	21	7	
294	37	HTH	H	7	259	37	
296	13	HTH	T	7	91	13	
298	20	HTH	H	3	60	20	
300	15	HTH	S	3	45	15	
304	8	HTH1	T	4	32	8	SPC1
306	11	HTH1	S	4	44	11	SPC1
308	6	HTH1	S	8	48	6	SPC1
310	59	HTH1	T	6	354	59	SPC1
316	31	HUR	S	5	155		
318	17	HTH	S	5	85	17	
320	44	HUR	S	5	220		
322	33	HUR	T	5	165		
324	44	HTH	T	5	220	44	
326	16	HUR	T	5	80		
328	11	HUR	S	3	33		
330	6	HSH	S	6	36		
332	50	HUR	T	3	150		
334	28	HSH	H	7	196		
336	20	HSH	S	6	120		
338	34	HSH	H	4	136		
340	84	HSH	S	8	672		
344	26	HSH	H	9	234		
346	12	HSH	S	6	72		
348	35	HUR	H	2	70		
350	57	HSV	H	6	342		
352	45	HSV	H	7	315		
354	61	HSV	H	5	305		
356	50	HSV	H	4	200		
358	20	HSV	H	4	80		
360	12	HSV	H	5	60		
400	19	HTH	T	3	57		
402	15	HTH	T	3	45		
404	30	HTH	T	3	90		
406	102	HTH	T	5	510		
408	103	HTH	T	3	309		
410	28	HTH	T	4	112		
412	17	HTH	T	3	51		
414	41	HTH	T	3	123		
416	11	HTH	T	3	33		
418	32	HTH	T	3	96		
420	20	HSH	T	9	180		
428	28	HTH	S	4	112		
430	9	HTH	T	3	27		

432	104	HTH	T	3	312		
436	58	HTH	T	3	174		
442	43	HTH	T	5	215		
448	24	HTH	T	6	144		
450	62	HTH	S	6	372		
454	16	HTH	T	6	96		
456	19	HSH	T	6	114		
458	40	HSH	T	6	240		
462	11	HTH	S	2	22		
466	38	HTH	S	2	76		
468	26	HTH	T	2	52		
470	25	HTH	H	5	125		
472	31	HTH	H	5	155		
474	23	HSH	H	5	115		
480	17	HTH	H	5	85	17	
482	39	HTH1	T	4	156		
484	32	HTH1	T	6	192		
488	45	HTH1	S	3	135	45	SPC1
490	70	HTH1	H	8	560	70	SPC1
492	37	HTH1	S	5	185	37	SPC1
494	6	HTH1	T	4	24	6	SPC1
500	36	HTH1	H	4	144	36	SPC1
502	16	HTH1	T	4	64		
504	30	HTH1	S	4	120		
514	24	HTH1	S	5	120	24	SPC1
516	17	HTH1	T	5	85	17	SPC1
518	26	HTH1	S	4	104		
520	46	HTH1	S	6	276	46	SPC1
522	32	HTH1	S	4	128		
526	9	HTH1	S	4	36	9	SPC1
529	46		T		0	46	SPC1
531	8	HTH1	T	2	16	8	Aspen Enhancement/SPC1
612	19	HTH	T	4	76	19	
614	40	HTH	T	3	120	40	
616	14	HTH	S	2	28	14	
618	122	HTH	T	7	854		
620	160	HTH	T	2	320	160	
622	26	HTH	T	5	130		
624	43	HTH	T	2	86	43	
626	41	HTH	H	2	82	41	
628	11	HTH	H	4	44		
630	14	HTH	S	5	70	14	
632	119	HTH	T	5	595	119	
634	47	HTH	S	7	329		
648	27	HTH	S	7	189	27	
651	58	HTH	S	7	406		
652	84	HTH	H	7	588		
654	50	HTH	H	7	350	50	
656	11	HTH	T	4	44		
658	146	HTH	T	6	876		
800	16	HTH	T	2	32	16	
802	3	HTH	S	2	6		

804	27	HUR	S	4	108		
805	39				0	39	
806	33	HSH	S	5	165		
808	23	HSH	H	4	92		
810	15	HSH	H	3	45		
815	154				0	154	
816	36	HSH	S	8	288		
818	6	HSH	S	5	30		
820	26	HSH	T	6	156		
822	38	HSH	S	6	228		
824	55	HSH	S	4	220		
826	7	HSH	H	7	49		
830	26	HSH	H	4	104		
832	18	HSH	S	6	108		
834	13	HSH	T	6	78		
836	11	HSH	S	6	66		
838	7	HUR	S	4	28		
840	26	HUR	T	4	104		
842	5	HTH	H	6	30	5	
844	19	HTH	T	6	114	19	
845	27		T		0	27	
846	30	HTH	H	3	90	30	
848	17	HTH	H	3	51	17	
Totals	**8207**			**4.01**	**32928**	**2650**	

Treatment Summary by Subwatershed

HSH	HSV	HTH	HTH1	HUR	SPC	SPC1	Subwatershed
248		1030		246	625		**30201**
210	245	568	426	220	334	390	**30203**
102		890	473		17	344	**30205**
116		1032			527		**30207**
259		780		26	20	86	**30209**
307		90		60	307		**30211**
0	0	0	0	0	0	0	**30213**
1242	**245**	**4390**	**899**	**552**	**1830**	**820**	**Treatment Totals**

Total Harvest	Total SPC	Total Acres Treated *	Subwatershed
1524	625	1939	**30201**
1669	724	1781	**30203**
1465	361	1511	**30205**
1148	527	1148	**30207**
1065	106	1151	**30209**
457	307	677	**30211**
0	0	0	**30213**
7328	**2650**	**8207**	**Totals**

* Acres not additive due to SPC in some of the harvest units.

** Precommercial thin units that show tractor logging system are potential biomass units.

SE Galena Silvicultural Treatments
Alternative 4

February 22, 2002

Unit	Acres	Harvest Rx	Harvest System	Volume Per Acre	Unit Volume (MBF)	Precommercial Thinning (acres)	Remarks
21	15		T			15	
25	86		T		0	86	SPC1
26	5		T		0	5	
100	69		T		0	69	
104	73		T		0	73	
109	32		T		0	32	
117	210		T		0	210	
121	106		T		0	106	
125	24		T		0	24	
126	68		T		0	68	
195	43		H		0	43	
206	11		T		0	11	
237	42		T		0	42	
242	13		S		0	13	SPC1
246	23		T		0	23	SPC1
252	22		S		0	22	SPC1
256	64		T		0	64	SPC1
271	16		S		0	16	SPC1
275	54				0	54	SPC1
276	9		H		0	9	SPC1
278	14		T		0	14	SPC1
279	69		H		0	69	SPC1-Aspen Enhancement
283	22		T		0	22	SPC1
284	42		S		0	42	
286	30		H		0	30	
288	24		S		0	24	
290	32		T		0	32	
292	7		S		0	7	
294	37		H		0	37	
296	13		T		0	13	
298	20		H		0	20	
300	15		S		0	15	
318	17		S		0	17	
324	44		T		0	44	
480	17		H		0	17	
488	45		S		0	45	SPC1
490	70		H		0	70	SPC1
500	36		H		0	36	SPC1
529	46		T		0	46	SPC1
531	8		H		0	8	SPC1-Aspen Enhancement
602	13		T		0	13	SPC1
603	25		T		0	25	SPC1
612	19		T		0	19	

614	40		T		0	40	
616	14		S		0	14	
620	160		T		0	160	
624	43		T		0	43	
626	41		H		0	41	
630	14		S		0	14	
632	119		T		0	119	
642	20		H		0	20	
643	45		T		0	45	
644	19		T		0	19	
646	46		T		0	46	
648	27		S		0	27	
649	7		S		0	7	
654	50		H		0	50	
675	29		T		0	29	
676	31		S		0	31	
728	67		H		0	67	ROG - Modified Rx
800	16		S		0	16	
805	39		S		0	39	
815	154		S		0	154	
842	5		H		0	5	
844	19		T		0	19	
845	27		T		0	27	
846	30		H		0	30	
848	17		H		0	17	
Totals	**2729**			**0.00**	**0**	**2729**	

Treatment Summary by Subwatershed

HSH	HSV	HTH	HTH1	HUR	SPC	SPC1	Subwatershed
					625		**30201**
					334	306	**30203**
					17	205	**30205**
					724	38	**30207**
					87	86	**30209**
					307		**30211**
0	0	0	0	0	0	0	**30213**
0	**0**	**0**	**0**	**0**	**2094**	**635**	**Treatment Totals**

Total Harvest	Total SPC	Total Acres Treated	Subwatershed
0	625	625	**30201**
0	640	640	**30203**
0	222	222	**30205**
0	762	762	**30207**
0	173	173	**30209**
0	307	307	**30211**
0	0	0	**30213**
0	**2729**	**2729**	**Totals**

** Precommercial thin units that show tractor logging system are potential biomass units.

Appendix "D" Silvicultural Treatments
Alternative 5

February 22, 2002

Unit	Acres	Harvest Rx	Harvest System	Volume Per Acre	Unit Volume (MBF)	Precommercial Thinning (acres)	Remarks
2	6	HSH	S	5	30		
3	7	HSH	T	5	35		
4	12	HSH	H	5	60		
6	70	HSH	S	5	350		
7	29	HSH	S	4	116		
8	26	HSH	S	5	130		
9	24	HSH	S	3	72		
10	22	HSH	T	3	66		
11	45	HSH	T	4	180		
12	32	HSH	T	3	96		
13	60	HSH	S	3	180		
15	42	HSH	S	2	84		
17	16	HUR	H	4	64		
18	10	HUR	S	4	40		
21	15	HTH	T	3	45	15	
23	4	HTH	T	4	16		
24	7	HTH	T	3	21		
25	86		T		0	86	
26	5	HTH	T	2	10	5	
27	55	HTH	T	6	330		
28	66	HTH	T	3	198		
29	73	HTH	S	4	292		
30	26	HTH	T	4	104		
31	61	HTH	S	3	183		
32	17	HTH	S	5	85		
33	13	HTH	T	4	52		
34	19	HTH	T	2	38		
35	54	HTH	T	4	216		
36	128	HTH	T	5	640		
37	48	HTH	T	3	144		
38	17	HTH	T	5	85		
39	22	HTH	T	4	88		
40	34	HTH	T	2	68		
41	17	HTH	S	2	34		
43	32	HTH1	S	5	160		
44	18	HTH	T	2	36		
45	60	HTH	T	4	240		
46	28	HTH	T	3	84		
47	5	HTH1	T	5	25		
48	21	HTH1	T	4	84		
49	21	HTH1	S	2	42		
60	40	HTH	H	6	240		
62	13	HTH	H	4	52		

64	18	HTH1	H	4	72		
66	23	HTH	H	4	92		
100	69	HTH	T	4	276	69	
102	125	HTH	T	5	625		
104	73	HTH	T	4	292	73	
106	114	HTH	T	6	684		
108	88	HTH	T	3	264		
109	32		T		0	32	
110	47	HTH	T	2	94		
112	34	HTH	H	4	136	34	
114	93	HSH	T	3	279		
116	99	HTH	T	3	297		
117	210		T		0	210	
118	32	HTH	T	2	64		
119	11	HTH	T	3	33		
120	11	HTH	T	2	22		
121	106		T		0	106	
122	79	HSH	T	8	632		
124	22	HUR	H	2	44		
125	24		T		0	24	
126	68	HTH	T	2	136	68	
130	40	HSH	T	5	200		
132	51	HTH	T	8	408		
134	44	HSH	T	8	352		
136	19	HTH	T	3	57		
138	99	HSH	T	2	198		
140	8	HUR	H	6	48		
144	45	HUR	T	2	90		
150	20	HSH	H	5	100		
152	10	HUR	H	9	90		
154	10	HUR	S	9	90		
156	18	HSH	S	7	126		
158	24	HSH	S	5	120		
160	10	HSH	H	7	70		
162	35	HUR	H	7	245		
164	47	HSH	H	6	282		
170	54	HUR	S	6	324		
172	11	HUR	T	2	22		
174	7	HUR	T	6	42		
176	14	HUR	S	6	84		
178	16	HUR	S	6	96		
180	21	HUR	S	7	147		
182	8	HTH	S	8	64		
184	17	HTH	T	8	136		
186	33	HUR	T	5	165		
188	39	HUR	S	5	195		
190	12	HUR	S	15	180		
192	7	HUR	T	5	35		
194	31	HUR	S	5	155		
195	43				0	43	
196	65	HTH	T	3	195		
198	191	HTH	T	3	573		

200	68	HTH	T	5	340		
201	37	HTH	T	5	185		
202	22	HTH	S	5	110		
203	11	HTH	T	5	55		
204	30	HSH	S	9	270		
206	11	HTH	T	5	55	11	
208	11	HTH	T	5	55		
210	17	HTH	S	9	153		
212	48	HSH	T	14	672		
214	8	HSH	T	4	32		
216	26	HSH	S	14	364		
218	14	HSH	S	14	196		
220	5	HTH	T	3	15		
222	18	HTH	S	3	54		
224	46	HTH	S	3	138		
226	13	HTH	T	3	39		
228	21	HSH	S	5	105		
230	50	HSH	T	5	250		
232	45	HTH	T	7	315		
234	14	HSH	T	8	112		
236	48	HSH	T	9	432		
237	42		T		0	42	
238	45	HSH	T	6	270		
240	28	HTH	T	7	196		
242	13	HTH	S	7	91	13	
244	27	HTH	T	7	189		
246	23	HTH	T	7	161	23	
248	61	HSH	S	5	305		
250	15	HSH	T	7	105		
252	22	HTH	S	7	154	22	
254	44	HTH	T	7	308		
256	64	HTH	T	3	192	64	
260	37	HSH	T	3	111		
262	17	HUR	T	3	51		
264	16	HSH	T	3	48		
266	8	HUR	T	8	64		
268	6	HUR	S	8	48		
270	66	HSH	S	6	396		
271	16				0	16	
272	35	HTH	T	4	140		
275	54				0	54	
276	9	HTH	H	4	36	9	
278	14	HTH	T	4	56	14	
279	69	HTH	T	1	69	69	Aspen Enhancement
280	20	HSH	H	5	100		
282	13	HTH	S	3	39		
283	22	HTH	T	2	44	22	
284	42	HTH	S	3	126	42	
286	30	HTH	H	3	90	30	
288	24	HTH	S	3	72	24	
290	32	HTH	T	4	128	32	
292	7	HTH	S	3	21	7	

294	37	HTH	H	7	259	37	
296	13	HTH	T	7	91	13	
298	20	HTH	H	3	60	20	
300	15	HTH	S	3	45	15	
302	25	HSH	S	6	150		
304	8	HUR	T	4	32		
306	11	HUR	S	4	44		
308	6	HSH	S	8	48		
310	59	HSH	T	8	472		
312	15	HUR	S	8	120		
314	30	HSH	S	8	240		
316	31	HUR	S	5	155		
318	17	HTH	S	5	85	17	
320	44	HUR	S	5	220		
322	33	HUR	T	5	165		
324	44	HTH	T	5	220	44	
326	16	HUR	T	5	80		
328	11	HUR	S	3	33		
330	6	HSH	S	6	36		
332	50	HUR	T	3	150		
334	28	HSH	H	7	196		
336	20	HSH	S	6	120		
338	34	HSH	H	4	136		
340	84	HSH	S	8	672		
344	26	HSH	H	9	234		
346	12	HSH	S	6	72		
348	35	HUR	H	2	70		
350	57	HSV	H	6	342		
352	45	HSV	H	7	315		
354	61	HSV	H	5	305		
356	50	HSV	H	4	200		
358	20	HSV	H	4	80		
360	12	HSV	H	5	60		
400	19	HTH	T	3	57		
402	15	HTH	T	3	45		
404	30	HTH	T	3	90		
406	102	HTH	T	5	510		
408	103	HTH	T	3	309		
410	28	HTH	T	4	112		
412	17	HTH	T	3	51		
414	41	HTH	T	3	123		
416	11	HTH	T	3	33		
418	32	HTH	T	3	96		
420	20	HSH	T	9	180		
422	25	HTH	T	4	100		
424	15	HTH	T	6	90		
426	27	HSH	T	15	405		
428	28	HTH	S	4	112		
430	9	HTH	T	3	27		
432	104	HTH	T	5	520		
434	24	HTH	S	5	120		
436	58	HTH	T	3	174		

438	38	HSH	T	12	456		
440	30	HTH	T	6	180		
441	12	HTH	S	5	60		
442	43	HTH	T	5	215		
444	5	HSH	T	14	70		
446	20	HSH	S	14	280		
448	24	HTH	T	6	144		
450	62	HTH	S	6	372		
452	20	HTH	T	6	120		
454	16	HTH	T	6	96		
456	19	HSH	T	6	114		
458	40	HSH	T	6	240		
460	49	HSH	T	8	392		
462	11	HTH	S	2	22		
464	9	HTH	T	5	45		
466	38	HTH	S	2	76		
468	26	HTH	T	2	52		
470	25	HTH	H	5	125		
472	31	HTH	H	5	155		
474	23	HSH	H	5	115		
476	36	HSH	S	6	216		
480	17	HTH	H	5	85	17	
482	39	HTH	T	4	156		
484	32	HTH	T	6	192		
486	9	HSH	S	6	54		
488	45	HTH	S	3	135	45	
490	70	HTH	H	8	560	70	
492	37	HUR	S	5	185		
494	6	HUR	T	4	24		
496	18	HTH	T	3	54		
498	24	HTH	S	2	48	24	
500	36	HTH	H	4	144	36	
502	16	HTH	T	4	64		
504	30	HTH	S	4	120		
506	14	HTH	H	3	42		
510	72	HSH	S	3	216		
512	8	HSH	H	3	24		
514	24	HUR	S	5	120		
516	17	HUR	T	5	85		
518	26	HTH	S	4	104		
520	46	HUR	S	6	276		
522	32	HSH	S	4	128		
526	9	HUR	S	4	36		
528	10	HUR	T	4	40		
529	46		T		0	46	
530	21	HUR	S	3	63		
531	8	HTH	T	2	16	8	Aspen Enhancement
600	50	HTH1	T	3	150		
602	13	HTH1	T	2	26	13	SPC1
603	25	HTH1	T	2	50	25	SPC1
604	46	HTH	T	3	138		
606	13	HTH1	T	16	208		

608	23	HTH1	H	16	368		
610	35	HTH	T	5	175	35	
612	19	HTH	T	4	76	19	
614	40	HTH	T	3	120	40	
616	14	HTH	S	2	28	14	
618	122	HTH	T	7	854		
620	160	HTH	T	2	320	160	
622	26	HTH	T	5	130		
624	43	HTH	T	2	86	43	
626	41	HTH	H	2	82	41	
628	11	HTH	H	4	44		
630	14	HTH	S	5	70	14	
632	119	HTH	T	5	595	119	
634	47	HTH	S	7	329		
636	85	HTH	T	5	425	85	
637	53	HUR	H	6	318		
638	84	HTH	H	6	504	84	
640	100	HTH	H	6	600	100	
642	20	HUR	H	3	60		
643	45	HTH	T	4	180	45	
644	19	HTH	T	4	76	19	
646	46	HTH	T	4	184	46	
648	27	HTH	S	7	189	27	
649	7	HTH	S	6	42	7	
650	55	HTH	S	6	330		
651	53	HTH	S	7	371		
652	84	HTH	H	7	588		
654	50	HTH	H	7	350	50	
656	11	HTH	T	4	44		
658	146	HTH	T	6	876		
660	27	HTH	H	6	162		
666	14	HTH	T	6	84		
672	62	HSH	T	4	248		
673	25	HSH	T	5	125		
674	20	HSH	S	4	80		
675	29	HTH	T	6	174	29	
676	31	HTH	S	5	155	31	
678	53	HSH	T	4	212		
680	45	HUR	H	3	135		
702	111	HTH	T	11	1221		
704	22	HUR	T	7	154		
706	40	HUR	S	7	280		
708	9	HTH	T	5	45		
710	60	HUR	T	5	300		
712	22	HTH	T	5	110		
714	47	HTH	T	4	188		
715	60	HUR	T	5	300		
716	35	HSH	S	5	175		
718	43	HTH	H	5	215		
720	92	HTH	H	4	368		
722	38	HTH	H	3	114		
724	34	HTH	H	5	170		

726	39	HTH	H	4	156		
728	67	HTH	H	5	335	67	
730	70	HTH	H	4	280		
732	46	HTH	H	4	184		
734	67	HTH	H	4	268		
800	16	HTH	T	2	32	16	
802	3	HTH	S	2	6		
804	27	HUR	S	4	108		
805	39				0	39	
806	33	HSH	S	5	165		
808	23	HSH	H	4	92		
810	15	HSH	H	3	45		
815	154				0	154	
816	36	HSH	S	8	288		
818	6	HSH	S	5	30		
820	26	HSH	T	6	156		
822	38	HSH	S	6	228		
824	55	HSH	S	4	220		
826	7	HSH	H	7	49		
830	26	HSH	H	4	104		
832	18	HSH	S	6	108		
834	13	HSH	T	6	78		
836	11	HSH	S	6	66		
838	7	HUR	S	4	28		
840	26	HUR	T	4	104		
842	5	HTH	H	6	30	5	
844	19	HTH	T	6	114	19	
845	27		T		0	27	
846	30	HTH	H	3	90	30	
848	17	HTH	H	3	51	17	
850	21	HTH	S	2	42		
852	96	HTH	H	2	192		
854	6	HTH	S	2	12		
856	13	HTH	S	8	104		
858	64	HTH	H	2	128		
860	29	HTH	H	5	145		
862	29	HTH	H	5	145		
864	43	HTH	H	4	172	43	
Totals	**12221**			**4.51**	**55136**	**3114**	

Treatment Summary by Subwatershed

HSH	HSV	HTH	HTH1	HUR	SPC	SPC1	Subwatershed
474		1122		375	659		**30201**
849	245	968		285	640		**30203**
398		1383		170	246		**30205**
276		1650	124	118	1008	38	**30207**
294		1548	97	208	173		**30209**
307		391		60	350		**30211**
0	0	0	0	0	0	0	**30213**
2598	**245**	**7062**	**221**	**1216**	**3076**	**38**	**Treatment Totals**

Total Harvest	Total SPC	Total Acres Treated *	Subwatershed
1971	659	2386	**30201**
2347	640	2459	**30203**
1951	246	1997	**30205**
2168	1046	2168	**30207**
2147	173	2233	**30209**
758	350	978	**30211**
0	0	0	**30213**
11342	**3114**	**12221**	**Totals**

*Acres not additive due to SPC in some of the harvest units.

** Precommercial thin units that show tractor logging system are potential biomass units.

Appendix "D" Reforestation Treatments
Alternative 2

February 22, 2002

Unit	Acres	Harvest Rx	Yarding System	Undesirable Tree Removal	Subsoil	Veg. Control	Plant	Gopher Control	Big Game Control	Stocking Surveys	Remarks
6	70	HSH	S	70			70	70	70	70	
9	24	HSH	S	24			24	24	24	24	
10	22	HSH	T	22		22	22	22	22	22	
2	6	HSH	S	6		6	6	6	6	6	
3	7	HSH	T	7		7	7	7	7	7	
4	12	HSH	H	12		12	12	12	12	12	
7	29	HSH	S	29		29	29	29	29	29	
8	26	HSH	S	26		26	26	26	26	26	
11	45	HSH	T	45	45	45	45	45	45	45	
12	32	HSH	T	32		32	32	32	32	32	
13	60	HSH	S	60			60	60	60	60	
15	42	HSH	S	42		42	42	42	42	42	
17	16	HUR	H	16						16	RNS
18	10	HUR	S	10						10	RNS
114	93	HSH	T	93			93	93	93	93	
122	79	HSH	T	79			79	79	79	79	
130	40	HSH	T	40		40	40	40	40	40	
134	44	HSH	T	44			44	44	44	44	
138	99	HSH	T	99		99	99	99	99	99	
144	45	HUR	T	45						45	RNS
150	20	HSH	H	20			20	20	20	20	
152	10	HUR	H	10						10	RNS
154	10	HUR	S	10						10	RNS
156	18	HSH	S	18			18	18	18	18	
160	10	HSH	H	10			10	10	10	10	
162	35	HUR	H	35						35	RNS
170	54	HUR	S	54						54	RNS
172	11	HUR	T	11						11	RNS
174	7	HUR	T	7						7	RNS
176	14	HUR	S	14						14	RNS
178	16	HUR	S	16						16	RNS
180	21	HUR	S	21						21	RNS
186	33	HUR	T	33						33	RNS
188	39	HUR	S	39						39	RNS
194	31	HUR	S	31						31	RNS
236	48	HSH	T	48			48	48	48	48	
316	31	HUR	S	31						31	RNS
320	44	HUR	S	44						44	RNS
322	33	HUR	T	33						33	RNS
326	16	HUR	T	16						16	RNS
328	11	HUR	S	11						11	RNS
330	6	HSH	S	6			6	6	6	6	
332	50	HUR	T	50						50	RNS
334	28	HSH	H	28			28	28	28	28	

336	20	HSH	S	20		20	20	20	20	20	
338	34	HSH	H	34		34	34	34	34	34	
340	84	HSH	S	84	84	84	84	84	84	84	
344	26	HSH	H	26			26	26	26	26	
346	12	HSH	S	12			12	12	12	12	
348	35	HUR	H	35						35	RNS
350	57	HSV	H				57			57	
352	45	HSV	H				45			45	
354	61	HSV	H				61			61	
356	50	HSV	H				50			50	
358	20	HSV	H				20			20	
360	12	HSV	H				12			12	
420	20	HSH	T	20			20	20	20	20	
456	19	HSH	T	19		19	19	19	19	19	
458	40	HSH	T	40		40	40	40	40	40	
460	49	HSH	T	49		49	49	49	49	49	
474	23	HSH	H	23		23	23	23	23	23	
642	20	HUR	H	20						20	RNS
672	62	HSH	T	62		62	62	62	62	62	
673	25	HSH	T	25		25	25	25	25	25	
674	20	HSH	S	20		20	20	20	20	20	
678	53	HSH	T	53			53	53	53	53	
680	45	HUR	H	45						45	RNS
704	22	HUR	H	22						22	RNS
706	40	HUR	H	40						40	RNS
710	60	HUR	H	60						60	RNS
715	60	HUR	H	60						60	RNS
716	35	HSH	S	35			35	35	35	35	
804	27	HUR	S	27						27	RNS
806	33	HSH	S	33		33	33	33	33	33	
808	23	HSH	H	23		23	23	23	23	23	
810	15	HSH	H	15		15	15	15	15	15	
816	36	HSH	S	36			36	36	36	36	
818	6	HSH	S	6			6	6	6	6	
820	26	HSH	T	26	26	26	26	26	26	26	
822	38	HSH	S	38	38	38	38	38	38	38	
824	55	HSH	S	55			55	55	55	55	
826	7	HSH	H	7			7	7	7	7	
830	26	HSH	H	26		26	26	26	26	26	
832	18	HSH	S	18			18	18	18	18	
834	13	HSH	T	13			13	13	13	13	
836	11	HSH	S	11			11	11	11	11	
838	7	HUR	S	7						7	RNS
840	26	HUR	T	26						26	RNS
Totals	**2813**			**2568**	**193**	**897**	**1934**	**1689**	**1689**	**2813**	

Subwatershed	Undesirable Tree Removal	Subsoil	Veg. Control	Plant	Gopher Control	Big Game Control	Stocking Surveys
30201	729	0	139	403	403	403	729

30203	478	84	138	503	258	258	723
30205	151	0	131	151	151	151	151
30207	341	0	129	276	276	276	341
30209	502	45	199	294	294	294	502
30211	367	64	161	307	307	307	367
30213	0	0	0	0	0	0	0
Totals	**2568**	**193**	**897**	**1934**	**1689**	**1689**	**2813**

Appendix "D" Reforestation Treatments

Alternative 3

February 22, 2002

Unit	Acres	Harvest Rx	Yarding System	able Tree Removal	Subsoil	* Veg. Control	Plant	* Gopher Control	Big Game Control	Stocking Surveys	Remarks
6	70	HSH	S	70			70	70	70	70	
9	24	HSH	S	24			24	24	24	24	
10	22	HSH	T	22		22	22	22	22	22	
2	6	HSH	S	6		6	6	6	6	6	
3	7	HSH	T	7		7	7	7	7	7	
4	12	HSH	H	12		12	12	12	12	12	
7	29	HSH	S	29		29	29	29	29	29	
8	26	HSH	S	26		26	26	26	26	26	
11	45	HSH	T	45	45	45	45	45	45	45	
12	32	HSH	T	32		32	32	32	32	32	
13	60	HSH	S	60			60	60	60	60	
15	42	HSH	S	42		42	42	42	42	42	
17	16	HUR	H	16						16	RNS
18	10	HUR	S	10						10	RNS
130	40	HSH	T	40		40	40	40	40	40	
134	44	HSH	T	44			44	44	44	44	
138	99	HSH	T	99		99	99	99	99	99	
144	45	HUR	T	45						45	RNS
150	20	HSH	H	20			20	20	20	20	
152	10	HUR	H	10						10	RNS
154	10	HUR	S	10						10	RNS
170	54	HUR	S	54						54	RNS
172	11	HUR	T	11						11	RNS
174	7	HUR	T	7						7	RNS
176	14	HUR	S	14						14	RNS
178	16	HUR	S	16						16	RNS
180	21	HUR	S	21						21	RNS
186	33	HUR	T	33						33	RNS
188	39	HUR	S	39						39	RNS
194	31	HUR	S	31						31	RNS
316	31	HUR	S	31						31	RNS
320	44	HUR	S	44						44	RNS
322	33	HUR	T	33						33	RNS
326	16	HUR	T	16						16	RNS
328	11	HUR	S	11						11	RNS
330	6	HSH	S	6			6	6	6	6	
332	50	HUR	T	50						50	RNS
334	28	HSH	H	28			28	28	28	28	
336	20	HSH	S	20		20	20	20	20	20	
338	34	HSH	H	34		34	34	34	34	34	
340	84	HSH	S	84	84	84	84	84	84	84	
344	26	HSH	H	26			26	26	26	26	
346	12	HSH	S	12			12	12	12	12	
348	35	HUR	H	35						35	RNS

350	57	HSV	H				57			57	
352	45	HSV	H				45			45	
354	61	HSV	H				61			61	
356	50	HSV	H				50			50	
358	20	HSV	H				20			20	
360	12	HSV	H				12			12	
420	20	HSH	T	20			20	20	20	20	
456	19	HSH	T	19		19	19	19	19	19	
458	40	HSH	T	40		40	40	40	40	40	
474	23	HSH	H	23		23	23	23	23	23	
804	27	HUR	S	27						27	RNS
806	33	HSH	S	33		33	33	33	33	33	
808	23	HSH	H	23		23	23	23	23	23	
810	15	HSH	H	15		15	15	15	15	15	
816	36	HSH	S	36			36	36	36	36	
818	6	HSH	S	6			6	6	6	6	
820	26	HSH	T	26	26	26	26	26	26	26	
822	38	HSH	S	38	38	38	38	38	38	38	
824	55	HSH	S	55			55	55	55	55	
826	7	HSH	H	7			7	7	7	7	
830	26	HSH	H	26		26	26	26	26	26	
832	18	HSH	S	18			18	18	18	18	
834	13	HSH	T	13			13	13	13	13	
836	11	HSH/HTH	S	11			11	11	11	11	
838	7	HUR	S	7						7	RNS
840	26	HUR	T	26						26	RNS
Totals	**2039**			**1794**	**193**	**741**	**1442**	**1197**	**1197**	**2039**	

Subwatershed	Undesirable Tree Removal	Subsoil	* Veg. Control	Plant	* Gopher Control	Big Game Control	Stocking Surveys
30201	494	0	139	203	203	203	494
30203	430	84	138	455	210	210	675
30205	102	0	82	102	102	102	102
30207	116	0	22	116	116	116	116
30209	285	45	199	259	259	259	285
30211	367	64	161	307	307	307	367
30213	0	0	0	0	0	0	0
Totals	**1794**	**193**	**741**	**1442**	**1197**	**1197**	**2039**

* Alternative 3 does not use chemicals for vegetation or animal damage control.

> Manual or mechanical methods can be used for control of competing vegetation.

> Trapping can be used for control of pocket gophers.

Appendix "D" Reforestation Treatments
Alternative 5

February 22, 2002

Unit	Acres	Harvest Rx	Yarding System	Undesirable Tree Removal	Subsoil	Veg. Control	Plant	Gopher Control	Big Game Control	Stocking Surveys	Remarks
6	70	HSH	S	70			70	70	70	70	
9	24	HSH	S	24			24	24	24	24	
10	22	HSH	T	22		22	22	22	22	22	
2	6	HSH	S	6		6	6	6	6	6	
3	7	HSH	T	7		7	7	7	7	7	
4	12	HSH	H	12		12	12	12	12	12	
7	29	HSH	S	29		29	29	29	29	29	
8	26	HSH	S	26		26	26	26	26	26	
11	45	HSH	T	45	45	45	45	45	45	45	
12	32	HSH	T	32		32	32	32	32	32	
13	60	HSH	S	60			60	60	60	60	
15	42	HSH	S	42		42	42	42	42	42	
17	16	HUR	H	16						16	RNS
18	10	HUR	S	10						10	RNS
114	93	HSH	T	93			93	93	93	93	
122	79	HSH	T	79			79	79	79	79	
124	22	HUR	H	22						22	RNS
130	40	HSH	T	40		40	40	40	40	40	
134	44	HSH	T	44			44	44	44	44	
138	99	HSH	T	99		99	99	99	99	99	
140	8	HUR	H	8						8	RNS
144	45	HUR	T	45						45	RNS
150	20	HSH	H	20			20	20	20	20	
152	10	HUR	H	10						10	RNS
154	10	HUR	S	10						10	RNS
156	18	HSH	S	18			18	18	18	18	
158	24	HSH	S	24			24	24	24	24	
160	10	HSH	H	10			10	10	10	10	
162	35	HUR	H	35						35	RNS
164	47	HSH	H	47			47	47	47	47	
170	54	HUR	S	54						54	RNS
172	11	HUR	T	11						11	RNS
174	7	HUR	T	7						7	RNS
176	14	HUR	S	14						14	RNS
178	16	HUR	S	16						16	RNS
180	21	HUR	S	21						21	RNS
186	33	HUR	T	33						33	RNS
188	39	HUR	S	39						39	RNS
190	12	HUR	S	12						12	RNS
192	7	HUR	T	7						7	RNS
194	31	HUR	S	31						31	RNS
204	30	HSH	S	30			30	30	30	30	
212	48	HSH	T	48			48	48	48	48	
214	8	HSH	T	8			8	8	8	8	

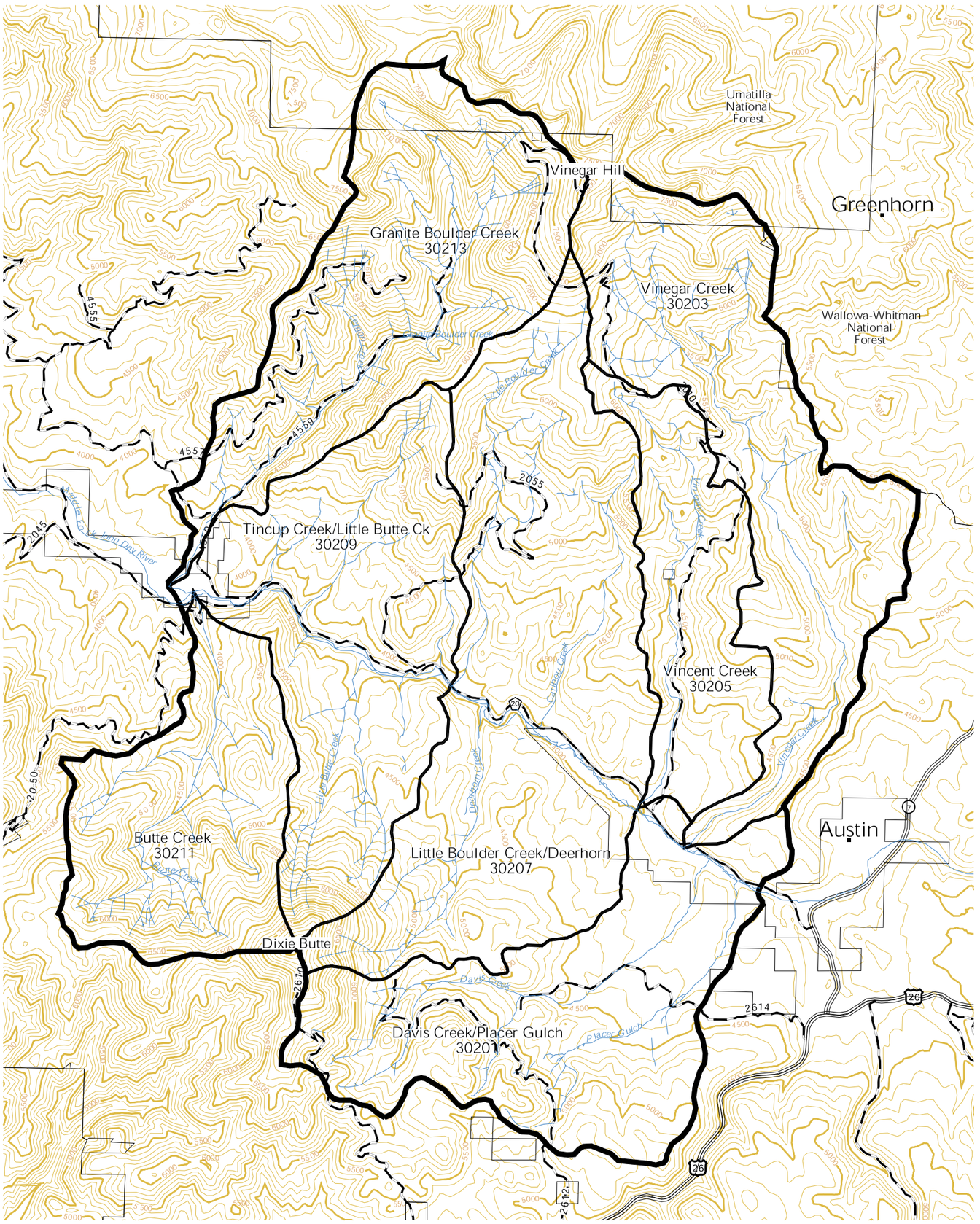
216	26	HSH	S	26			26	26	26	26	
218	14	HSH	S	14			14	14	14	14	
228	21	HSH	S	21			21	21	21	21	
230	50	HSH	T	50			50	50	50	50	
234	14	HSH	T	14		14	14	14	14	14	
236	48	HSH	T	48		48	48	48	48	48	
238	45	HSH	T	45		45	45	45	45	45	
248	61	HSH	S	61			61	61	61	61	
250	15	HSH	T	15			15	15	15	15	
260	37	HSH	T	37	37	37	37	37	37	37	
262	17	HUR	T	17						17	RNS
264	16	HSH	T	16	16	16	16	16	16	16	
266	8	HUR	T	8						8	RNS
268	6	HUR	S	6						6	RNS
270	66	HSH	S	66			66	66	66	66	
280	20	HSH	H	20	20	20	20	20	20	20	
302	25	HSH	S	25			25	25	25	25	
304	8	HUR	T	8						8	RNS
306	11	HUR	S	11						11	RNS
308	6	HSH	S	6			6	6	6	6	
310	59	HSH	T	59			59	59	59	59	
312	15	HUR	S	15						15	RNS
314	30	HSH	S	30		30	30	30	30	30	
316	31	HUR	S	31						31	RNS
320	44	HUR	S	44						44	RNS
322	33	HUR	T	33						33	RNS
326	16	HUR	T	16						16	RNS
328	11	HUR	S	11						11	RNS
330	6	HSH	S	6			6	6	6	6	
332	50	HUR	T	50						50	RNS
334	28	HSH	H	28			28	28	28	28	
336	20	HSH	S	20		20	20	20	20	20	
338	34	HSH	H	34		34	34	34	34	34	
340	84	HSH	S	84	84	84	84	84	84	84	
344	26	HSH	H	26			26	26	26	26	
346	12	HSH	S	12			12	12	12	12	
348	35	HUR	H	35						35	RNS
350	57	HSV	H				57			57	
352	45	HSV	H				45			45	
354	61	HSV	H				61			61	
356	50	HSV	H				50			50	
358	20	HSV	H				20			20	
360	12	HSV	H				12			12	
420	20	HSH	T	20			20	20	20	20	
426	27	HSH	T	27			27	27	27	27	
438	38	HSH	T	38		38	38	38	38	38	
444	5	HSH	T	5		5	5	5	5	5	
446	20	HSH	S	20		20	20	20	20	20	
456	19	HSH	T	19		19	19	19	19	19	
458	40	HSH	T	40		40	40	40	40	40	
460	49	HSH	T	49		49	49	49	49	49	
474	23	HSH	H	23		23	23	23	23	23	

476	36	HSH	S	36		36	36	36	36	36	
486	9	HSH	S	9			9	9	9	9	
492	37	HUR	S	37						37	RNS
494	6	HUR	T	6						6	RNS
510	72	HSH	S	72		72	72	72	72	72	
512	8	HSH	H	8		8	8	8	8	8	
514	24	HUR	S	24						24	RNS
516	17	HUR	T	17						17	RNS
520	46	HUR	S	46						46	RNS
522	32	HSH	S	32		32	32	32	32	32	
526	9	HUR	S	9						9	RNS
528	10	HUR	T	10						10	RNS
530	21	HUR	S	21						21	RNS
637	53	HUR	H	53						53	RNS
642	20	HUR	H	20						20	RNS
672	62	HSH	T	62		62	62	62	62	62	
673	25	HSH	T	25		25	25	25	25	25	
674	20	HSH	S	20		20	20	20	20	20	
678	53	HSH	T	53			53	53	53	53	
680	45	HUR	H	45						45	RNS
704	22	HUR	T	22						22	RNS
706	40	HUR	S	40						40	RNS
710	60	HUR	T	60						60	RNS
715	60	HUR	T	60						60	RNS
716	35	HSH	S	35			35	35	35	35	
804	27	HUR	S	27						27	RNS
806	33	HSH	S	33		33	33	33	33	33	
808	23	HSH	H	23		23	23	23	23	23	
810	15	HSH	H	15		15	15	15	15	15	
816	36	HSH	S	36			36	36	36	36	
818	6	HSH	S	6			6	6	6	6	
820	26	HSH	T	26	26	26	26	26	26	26	
822	38	HSH	S	38	38	38	38	38	38	38	
824	55	HSH	S	55			55	55	55	55	
826	7	HSH	H	7			7	7	7	7	
830	26	HSH	H	26		26	26	26	26	26	
832	18	HSH	S	18			18	18	18	18	
834	13	HSH	T	13			13	13	13	13	
836	11	HSH	S	11			11	11	11	11	
838	7	HUR	S	7						7	RNS
840	26	HUR	T	26						26	RNS
Totals	**4059**			**3814**	**266**	**1318**	**2843**	**2598**	**2598**	**4059**	

Subwatershed	Undesirable Tree Removal	Subsoil	Veg. Control	Plant	Gopher Control	Big Game Control	Stocking Surveys
30201	849	0	139	474	474	474	849
30203	1134	157	348	1094	849	849	1379
30205	568	0	342	398	398	398	568

30207	394	0	129	276	276	276	394
30209	502	45	199	294	294	294	502
30211	367	64	161	307	307	307	367
30213	0	0	0	0	0	0	0
Totals	**3814**	**266**	**1318**	**2843**	**2598**	**2598**	**4059**

Southeast Galena Restoration
Subwatersheds and Topography



SE Galena Boundary

Other Land Ownership

Category I and II Streams

Subwatersheds Boundarys
6th Field HUC

Map 1--Subwatersheds and Topography

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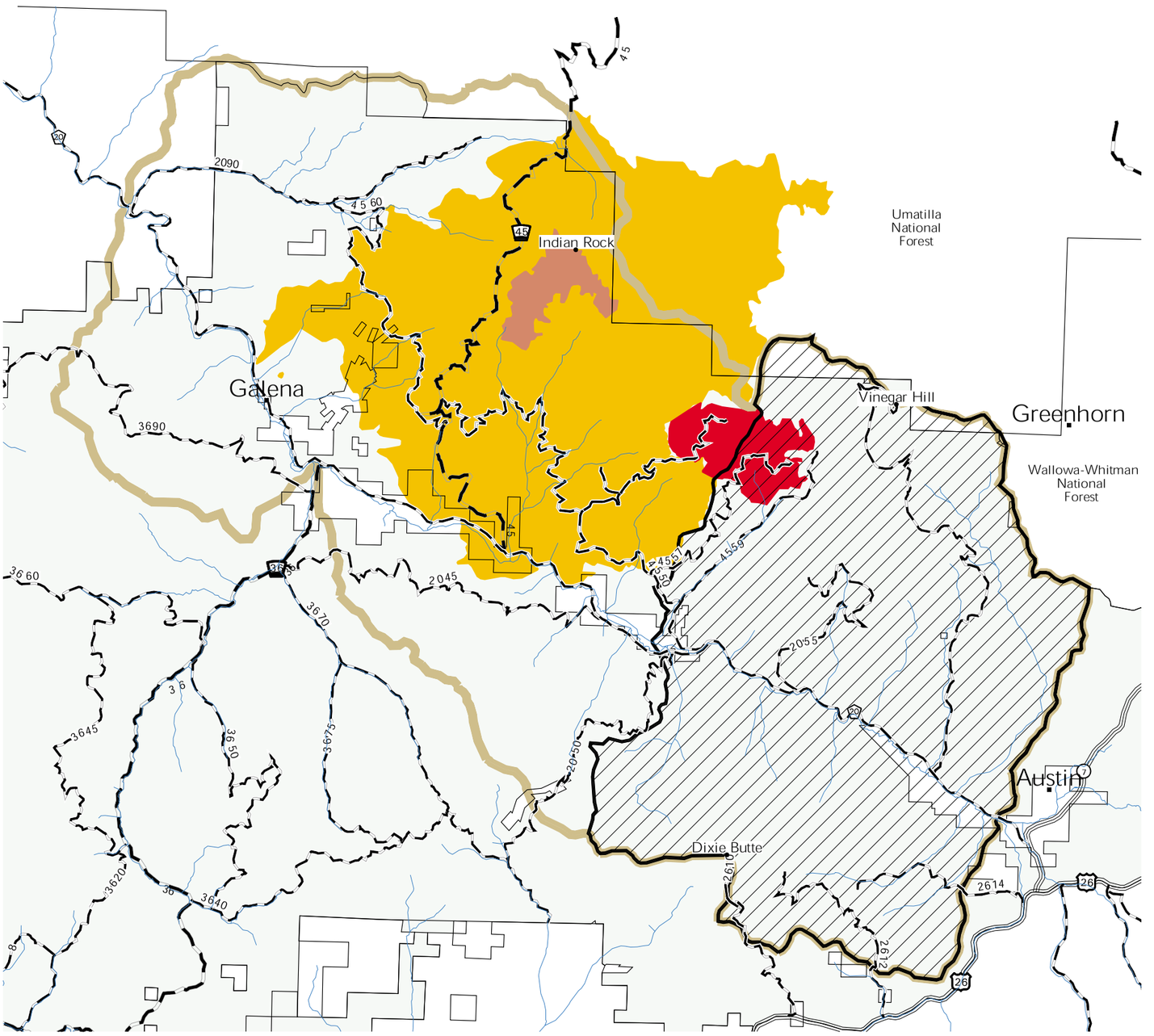
map01.aml dam February 25, 2002

Scale = 1:81320 (.779 inches to 1 mi)

0 1/2 1 2 3

Note: 100 foot contours

Galena Watershed
Large Fire History



Map 2--Large Fire History

- Galena Watershed
- Other Land Ownership
- Category I Streams
- Malheur National Forest
- Summit Fire-1996
- Indian Rock Fire-1994
- Reed Fire-1994
- SE Galena Boundary

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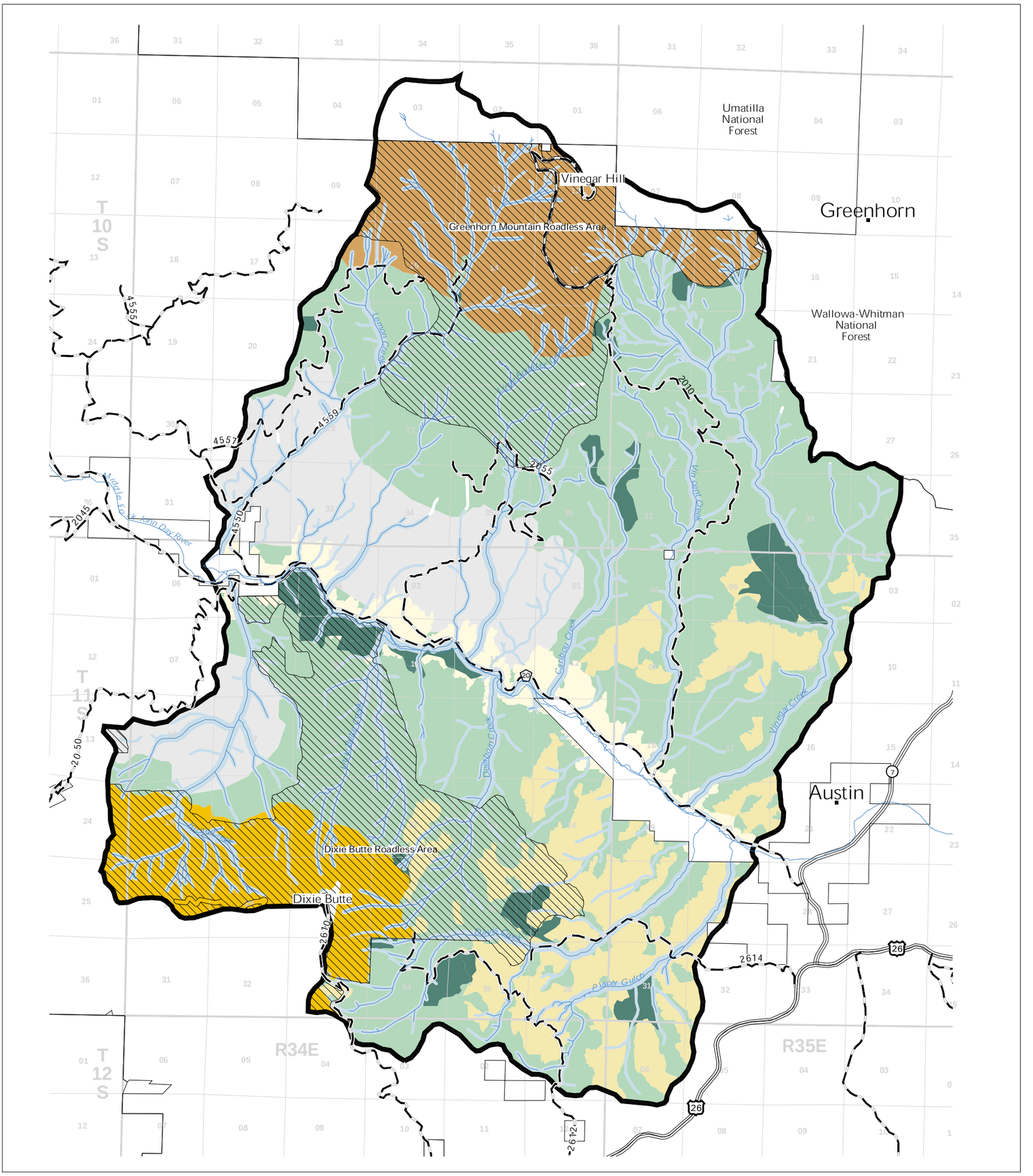
map02.aml dam February 25, 2002

Scale = 1:154613 (.4098 inches to 1 mi)

0 1 2 3 4 5 6

Southeast Galena Restoration
Management Areas and Roadless Areas



Map 3--Management Areas and Roadless Areas

- SE Galena Boundary
- Other Land Ownership
- Category I and II Streams
- Dedicated/Replacement Old Growth (MA 13)
- Visual Corridors (MA 14) Foreground
- Visual Corridors (MA14) Middleground
- General Forest/Rangeland (MA 1_2)
- Wildlife Emphasis Area (MA 21)
- Big Game Winter Range (MA 4a)
- Vinegar Hill & Indian Rock Scenic Areas (MA 7)
- RHCAs
- Appendix C Roadless Areas

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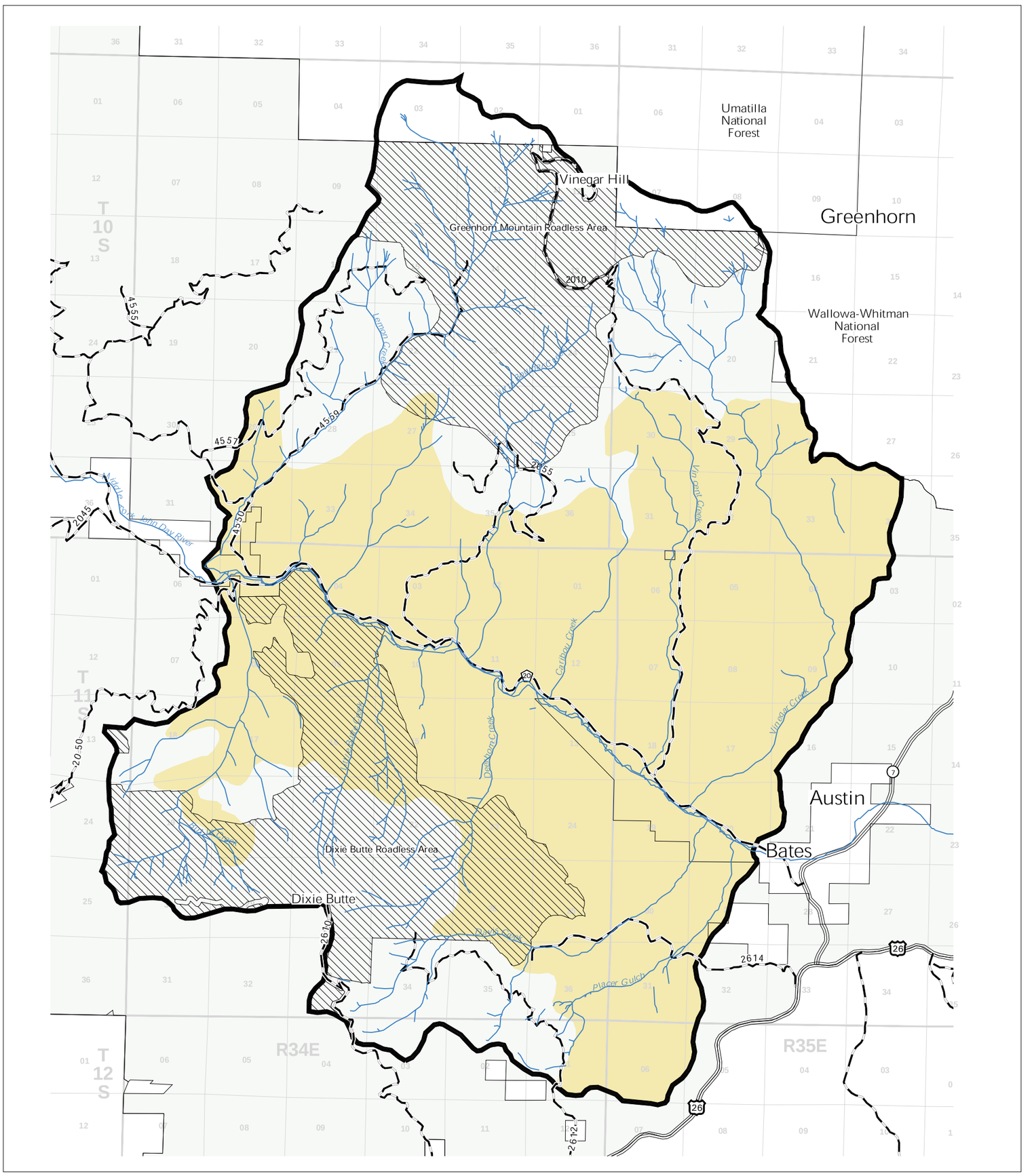
map34.aml dam February 25, 2002

Scale = 1:81320 (.779 inches to 1 mi)

0 1/2 1 2 3

Southeast Galena Restoration
Historic Railroad Logging



Malheur National Forest

Area affected by Historic Railroad Logging

Appendix C Roadless Areas

SE Galena Boundary

Other Land Ownership

Category I and II Streams

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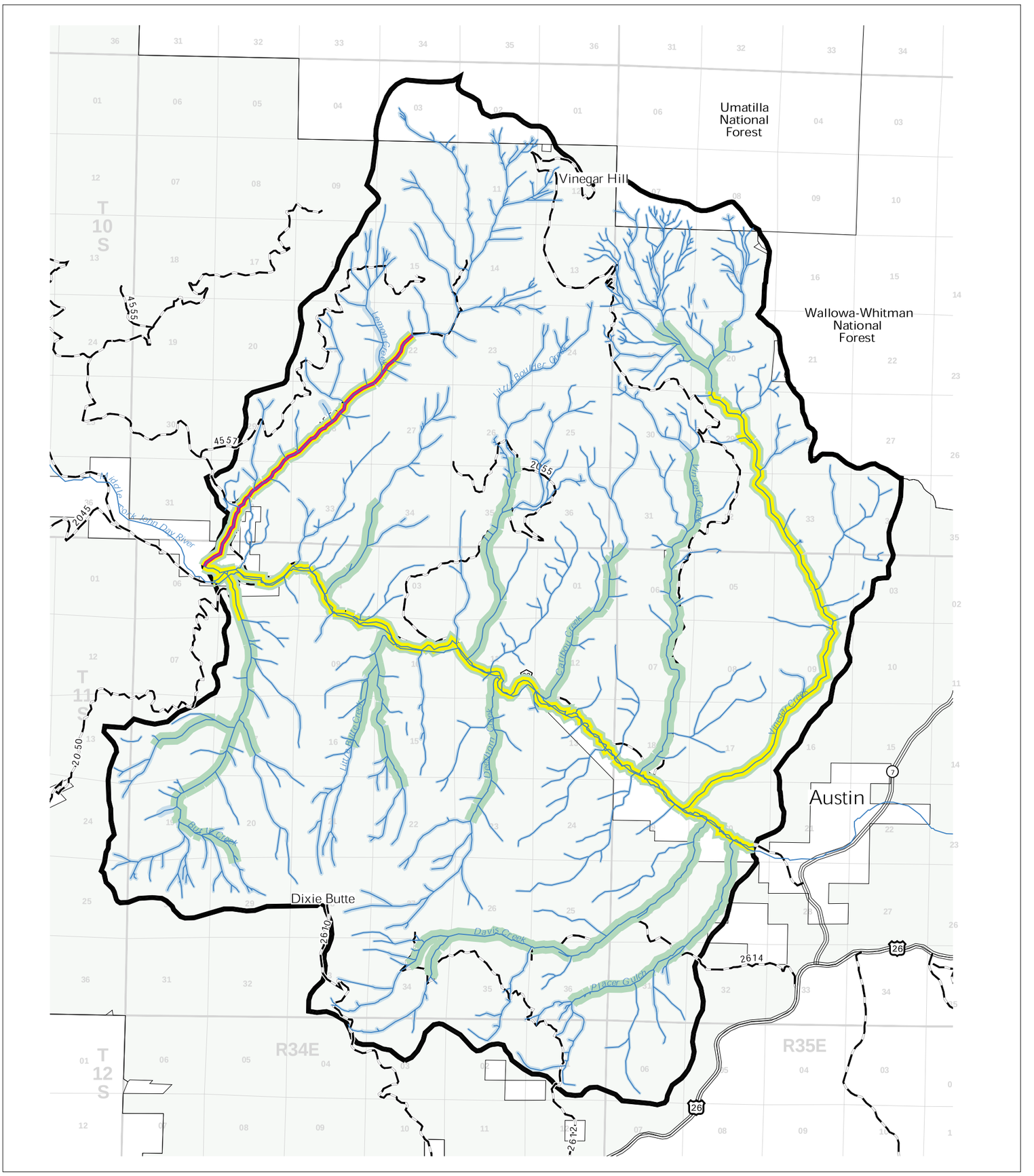
Map 4 Historic Railroad Logging & Appendix "C" Roadless Areas

map04.aml kls November 26, 2002

Scale = 1:81320 (.779 inches to 1 mi)

0 1/2 1 2 3

Southeast Galena Restoration
Threatened, Endangered, Sensititve Species
and Essential Habitat for Fish



SE Galena Boundary

Other Land Ownership

Malheur National Forest

RHCA's

Category I, II, IV Streams

Steelhead Trout (ONMY1) and Redband Trout(ONMY3) Presence

Chinook Salmon (ONTS1) Presence

Bull Trout (SACO) Presence

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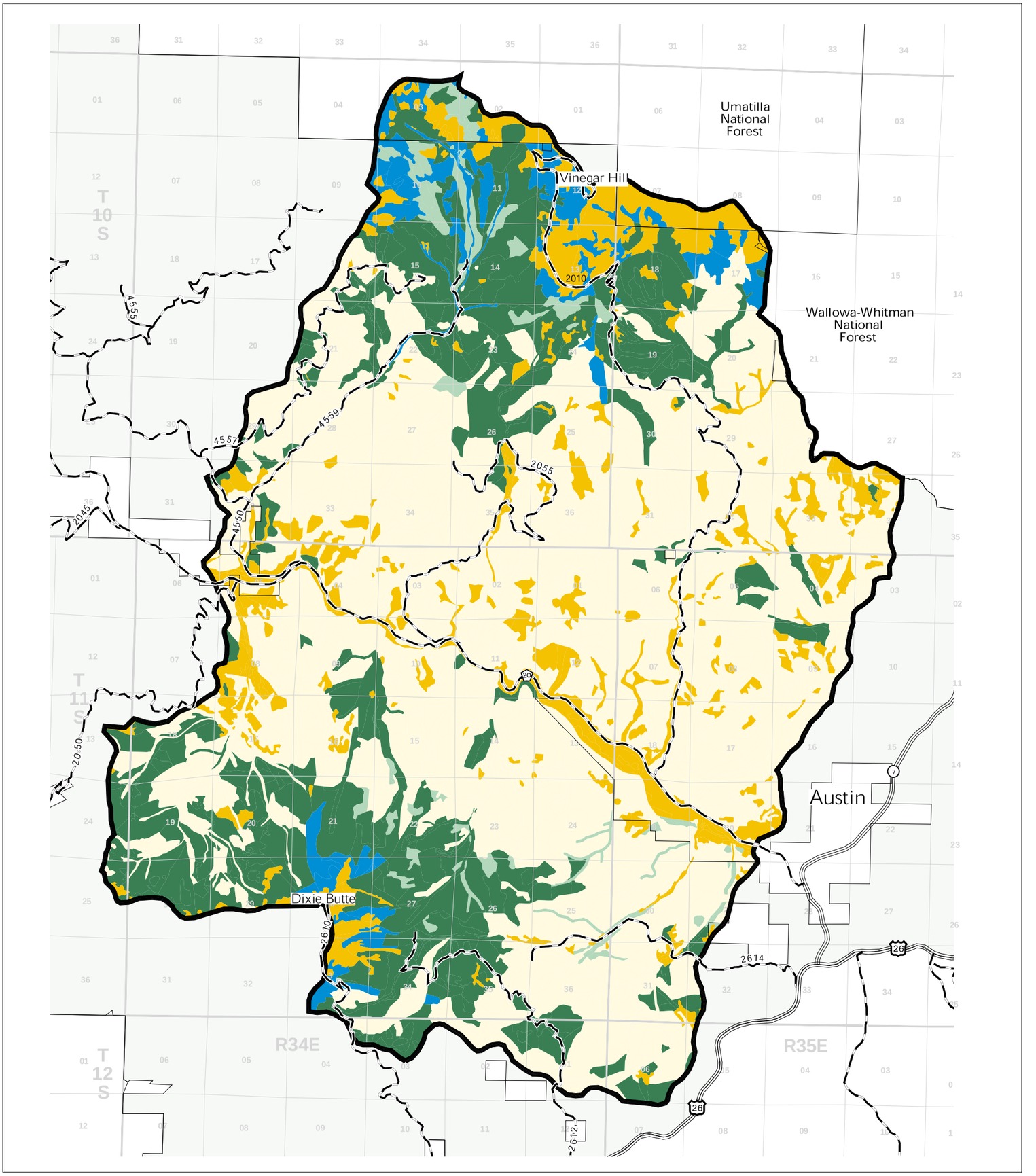
map05.aml kls February 25, 2002

Map 5--TES Fish Species and Essential Habitat for Fish

Scale = 1:81320 (.779 inches to 1 mi)

0 1/2 1 2 3

Southeast Galena Restoration
Forest Stand Types



Map 6--Forest Stand Types

Malheur National Forest

SE Galena Boundary

Other Land Ownership

Cold Forest

Dry Forest

Lodgepole Pine

Moist Forest

Non-Forest

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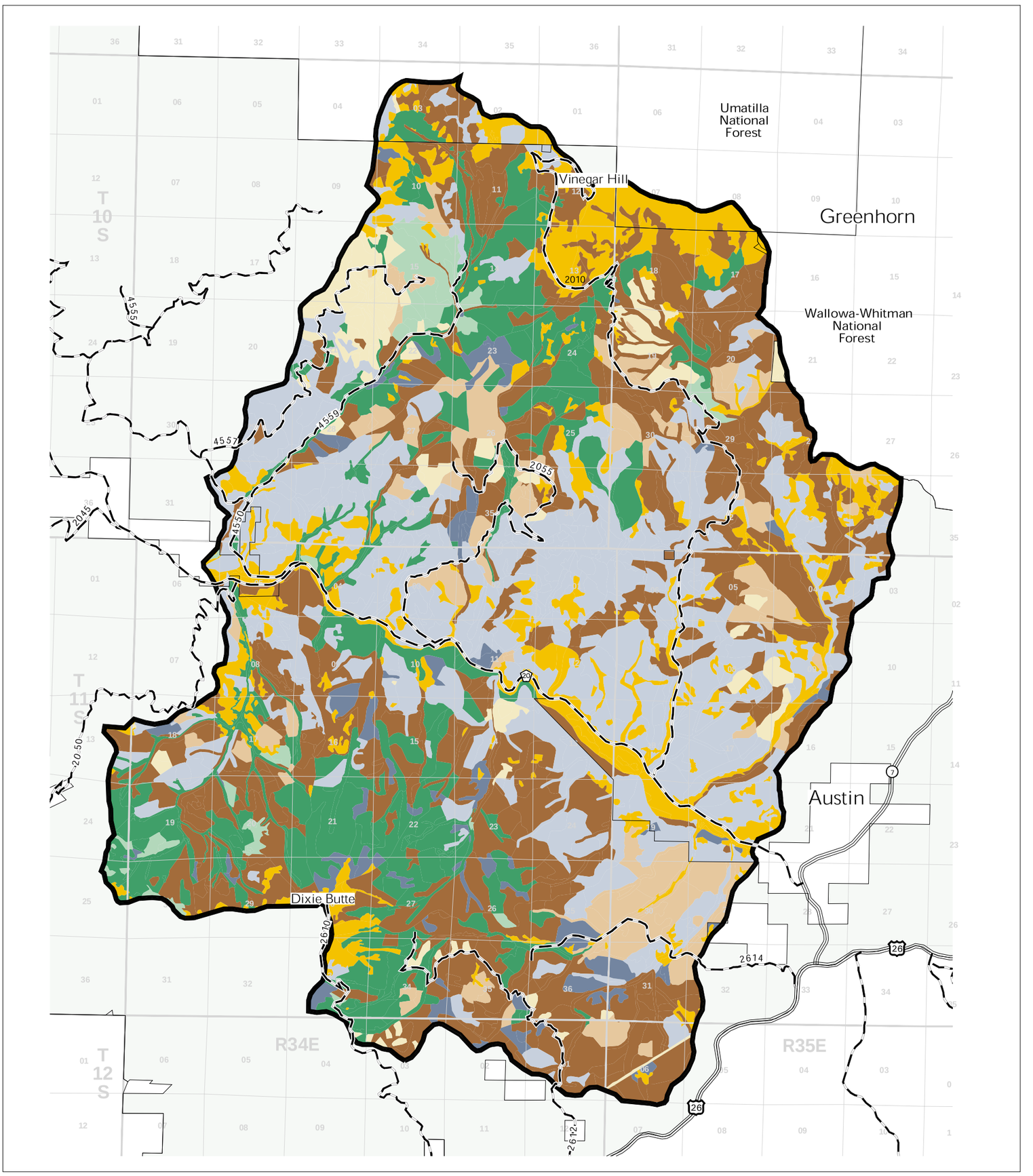
map06.aml kls February 26, 2002

Scale = 1:81320 (.779 inches to 1 mi)

0 1/2 1 2 3

Southeast Galena Restoration
Forest Stand Structural Stages



Map 7--Forest Stand Structural Stages

- Malheur National Forest
- SE Galena Boundary
- Other Land Ownership
- Non-Forest
- Old Forest, Multi Strata (OFMS)
- Old Forest, Single Strata (OFSS)
- Stem Exclusion, Closed Canopy (SECC)
- Stem Exclusion, Open Canopy (SEOC)
- Stand Initiation (SI)
- Understory Re-initiation (UR)
- Young Forest, Multi Strata (YFMS)

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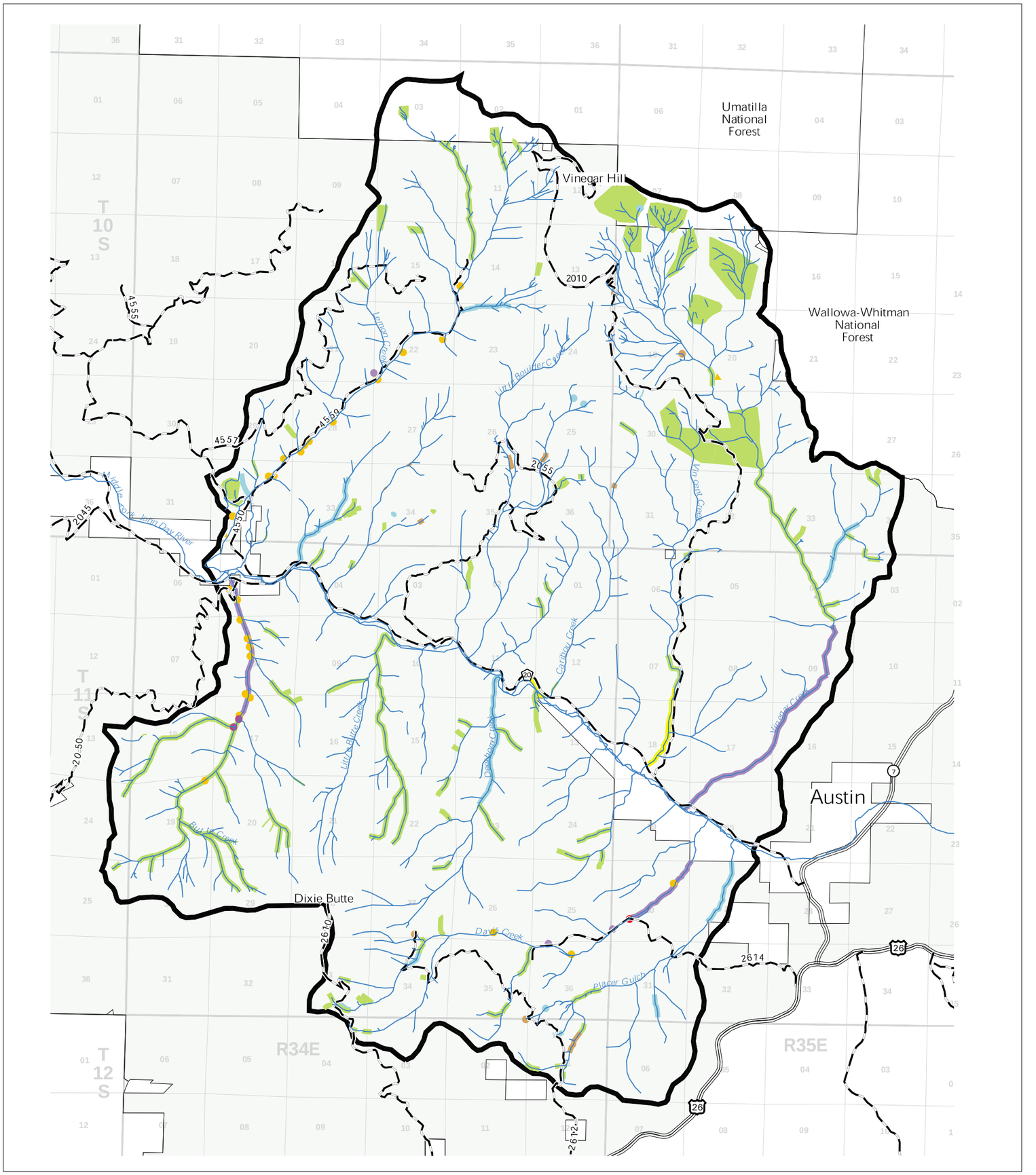
map07.aml kls February 26, 2002

Scale = 1:81320 (.779 inches to 1 mi)

0 1/2 1 2 3

Southeast Galena Restoration
Stream and Riparian Rehabilitation
For Action Alternatives



SE Galena Boundary

Malheur National Forest

Category I, II, IV Streams

Caging or Fencing of Natural Hardwood Regeneration in Springs, Seeps or Streams

Planting and Protection of Hardwood Seedlings in Springs, Seeps, or Streams

Channel/Floodplain Rehabilitation using Large (heavy) Equipment in Alts 2 & 5

Installation of Culvert

Removal of Log Culvert, and Rehabilitation

Watershed Improvement (See NOTE 1)

Placement of Large Wood (See NOTE 2)

Planting (See NOTE 3)

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Map 8--Stream & Riparian Rehab Recommendations For Action Alternatives

map08.aml kls February 27, 2002

NOTE 1: Combination of additional planting and protection of naturally occurring hardwoods, hillslopes, and along channels.

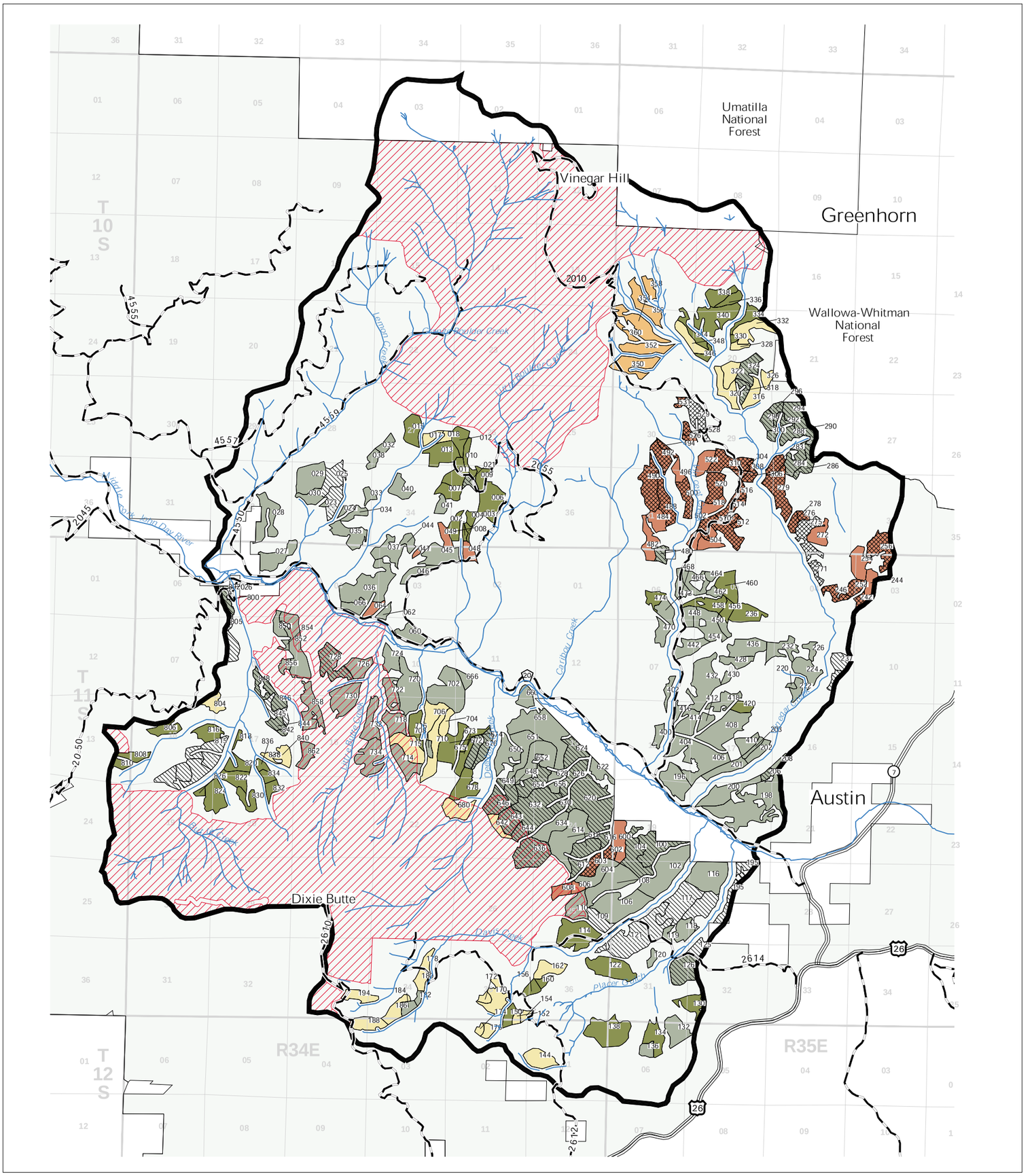
NOTE 2: Placement of large wood in current or historic Bull Trout streams to improve habitat complexity in selecteiffles.
Heavy equipment would be used to place wood for Alternatives 2 and 5.

NOTE 3: Planting of hardwood or conifer in current or historic Bull Trout streams to improve habitiat complexity in selected riffles.

Scale = 1:81320 (.779 inches to 1 mi)

0 1/2 1 2 3

Southeast Galena Restoration
Mechanical Treatments
Alternative 2



Malheur National Forest

SE Galena Boundary

Other Land Ownership

Category I and II Streams

Shelterwood

Salvage

Commercial Thinning

Commercial Thinning Within Connectivity Corridors

Understory Removal

Precommercial Thinning

Precommercial Thinning Within Connectivity Corridors

Roadless Areas

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map09.aml kls February 26, 2002

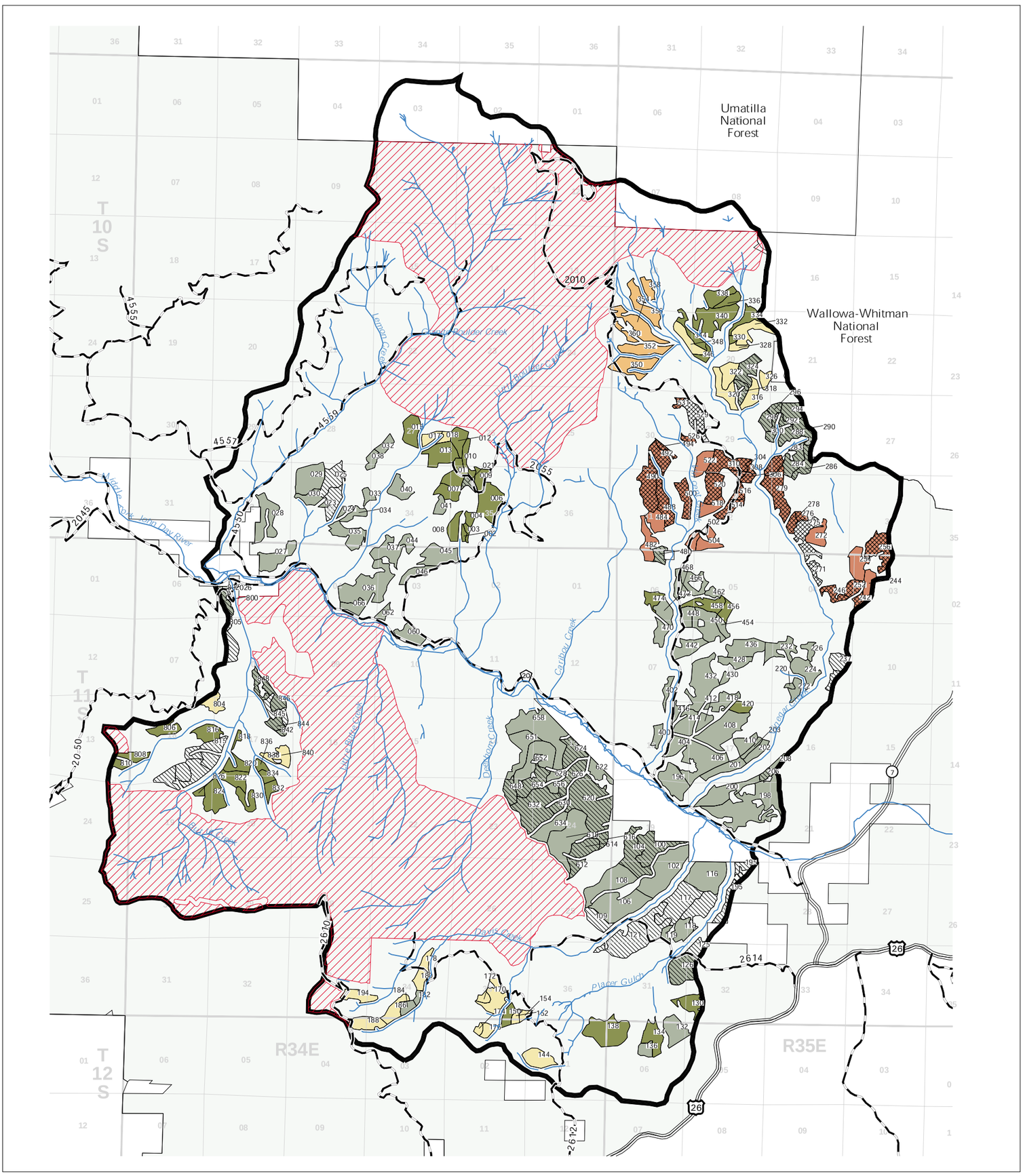
Map 9--Recommended Mechanical Treatments - Alt 2

NOTE: Refers to treatment in Forest Plan wildlife corridors and key linkage areas.

Scale = 1:81320 (.779 inches to 1 mi)

0 1/2 1 2 3

Southeast Galena Restoration
Mechanical Treatments
Alternative 3



- Malheur National Forest
- SE Galena Boundary
- Other Land Ownership
- Category I and II Streams
- Shelterwood
- Salvage
- Commercial Thinning
- Commercial Thinning Within Connectivity Corridors
- Understory Removal
- Precommercial Thinning
- Precommercial Thinning Within Connectivity Corridors
- Roadless Areas

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map10.aml kls February 26, 2002

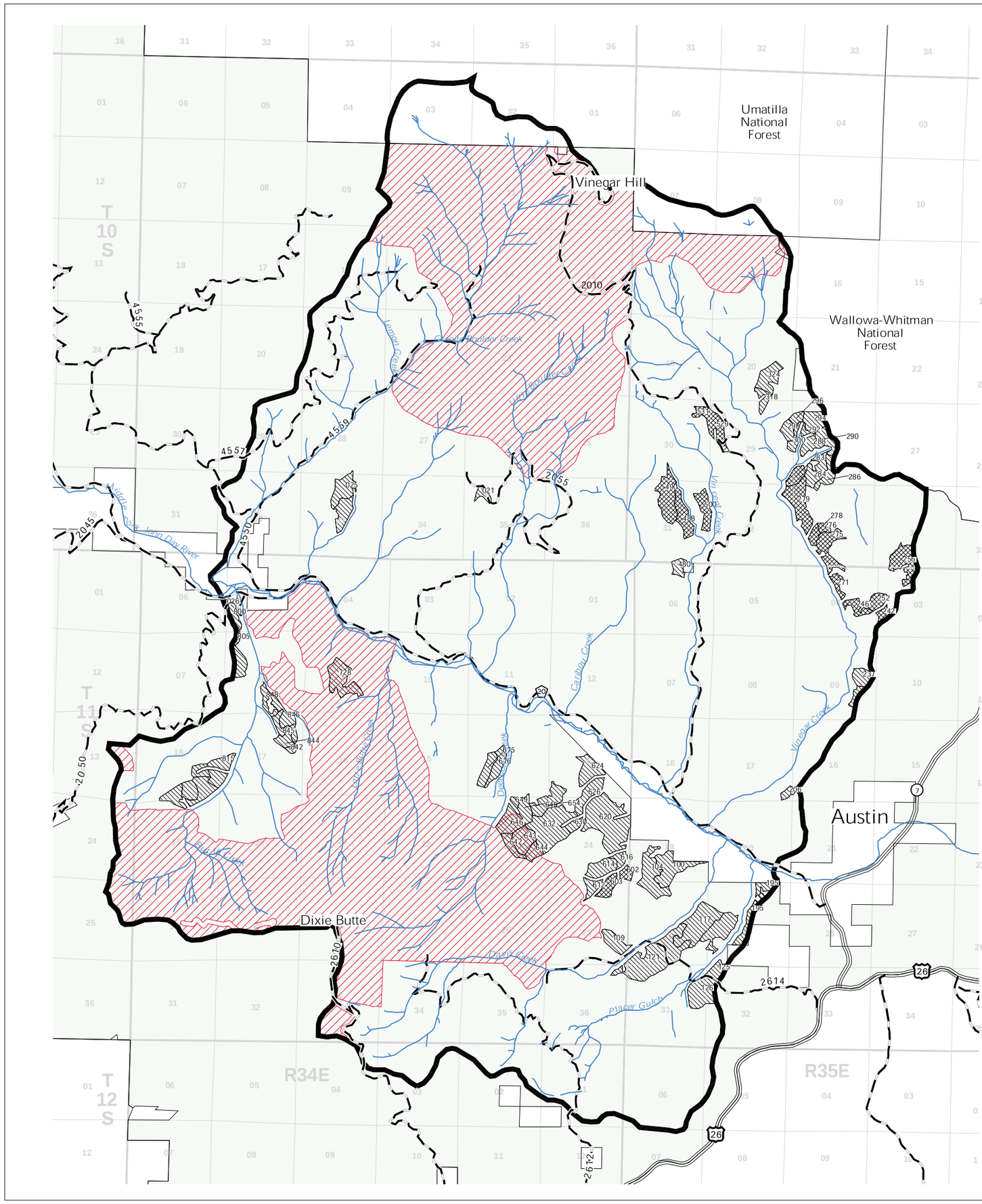
Map 10--Recommended Mechanical Treatments - Alt 3

NOTE: Refers to treatment in Forest Plan wildlife corridors and key linkage areas.

Scale = 1:81320 (.779 inches to 1 mi)

0 1/2 1 2 3

Southeast Galena Restoration
Mechanical Treatments (Pre-Commercial)
Alternative 4



Malheur National Forest

SE Galena Boundary

Other Land Ownership

Category I and II Streams

Precommercial Thinning

Precommercial Thinning Within Corridors

Roadless Areas

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Map 11--Recommended Mechanical Treatments - Alt 4

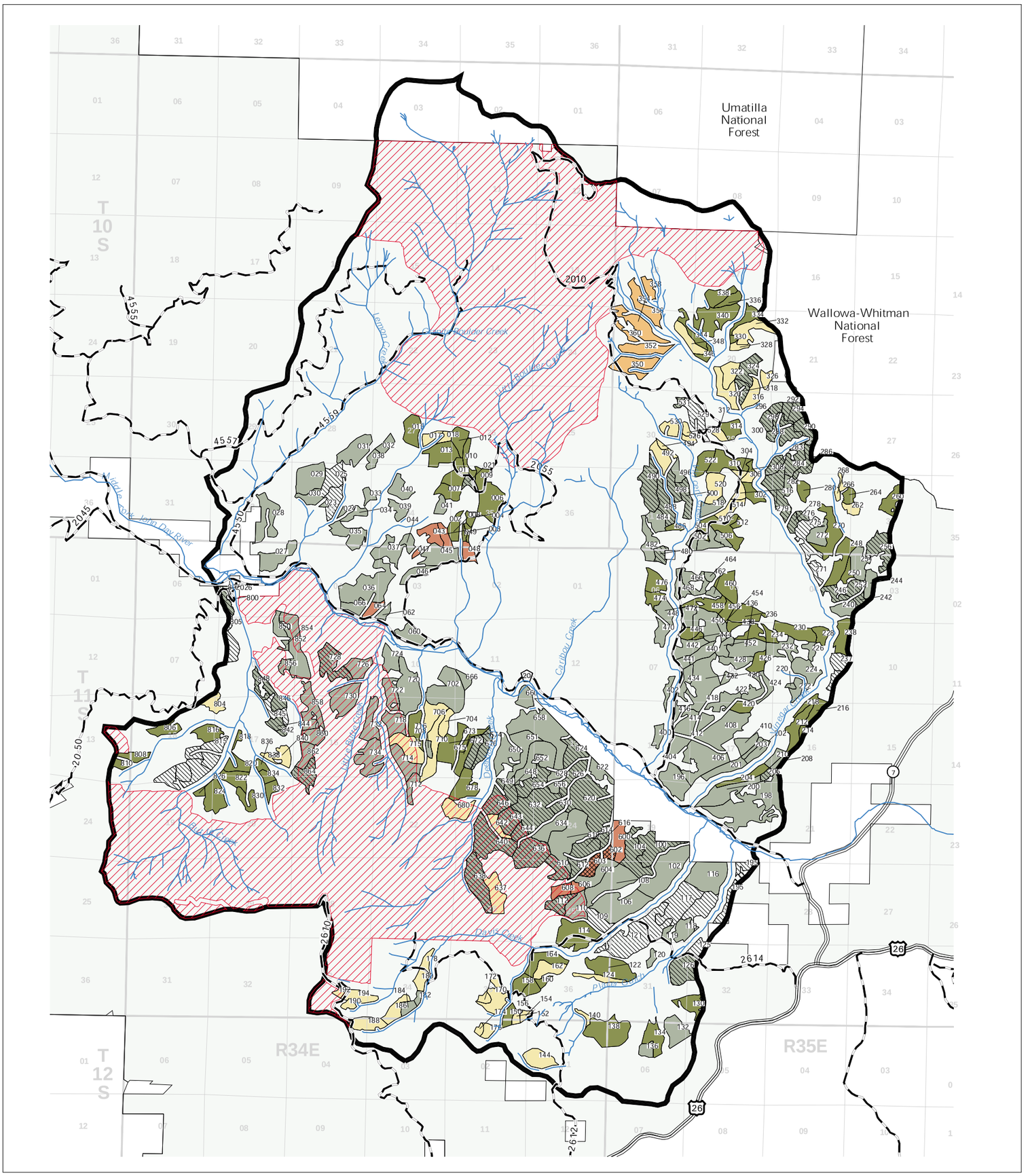
map11.aml kls February 26, 2002

Scale = 1:81320 (.779 inches to 1 mi)

0 1/2 1 2 3

NOTE: Refers to treatment in Forest Plan wildlife corridors and key linkage areas.

Southeast Galena Restoration
Mechanical Treatments
Alternative 5



Malheur National Forest

SE Galena Boundary

Other Land Ownership

Category I and II Streams

Shelterwood

Salvage

Commercial Thinning

Commercial Thinning Within Connectivity Corridors

Understory Removal

Roadless Areas

Precommercial Thinning

Precommercial Thinning Within Corridors

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map26.aml kls February 26, 2002

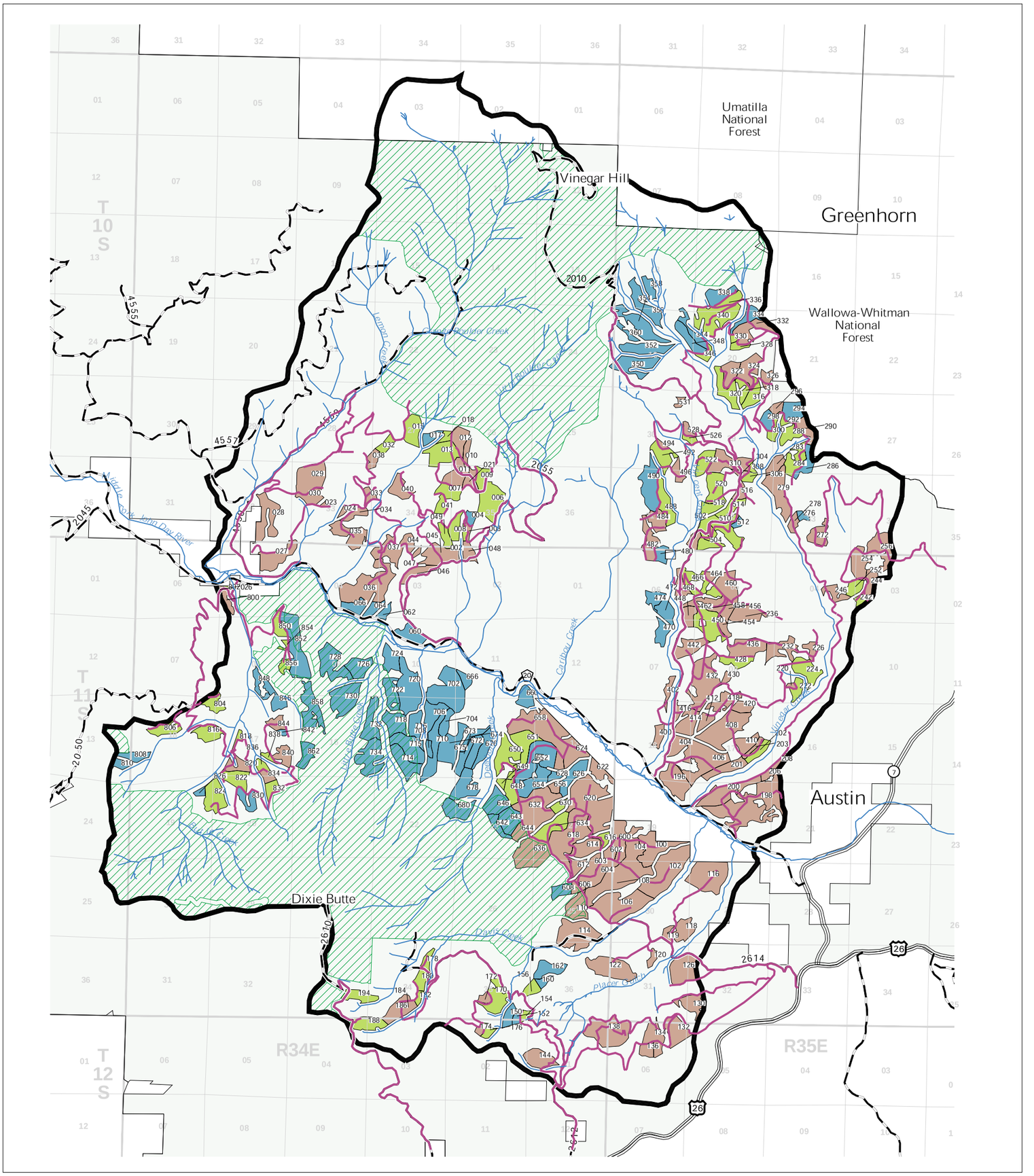
Map 12--Recommended Mechanical Treatments - Alt 5

NOTE: Refers to treatment in Forest Plan wildlife corridors and key linkage areas.

Scale = 1:81320 (.779 inches to 1 mi)

0 1/2 1 2 3

Southeast Galena Restoration
Proposed Logging Systems
Alternative 2



Malheur National Forest

SE Galena Boundary

Other Land Ownership

Category I and II Streams

Proposed Haul Routes

Helicopter Logging

Skyline Logging

Tractor Logging

Roadless Areas

Map13--Recommended Logging Systems - Alt 2

NOTE: Only major access roads and proposed haul routes are displayed.
Check the Access Management Plan maps for a more detailed roads display.

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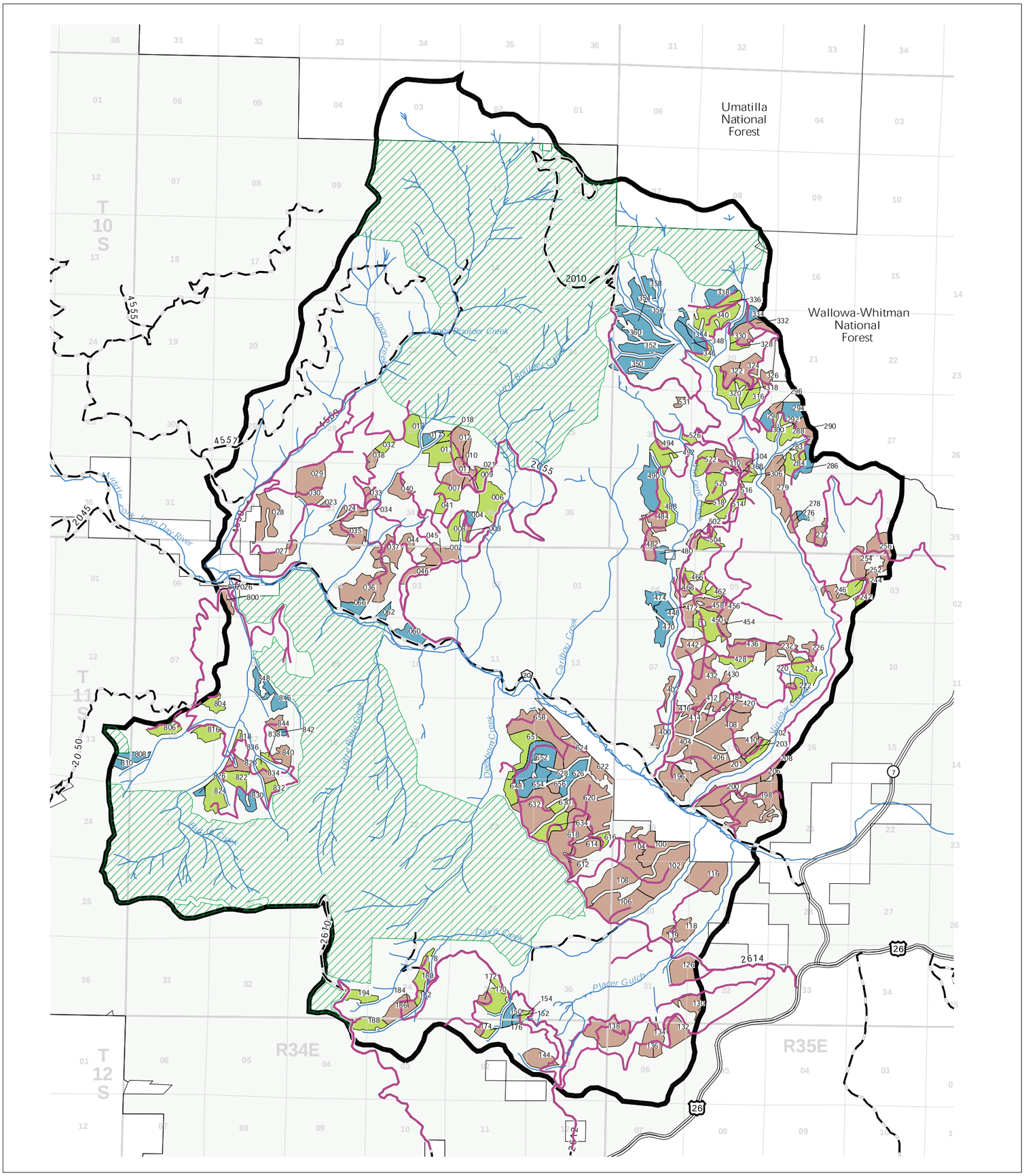
map13.aml kls February 27, 2002

Scale = 1:81320 (.779 inches to 1 mi)

0 1/2 1 2 3

Southeast Galena Restoration
Logging Systems
Alternative 3



Malheur National Forest

SE Galena Project Boundary

Other Land Ownership

Category I and II Streams

Proposed Haul Routes

Helicopter Logging

Skyline Logging

Tractor Logging

Roadless Areas

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map14.aml kls February 27, 2002

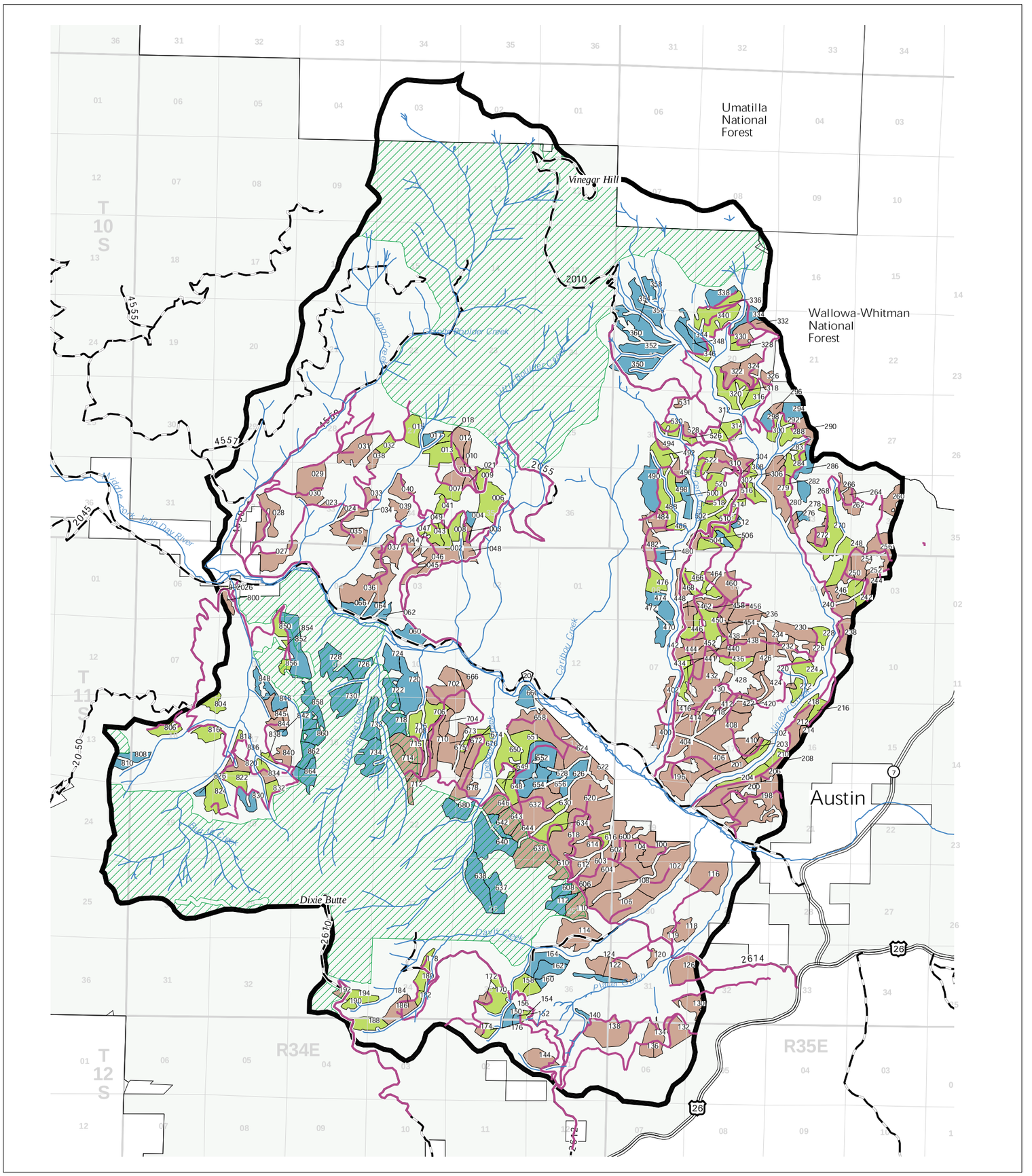
Map 14--Recommended Logging Systems - Alt 3

NOTE: Only major access roads and proposed haul routes are displayed.
Check the Access Management Plan maps for a more detailed roads display.

Scale = 1:81320 (.779 inches to 1 mi)

0 1/2 1 2 3

Southeast Galena Restoration
Logging Sytems
Alternative 5



Malheur National Forest

SE Galena Project Boundary

Other Land Ownership

Category I and II Streams

Proposed Haul Routes

Helicopter Logging

Skyline Logging

Tractor Logging

Roadless Areas

ATTENTION

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map15.aml kls February 27, 2002

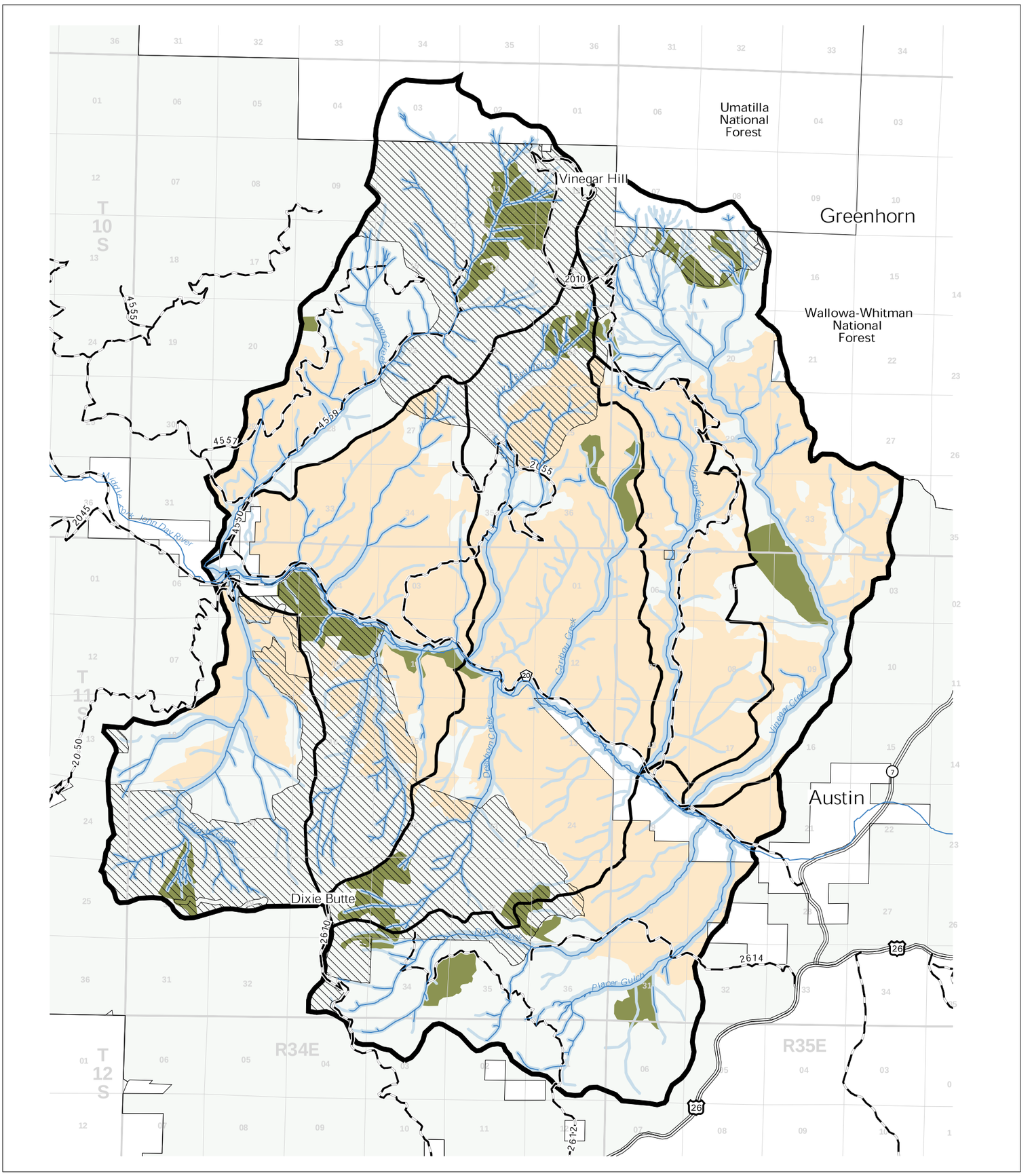
Map 15--Recommended Logging Systems - Alt 5

NOTE: Only major access roads and proposed haul routes are displayed.
Check the Access Management Plan maps for a more detailed roads display.

Scale = 1:75191

0 1/2 1 2 3

Southeast Galena Restoration
Prescribed Fire Opportunities
Alternatives 2 and 5



SE GalenaBoundary

Other Land Ownership

Category I and II Streams

Subwatershed Boundarys

Malheur National Forest

RHCA's

Prescribed Fire Opportunities

Dedicated Old Growth
Outside of Perscribed Fire

Roadless Areas

ATTENTION
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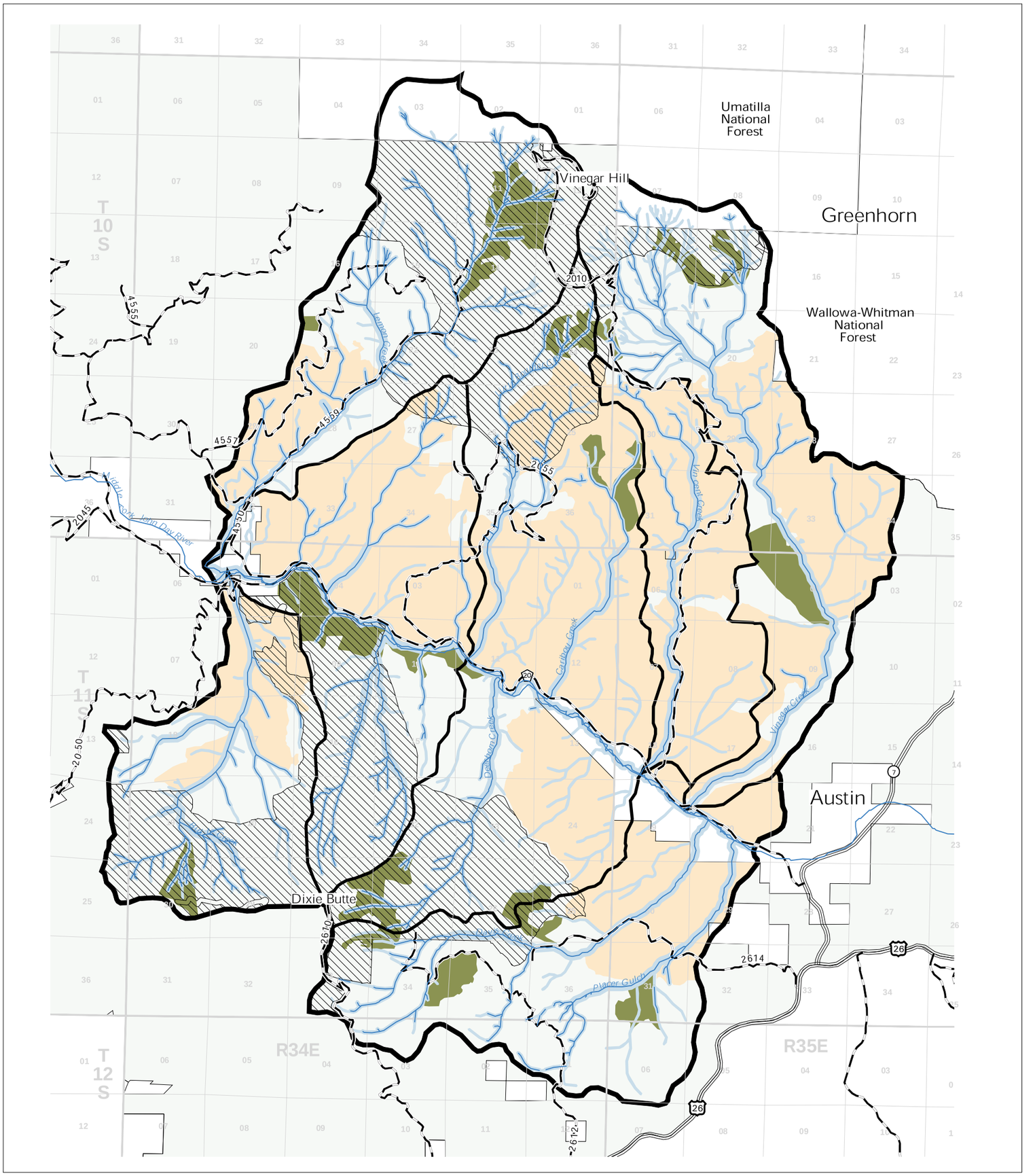
map7.aml kls February 27, 2002

Map 16--Recommended Rx Fire Opportunities - Alt 2&5

Scale = 1:81320 (.779 inches to 1 mi)

0 1/2 1 2 3

Southeast Galena Restoration
Prescribed Fire Opportunities
Alternative 3



- SE Galena Boundary
- Other Land Ownership
- Category I and II Streams
- Subwatershed Boundarys
- Malheur National Forest
- RHCA's
- Prescribed Fire Opportunities
- Dedicated Old Growth Outside of Perscribed Fire
- Roadless Areas

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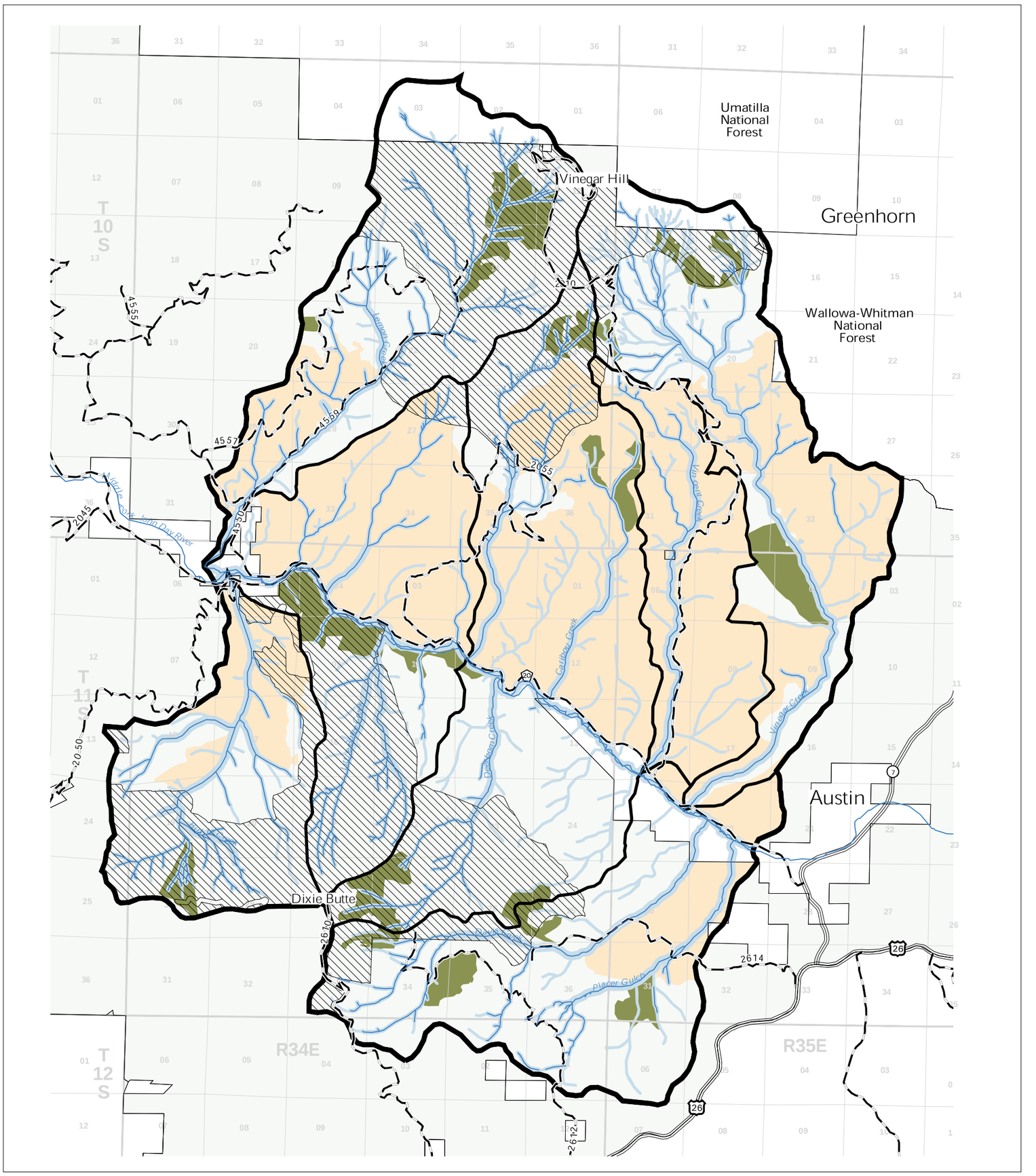
map17.aml kls February 27, 2002

Map 17--Recommended Prescribed Fire Opportunities - Alt 3

Scale = 1:81320 (.779 inches to 1 mi)

0 1/2 1 2 3

Southeast Galena Restoration
Prescribed Fire Opportunities
Alternative 4



- SE Galena Boundary
- Other Land Ownership
- Category I and II Streams
- Subwatershed Boundarys
- Malheur National Forest
- RHCA's
- Prescribed Fire Opportunities
- Dedicated Old Growth Outside of Perscribed Fire
- Roadless Areas

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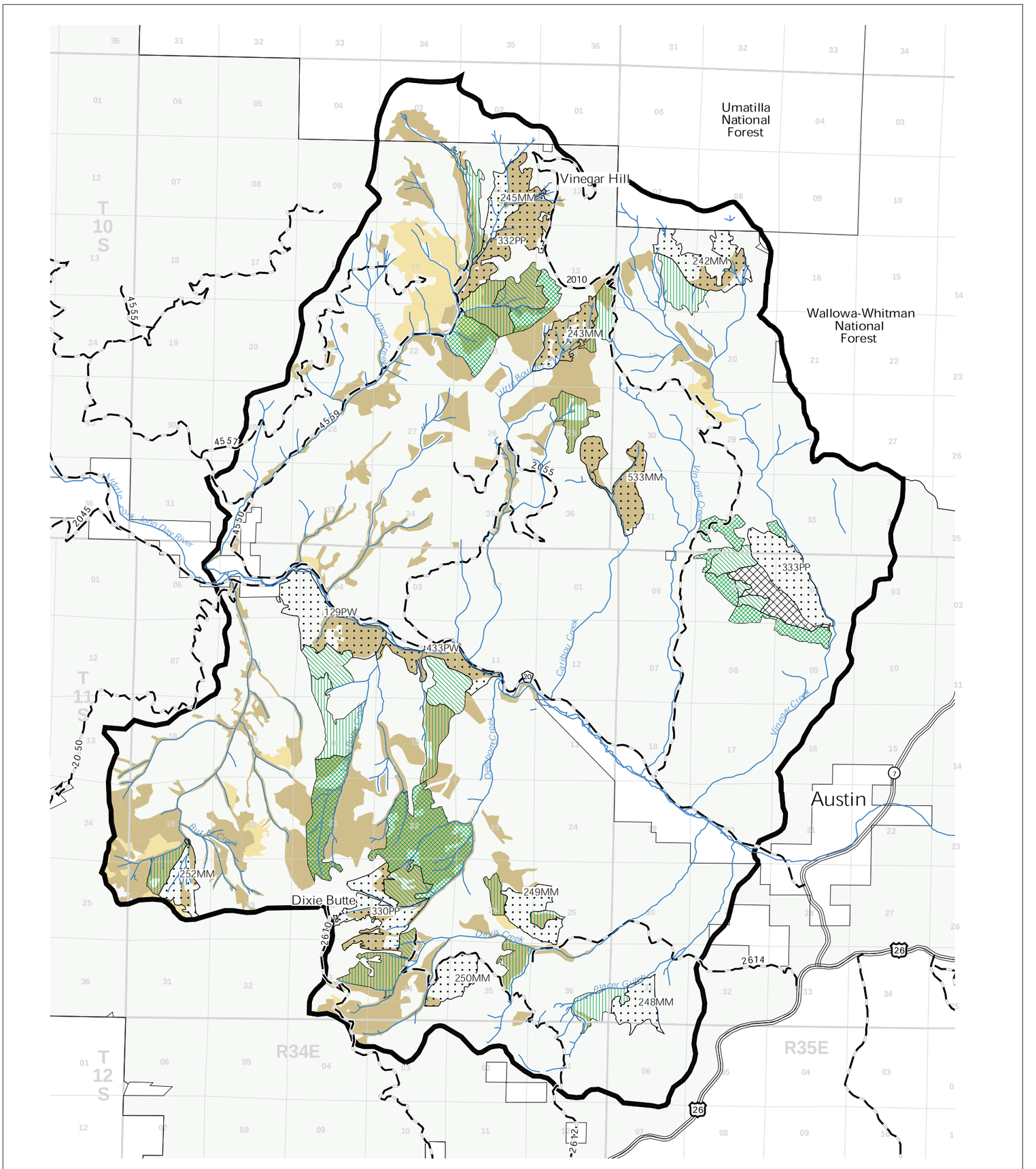
map18.aml kls February 27, 2002

Map 18--Prescribed Fire Opportunities - Alt 4

Scale = 1:81320 (.779 inches to 1 mi)

0 1/2 1 2 3

Southeast Galena Restoration
Dedicated and Replacement Old Growth
For Action Alternatives



Map 19--Recommended Dedicated and Replacement Old Growth- For Action Alts

- SE Galena Boundary
- Other Land Ownership
- Category I and II Streams
- Malheur National Forest
- Existing Old Growth Forest, Multi Strata (OFMS)
- Existing Old Growth Forest, Single Strata (OFSS)
- Existing Management Area 13 Dedicated Old Growth (DOG)
- Existing Replacement Old Growth (ROG)
- Proposed Pileated Woodpecker Feeding Area (PWFA)
- Proposed ROG and PWFA
- Proposed Expanded Old Growth for Alt. 3 only

NOTE: Existing DOGs are labeled. PP = Pileated Woodpecker, MM = Pine Marten, PW = Pileated Woodpecker and Pine Marten

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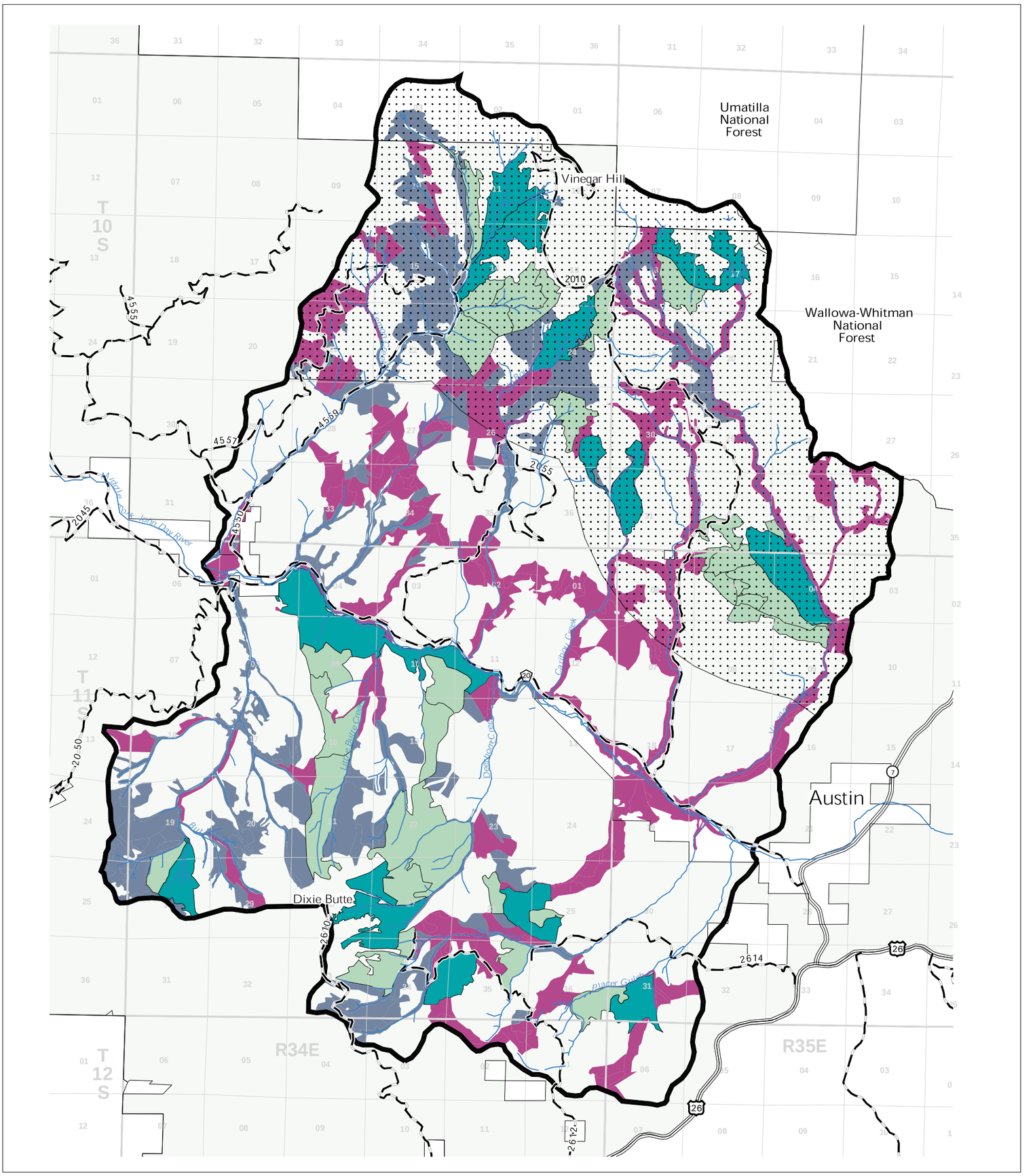
map19.aml kls February 28, 2002

Scale = 1:81320 (.779 inches to 1 mi)

0 1/2 1 2 3

Southeast Galena Restoration
Wildlife Connectivity
For Action Alternatives



SE Galena Boundary

Other Land Ownership

Category I and II Streams

Malheur National Forest

Existing Old Growth

Existing Management Area 13
Dedicated Old Growth (DOG)

ROG or PWFA (See NOTE)

LRMP2 Wildlife Corridors

Key Linkage Areas

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map20.aml kls February 26, 2002

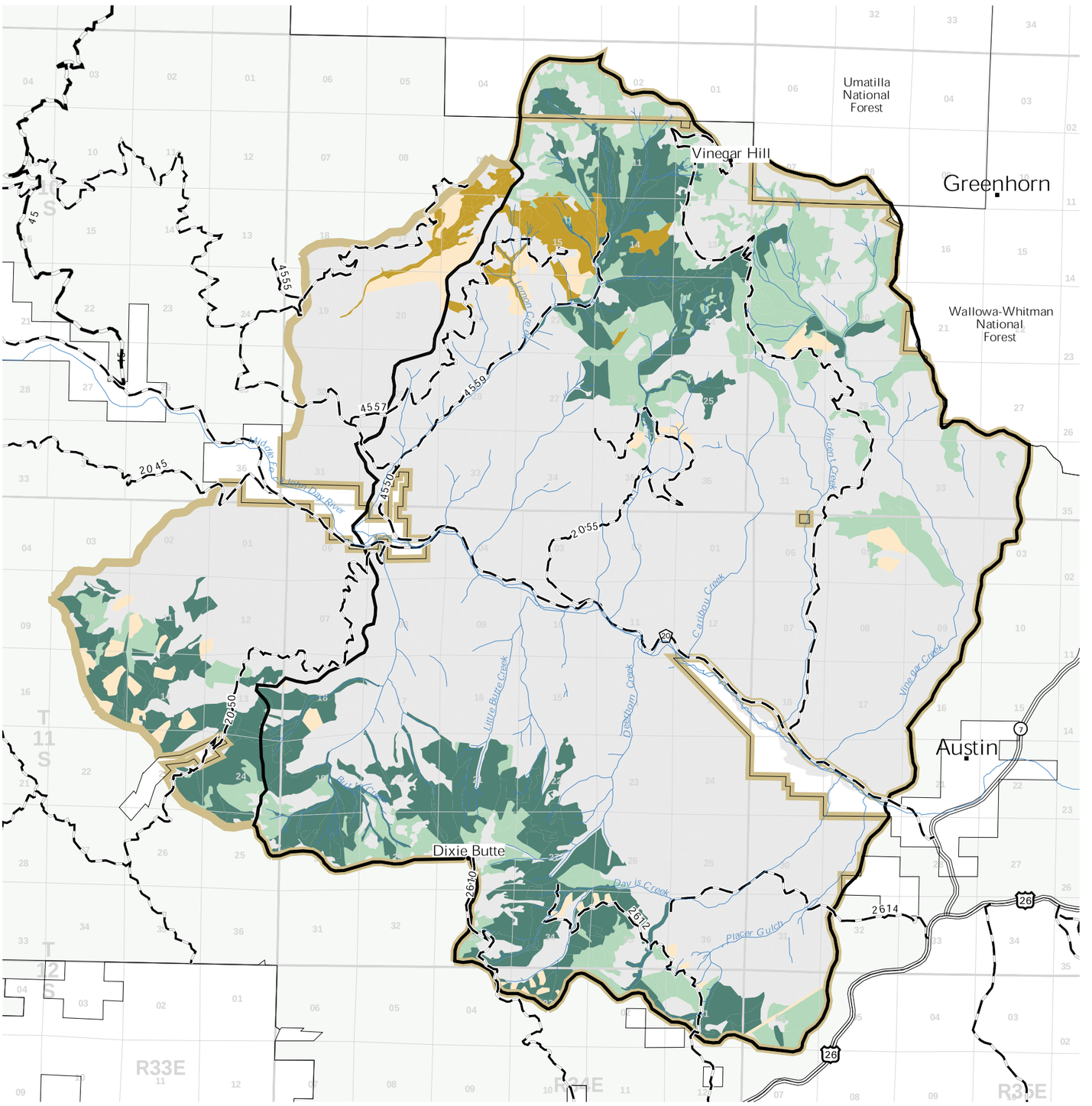
Map 20--Wildlife Connectivity for Action Alts

Scale = 1:81320 (.779 inches to 1 mi)

0 1/2 1 2 3

NOTE: Proposed Replacement Old Growth (ROG) or Pileated Woodpecker Feeding Areas (PWFA)

Southeast Galena Restoration
Canada Lynx Habitat - Existing Condition



Southeast Galena Lynx Analysis Unit (LAU)

SE Galena Boundary

Other Land Ownership

Category I and II Streams

Malheur National Forest

Non-Habitat

Unsuitable Habitat

Created Unsuitable Habitat

Forage Habitat

Denning Habitat

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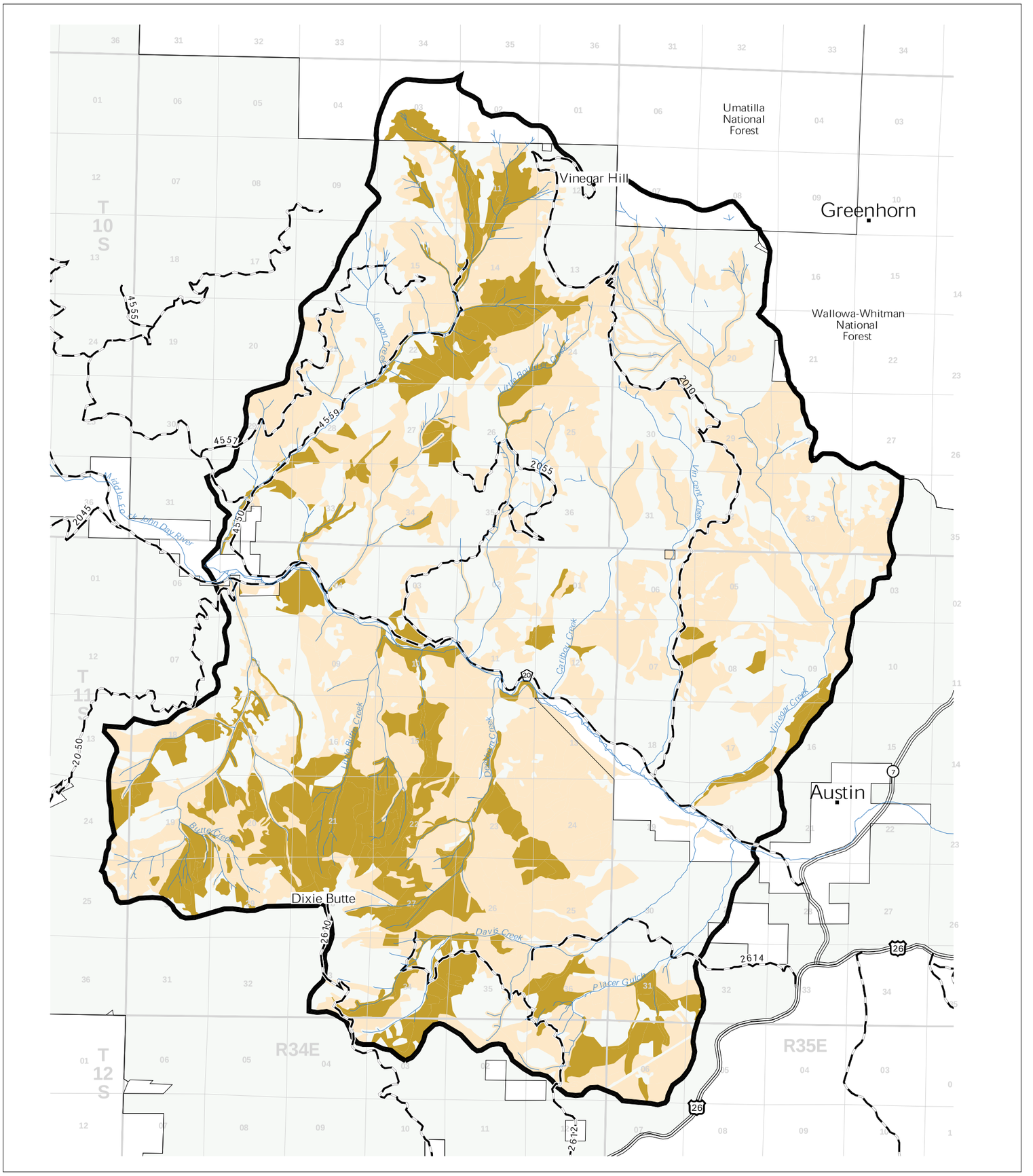
map21.aml dam February 27, 2002

Map 21--Canada Lynx Habitat - Existing Condition

Scale = 1:94514 (.67 inches to 1 mi)

0 1 2 3 4

Southeast Galena Restoration
Big Game Cover
Existing Condition



SE Galena Boundary

Other Land Ownership

Category I and II Streams

Malheur National Forest

Marginal Big Game Cover

Satisfactory Big Game Cover

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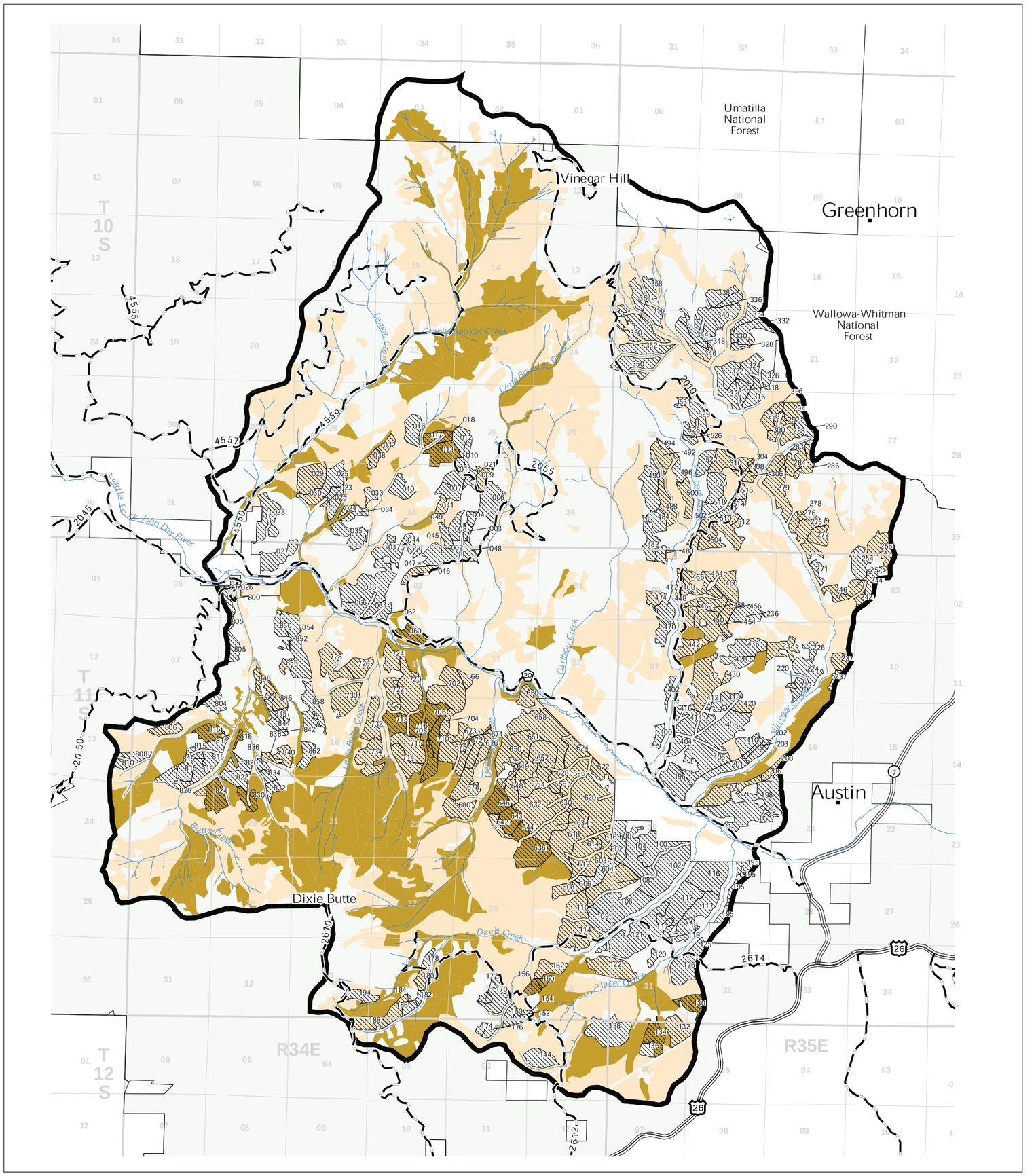
map22.aml dam February 27, 2002

Map 22-Big Game Cover--Existing Condition

Scale = 1:81320 (.779 inches to 1 mi)

0 1/2 1 2 3

Southeast Galena Restoration
Big Game Cover
Alternative 2



SE Galena Boundary

Other Land Ownership

Category I and II Streams

Malheur National Forest

Marginal Big Game Cover

Satisfactory Big Game Cover

Commercial and Precommercial Proposed Harvest Units

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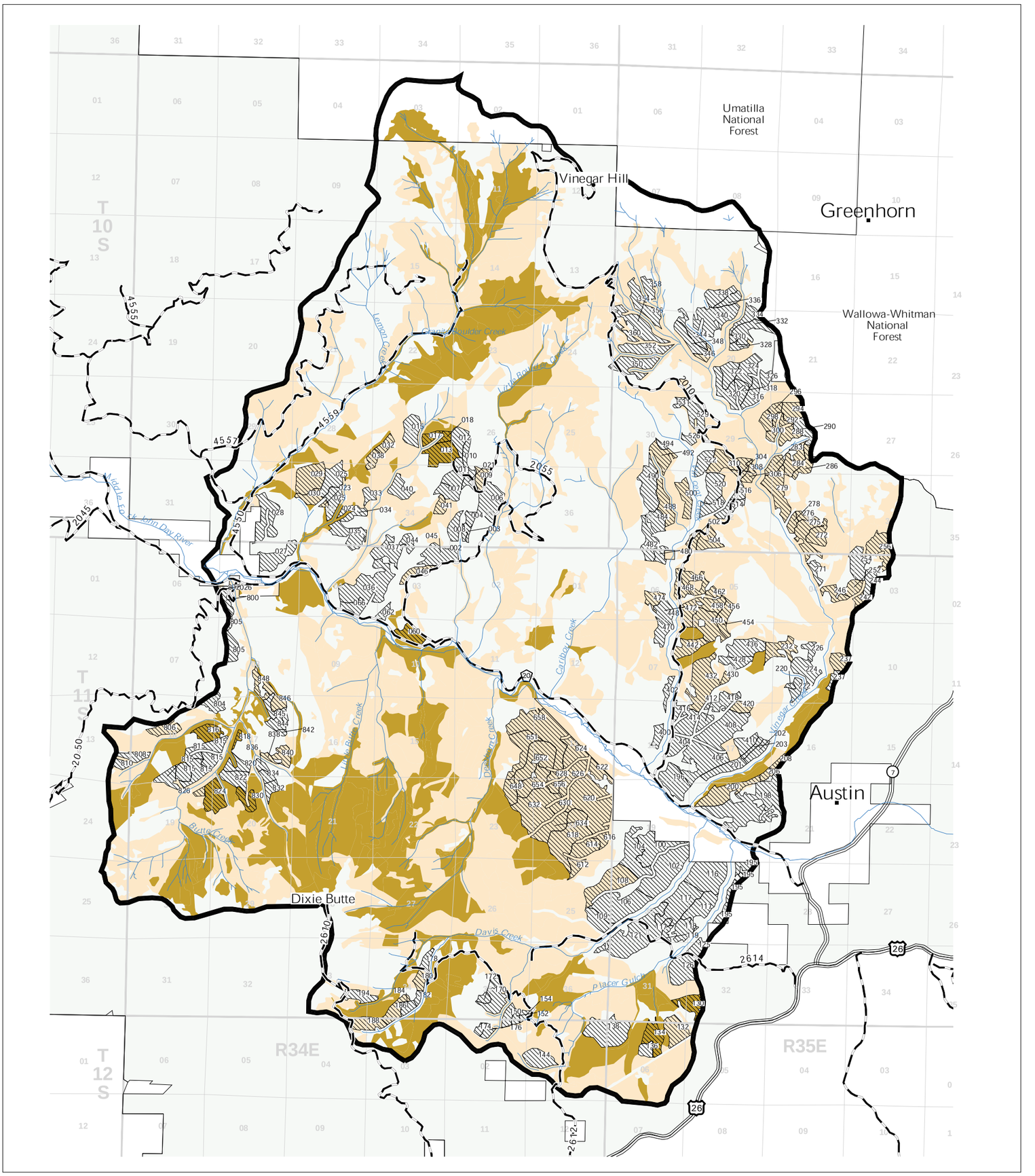
map23.aml dam February 27, 2002

Map 23--Big Game Cover - Alt 2

Scale = 1:81320 (.779 inches to 1 mi)

0 1/2 1 2 3

Southeast Galena Restoration
Big Game Cover
Alternative 3



SE Galena Boundary

Other Land Ownership

Category I and II Streams

Malheur National Forest

Marginal Big Game Cover

Satisfactory Big Game Cover

Commercial and Precommercial Proposed Harvest Units

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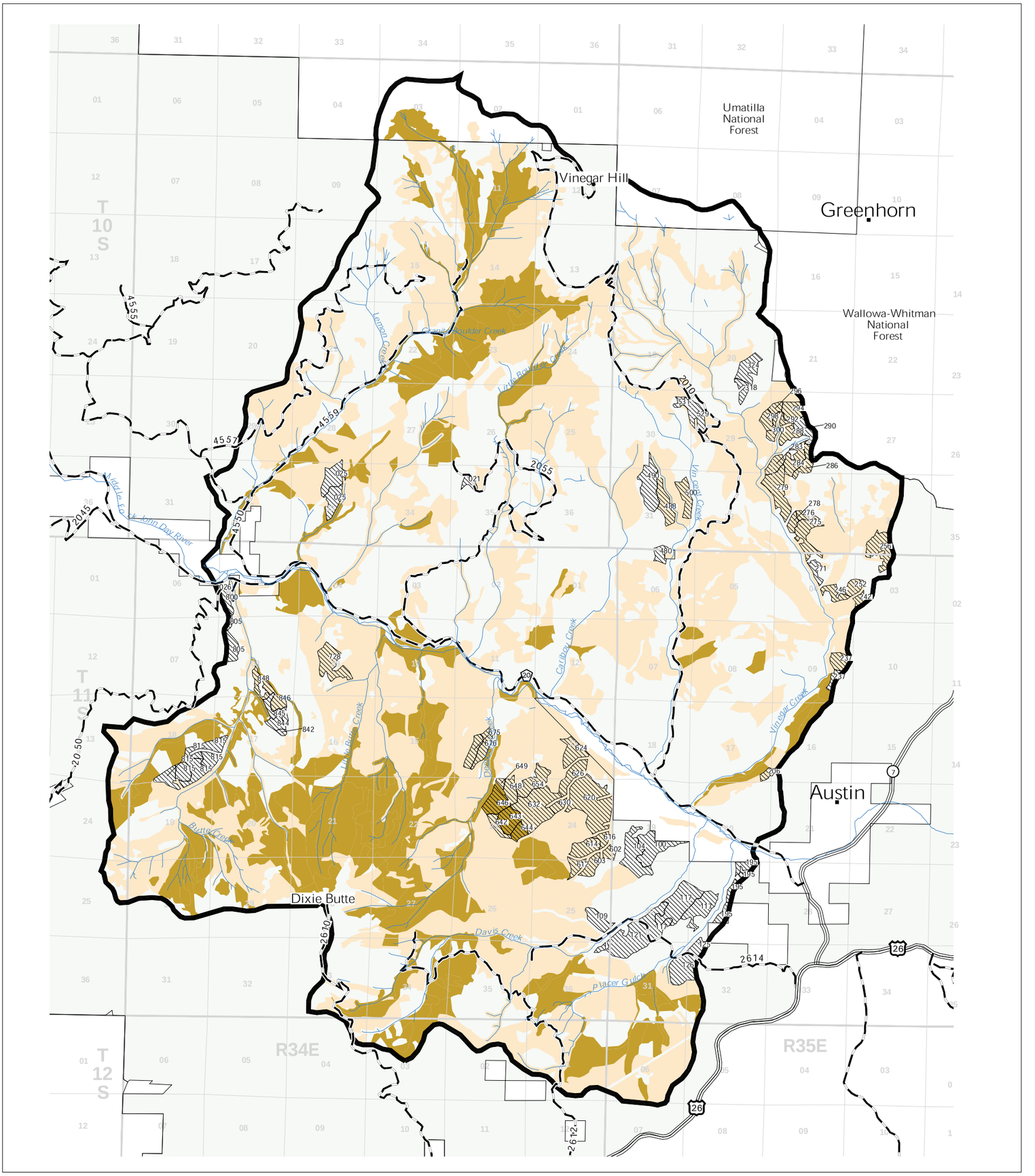
map24.aml dam February 27, 2002

Map 24--Big Game Cover - Alt 3

Scale = 1:81320 (.779 inches to 1 mi)

0 1/2 1 2 3

Southeast Galena Restoration
Big Game Cover
Alternative 4



SE Galena Boundary

Other Land Ownership

Category I and II Streams

Malheur National Forest

Marginal Big Game Cover

Satisfactory Big Game Cover

Precommercial Proposed Harvest Units

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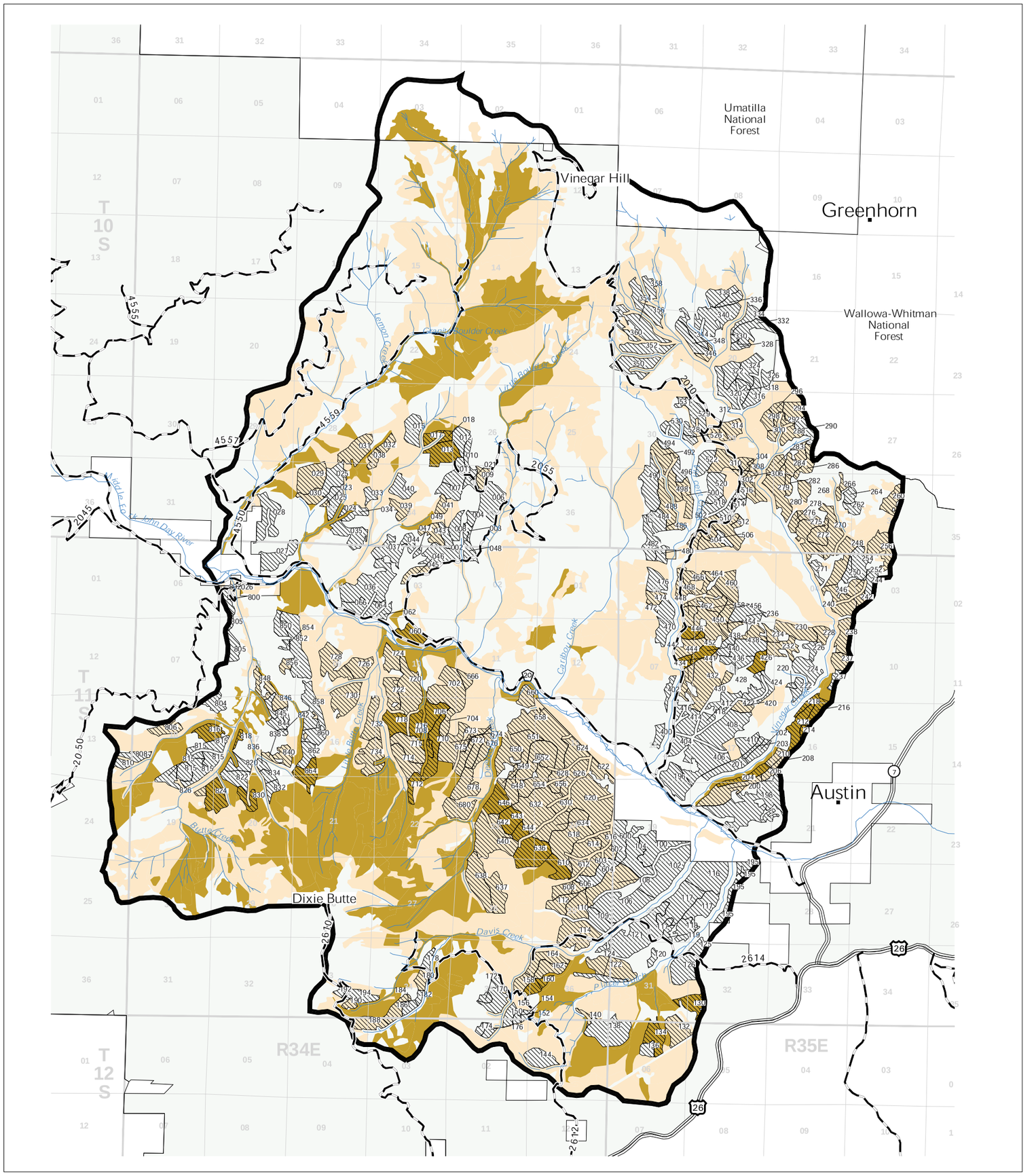
map25.aml dam February 27, 2002

Map 25--Big Game Cover - Alt 4

Scale = 1:81320 (.779 inches to 1 mi)

0 1/2 1 2 3

Southeast Galena Restoration
Big Game Cover
Alternative 5



SE Galena Project Boundary

Other Land Ownership

Category I and II Streams

Malheur National Forest

Marginal Big Game Cover

Satisfactory Big Game Cover

Commercial and Precommercial Proposed Harvest Units

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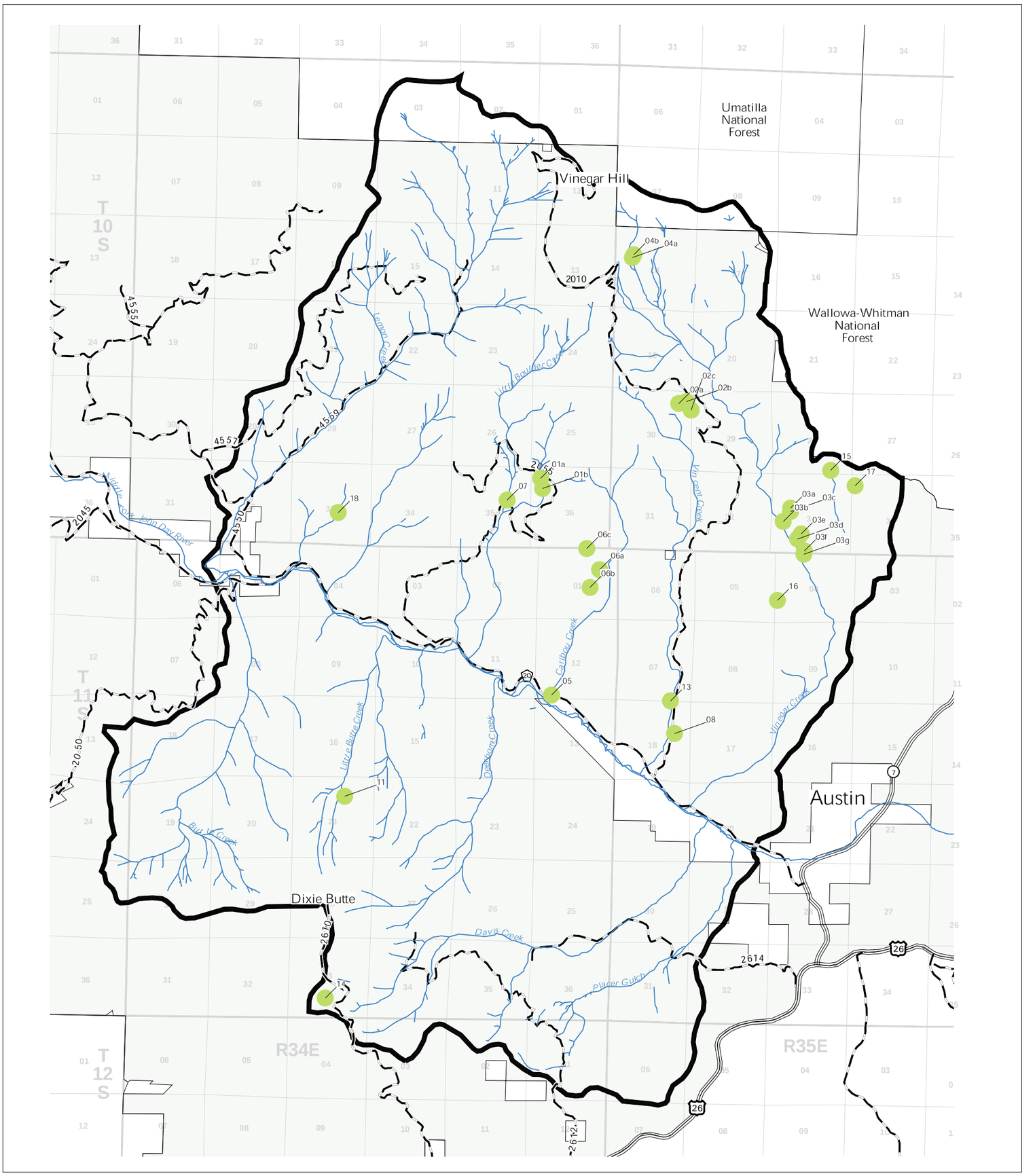
map26.aml dam February 27, 2002

Map 26--Big Game Cover - Alt 5

Scale = 1:81320 (.779 inches to 1 mi)

0 1/2 1 2 3

Southeast Galena Restoration
Aspen Enhancement Sites



SE Galena Boundary

Malheur National Forest

Category I and II Streams

Aspen Restoration Sites

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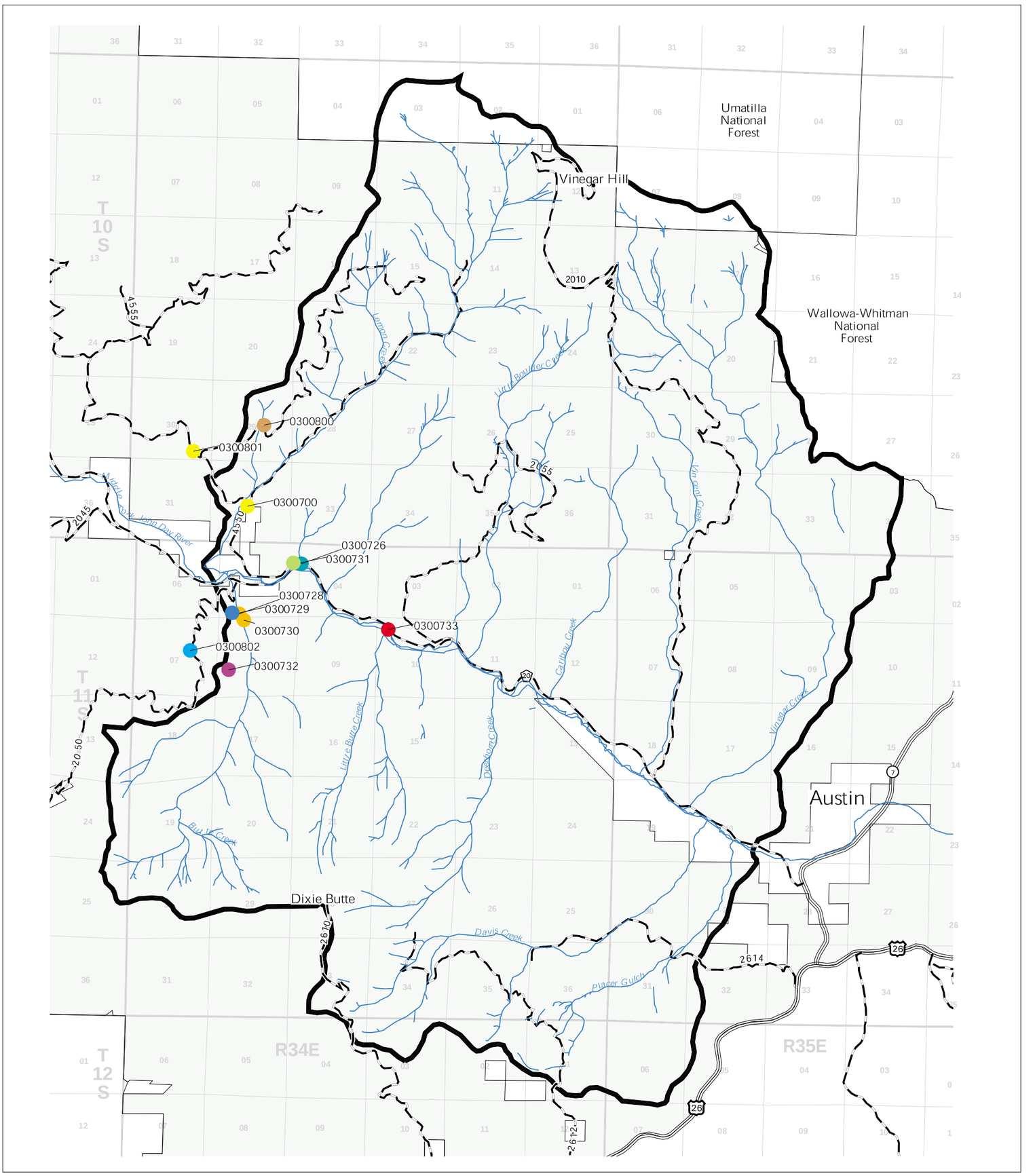
map27.aml kls February 28, 2002

Map 27--Aspen Enhancement Sites - For Action Alts

Scale = 1:81320 (.779 inches to 1 mi)

0 1/2 1 2 3

Southeast Galena Restoration
Noxious Weed Sites



- SE Galena Boundary
- Other Land Ownership
- Malheur National Forest
- Category I and II Streams
- Musk Thistle (CANU4)
- Diffuse Knapweed (CEDI3)
- Spotted Knapweed (CEMA)
- St Johnswort (HYPE)
- Yellow Toadflax (LIVU2)
- Canada Thistle (CIAR)
- Houndstognue (CYOF)
- Tansy Ragwort (SEJA)
- CEMA and HYPE

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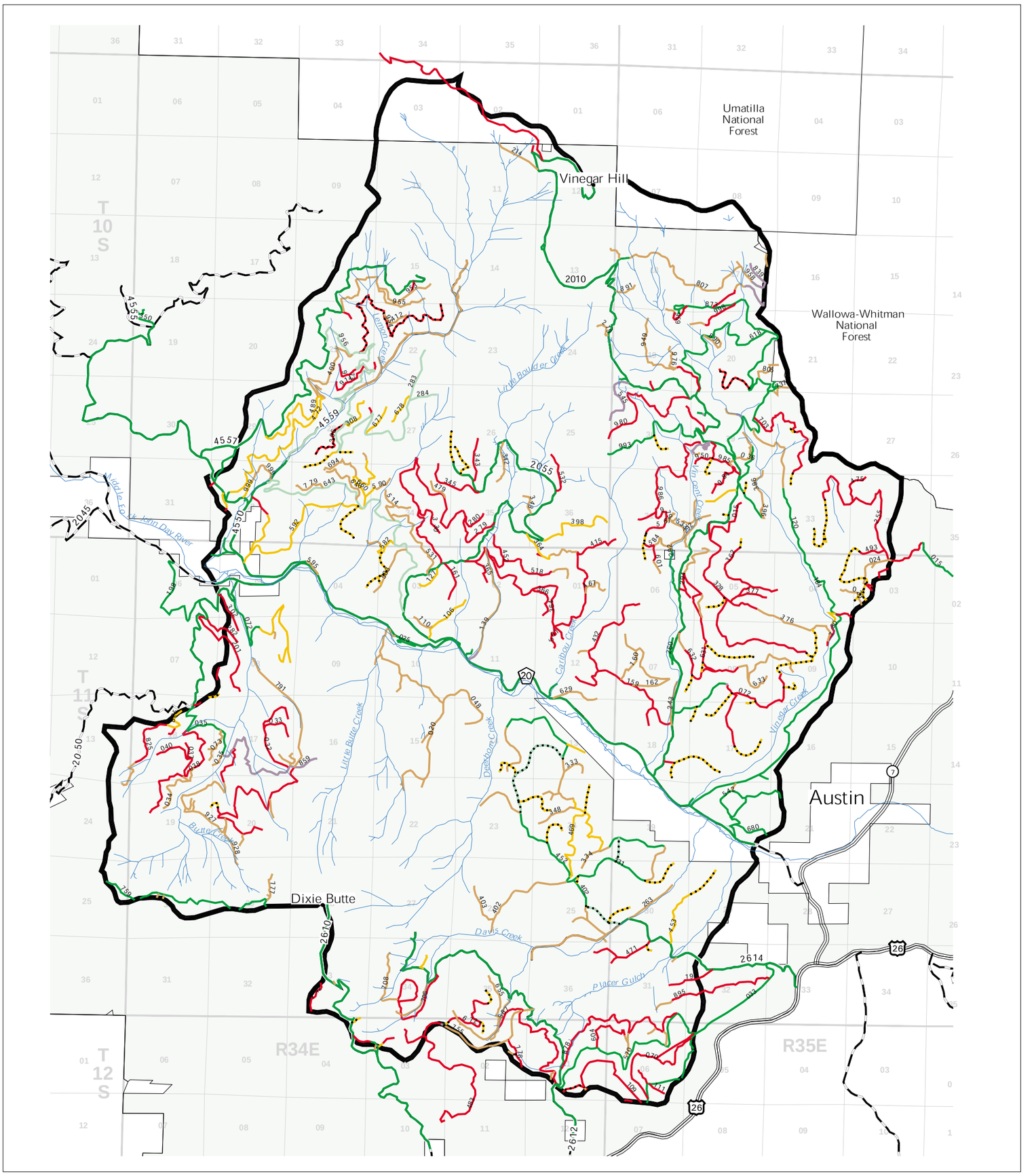
map28.aml kls February 25, 2002

Map 28--Noxious Weed Sites - Existing Condition

Scale = 1:81320 (.779 inches to 1 mi)

0 1/2 1 2 3

Southeast Galena Restoration
Access Travel Management Plan
for Alternatives 2, 3, 4



- SE Galena Boundary
- Other Land Ownership
- Malheur National Forest
- Category I and II Streams
- Existing Open Roads
- Proposed New Road Construction to Remain Open
- Seasonal Road Closure (Dec 1 - Mar 31)
- Existing Closed Roads to Open
- Existing Closed Roads
- Existing Closed Roads, Proposed Inactivation
- Proposed New Road Closures
- Proposed New Road Construction to to be Closed
- Roads Proposed for Decommission

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map29.aml kls February 28, 2002

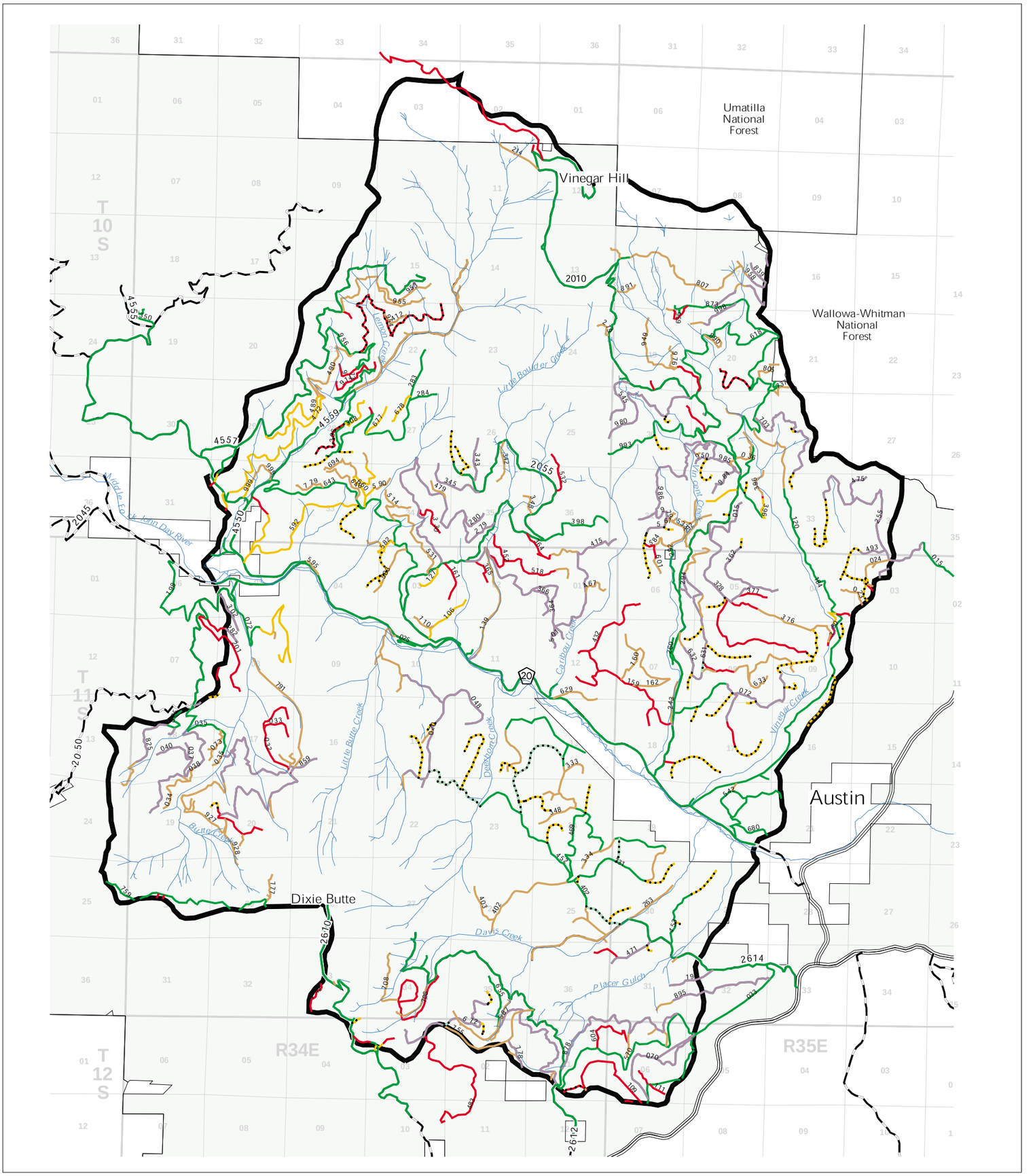
Map 29--Access Travel Management Plan - Alts 2,3,4

Note: Temporary Roads are not intended to be part of the forest transportation system, are not needed for long-term resource management, and are not displayed on this map. They are typically scarified or subsoiled and seeded after timber harvest is completed. Alt 2 would construct an estimated 6 miles of temp road, Alt 3 would construct less then 6 miles, and Alt 4 would construct less then 1 mile.

Scale = 1:81320 (.779 inches to 1 mi)

0 1/2 1 2 3

Southeast Galena Restoration
Access Travel Management Plan
for Alternative 5



SE Galena Project Boundary

Other Land Ownership

Malheur National Forest

Category I and II Streams

Existing Open Roads

Proposed New Road Construction to Remain Open

Existing Closed Roads to Open

Existing Closed Roads

Existing Closed Roads, Proposed Inactivation

Proposed New Road Closures

Proposed New Road Construction to to be Closed

Roads Proposed for Decommission

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map30.aml kls February 28, 2002

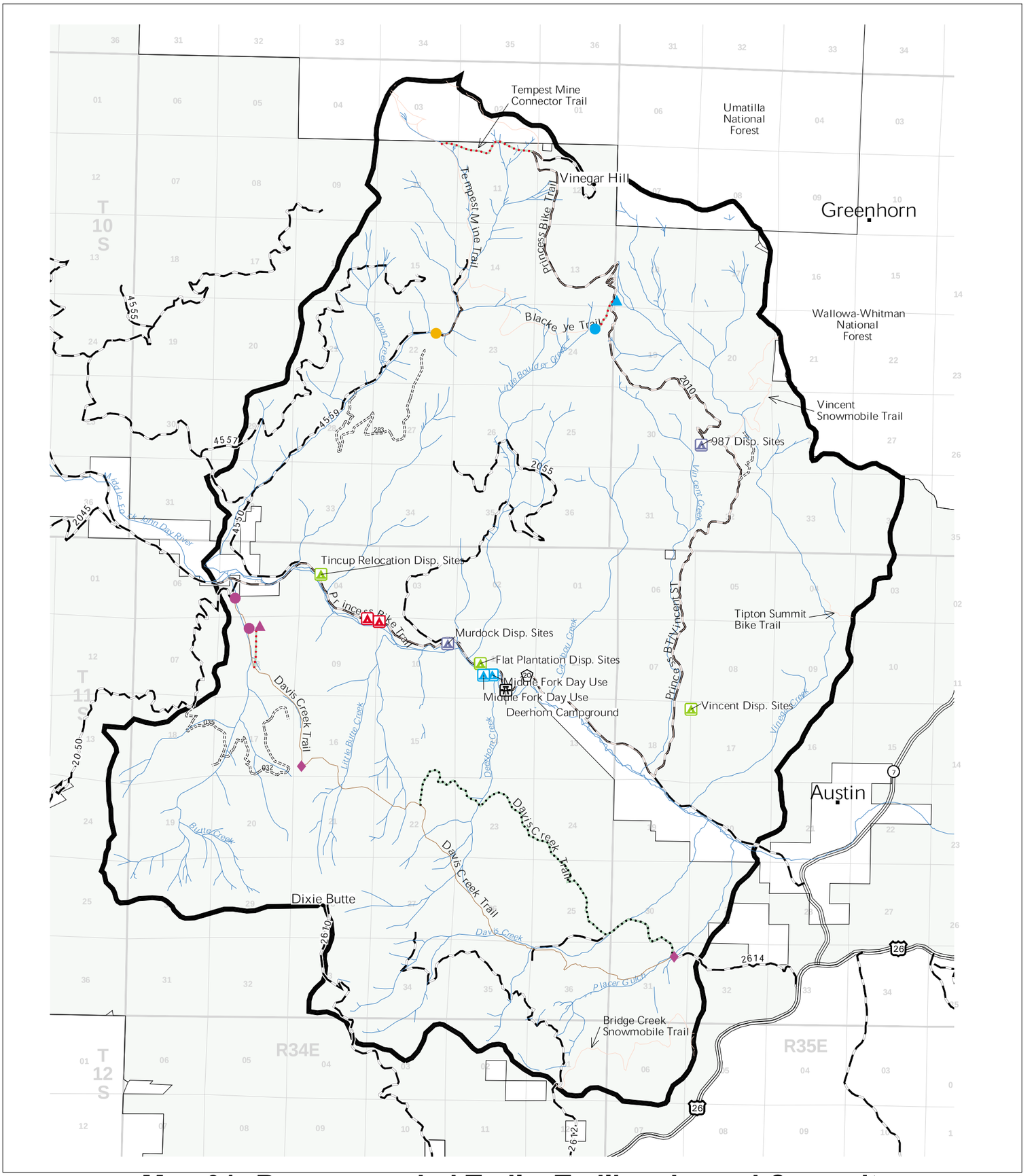
Map 30--Access Travel Management Plan - Alt 5

Note: Temporary Roads are not intended to be part of the forest transportation system, are not needed for long-term resource management, and are not displayed on this map. They are typically scarified or subsoiled and seeded after timber harvest is completed. Alt 5 would construct an estimated 7 miles of temporary roads.

Scale = 1:81320 (.779 inches to 1 mi)

0 1/2 1 2 3

Southeast Galena Restoration
Proposed Trails, Trailheads, and Campsite Projects - For Action Alternatives



Map 31--Recommended Trails, Trailheads, and Campsites

- SE Galena Boundary
- Other Land Ownership
- Category I and II Streams
- Malheur National Forest
- Existing Trails Alternative 1
- Proposed New Trails Alternative 2 3 4 5
- Proposed New Trail Alternative 5
- Proposed Trail for Reconstruction Alternative 2 3 5
- Proposed Trails for Decommission Alternative 2 3 4 5
- Black Eye Trailhead Existing Proposed for Decommission
- Black Eye Trailhead Proposed for Construction
- Black Eye and Tempest Trailhead Existing Proposed for Decommission
- Davis Creek Trailhead Existing no Proposals
- Davis Creek Trailhead Existing Proposed for Decommission
- Davis Creek Trailhead Proposed for Construction
- Proposed Improvement to Existing Campground
- Proposed New Dispersed Camp Sites
- Proposed Improvements to Dispersed Camp Sites
- Proposed Closure Dispersed Camp Sites
- Proposed Day Use Sites

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map31.aml dam February 28, 2002

Scale = 1:81320 (.779 inches to 1 mi)

0 1/2 1 2 3

Appendix F

Fire Risk

Fire risk is the chance of a fire starting. Generally, risk increases with drier, hotter seasonal climate changes. This is determined by using the frequency of past fire starts. Fire frequency is expressed statistically as the number of fires per one thousand acres per year.

Low risk = 0 to 0.49. At least one fire expected every 20 or more years per thousand acres.

Moderate risk = 0.50 to 0.99. At least one fire expected in 11 to 20 years per thousand acres.

High risk = 1.0 or greater. At least one fire expected in 0 to 10 years per thousand acres.

For the Galena watershed, and the Project Area, fire frequency is 1.3 fires, per one thousand acres. For the project area it is 1.7 per one thousand acres. Lightning causes about 87 percent of the fire starts in the watershed—the remaining 13 per cent are human caused.

Fire Hazard for Surface Fires

Fire hazard relates to fuel accumulation and loadings. These hazards are seasonal in nature. Fire hazard is determined by combinations of slope, aspect, and ground fuels. The amount, type, and arrangement of ground fuels are classified by using fuel models developed by the National Forest Fire Laboratory.

Most of the project area is characterized by a fire behavior Fuel Model 9 (Timber, loosely compacted litter), and Fuel Model 10 (Timber, heavy litter) . Other fuel models present, include Fuel Models 1, 5, 8, 11 and 13. The following table displays the percent of each fuel model present.

Table 1 Fuel Models in the Project Area.

Fuel Model/ Description	Existing Fuel Models
1/Short Grass	8
2/ Timber-Grass Understory	0
6/ Shrubs	3
8/Timber-Compacted Litter	4
9/Timber-Loosely Compacted Litter	41
10/ Timber-Heavy Litter	38
11/Activity Created Slash	7
13/Blow down Generated Fuels	1

Fuel Models

Fuel Model 1: This fuel model is used to describe most of the non-forested areas with short grasses and shrub vegetation. It generally results in low to moderate severity fire with a low resistance to control and high spread rates.
Fuel Model 2: This fuel model is representative of the area burned by the Summit Fire and the Dry Forest type, where the canopy is open enough to allow grass. In Fuel Model 2, there can be high spread rate through the fine ground fuels.
Fuel Model 6: This fuel model represents shrub lands. Fires can spread quickly with increased flame lengths when winds exceed eight miles per hour. Lower wind speeds will help keep the fire on the ground.
Fuel Model 8: This fuel model represents timber with compacted litter. The fire spread rates are usually low. Torching and spotting results from downed woody concentrations where fire behavior would resemble Fuel Model 10.
Fuel Model 9: This fuel model is typical of dense ponderosa pine. Fires can run through surface litter at a high rate because of the loose arrangement. Concentrations of dead and down woody material will contribute to possible torching, spotting and crowning.
Fuel Model 10: This fuel model is typical of late succession, moist and Dry Forest types that are mixed conifer, including lodgepole pine. Fires in this fuel model can result in crowning, spotting, and torching of individual trees, particularly in sub-alpine fir.
In Fuel Model 11: In this fuel model the activity that generated the slash are thiamins and partial removals, not regeneration harvests. Fire potential is limited by typical light slash and shading from overstory.
Fuel Model 13: This fuel model represents the 300 acre area of almost complete blow down in Vinegar Creek. Heavy fuels in all size classes are present. The resistance to

control is high and the loosely compacted fuels makes it a safety hazard to fire fighters. The following table displays the percentage of each fuel model by subwatershed.

Potential Wildfire Susceptibility

The following table displays the acres of fire hazard and fire starts by subwatershed.

Table 2 Fire Frequency and Fire Starts by Subwatershed

SWS	Fire Starts				Fire Frequency
	1980-1989	1990-1998 all	1990-1998 lightning	1990-1998 human	1980-1998
Davis/Placer 30201	5	10	8	2	1.0
Vinegar 30203	8	14	13	1	1.5
Vincent 30205	3	11	11	0	2.0
L. Boulder/ Deerhorn 30207	7	18	18	0	1.2
Tincup/LButte 30209	8	19	17	2	1.9
Butte 30211	6	5	4	1	1.2
Granite Boulder 30213	5	12	9	3	1.2
Total	42	89	80	9	1.7

Appendix F Fuel Models page 4---Low intensity/high intensity wildfire

1 Historically, periodic low intensity fire was the typical behavior in forests, before Euro-American settlement, the open park-like forests were shaped by relatively cool surface fires.

2. Without periodic low intensity fires, which naturally thin forest stands, dense tree stocking develops in what was formerly open forests with large fire resistant trees.

3 Overstocking in multi-storied stands, provide ladder fuels allowing surface fires to move into the tree crowns, killing even fire resistant overstory trees such as Ponderosa pine and western larch.

4 Crown fires in trees are not easily contained, and cause stand destruction and severe burning of soils, with loss of native vegetation which could otherwise survive low intensity fires. The Summit Fire 1996 (this photo) was an example of this type of fire behavior.

July 2, 2002

SOUTHEAST GALENA ROADS ANALYSIS

Malheur National Forest

July, 2002

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Southeast Galena Roads Analysis

Background and Purpose

Land management strategies and the road maintenance budget have changed significantly during the past decade. On March 3, 2000, the Forest Service published its proposed transportation system policy revisions in the Federal Register (65 FR 43). Decisions to decommission, reconstruct, construct, and maintain roads are to be informed by a science based roads analysis. Miscellaneous Report FS-643, **Roads Analysis: Informing Decisions About Managing the National Forest Transportation System,** was published in August of 1999, and describes in detail the roads analysis process. **FSM 7700 (12/14/2001), Chapter 7710, Transportation Atlas, Records, and Analysis, Section 7712**, provides direction and policy related to transportation analysis and the roads analysis process.

Road systems are expensive, valuable, and potentially damaging, and an important stewardship element of Forest Land Management. The intent of a Roads Analysis is to look at the current road system, and determine where changes are needed to reduce impacts, reduce maintenance costs, and better fit today's access needs. Roads Analyses should identify roads with little utility and high resource impacts, and roads with high utility and high resource impacts, and draw distinctions between benefits and effects. The results of a Roads Analysis are intended to guide future actions, not prevent them.

The Roads Analysis process should focus on identifying the "minimum road system" needed for safe and efficient access for administration, utilization, and protection of National Forest System Lands. It should produce a strategy that can be used to change the existing road system to fit current access needs as funding opportunities become available.

A roads analysis is not intended to produce recommendations for a "final" road system. It is intended to assess the existing road system and reasonably forseeable needs for road access, and to make recommendations for changes based on that assessment. Just as with a Watershed Assessment, as new information becomes available or needs and situations change in the future, the road system will need to be assessed again to determine if other changes in the road system are needed.

The purpose of a roads analysis is to ensure the Forest Transportation System:

- Provides safe access and meets the needs of communities and Forest users;
- Facilitates the implementation of the ***Land and Resource Management Plan*** (LRMP);
- Allows for economical and efficient management within projected budget levels;
- Meets current and future resource management objectives;
- Minimizes road related ecological impacts.

Assumptions

This roads analysis was done based on the following assumptions:

- The need for a basic transportation system will continue to exist;
- Available maintenance dollars are likely to remain static or increase only marginally in the foreseeable future;
- Roads can adversely affect water quality and riparian habitat;
- Poor road conditions can present a hazard to users, and are a liability to the Forest;
- Roads will continue to be used for recreation, administration, fire protection, permit and contract access, special uses, mining, and other traditional uses.

Information Needs for the Analysis

The road analysis policy and process were published after a planning effort named the ***Southeast Galena Restoration Environmental Analysis*** was already in progress. Because this roads analysis effort took place concurrently with that planning effort, most of the information needs were the same for both analyses. This included a need for current condition surveys of all of the existing roads in the area. It also included analysis of the inter-relationships between the roads and other resources in the area, including soils, hydrology, water quality, fisheries and wildlife.

Limitations of this Roads Analysis

--General

Most of the existing road mileages and locations used for this analysis and included in this document were generated through queries of the Forest Geographical Information Systems (GIS) database. The road mileages and locations reflect what is recorded in the GIS database, which will vary slightly from what is actually out on the ground. The recommended new construct roads and road relocation segments displayed on the maps and their lengths are also approximate, as many of the locations have not been established on the ground.

While the information in the database is not 100 percent accurate, the road mileages overall are not expected to vary significantly from the numbers used, and the GIS database represents the best information the team had available to use for the analysis.

--Closed Roads

While this analysis makes recommendations for specific roads to either remain closed or be placed in a closed status, it does not recommend specific closure types or methods for each road. Specific closure types and methods need to be designed on a road-by-road basis to ensure the closure is effective, and could vary depending on the intent of the closure (short-term or long-term).

--Mining Access

There are many historic mining sites located within the analysis area, which produced gold, silver, and other locatable minerals. During recent decades the level of mining activity in the area has been relatively low. At the time this analysis was done, there were about 10 active

mining claims located inside the analysis area, and the amount of actual mining activity taking place on the ground was very minimal. The recommendations from this analysis include maintaining reasonable access to the active claims, which in some cases may mean deferring decommissioning activities on a few road segments.

The amount of speculation, interest, and actual level of mining activity is dramatically influenced by the market values of locatable minerals, which are currently relatively low. The number of mining claims and related activities could increase very rapidly from the current level if market prices became significantly higher, and if this did happen, the need to provide reasonable access for mining operations could also increase proportionately. As planning and decisions to implement road decommissioning are prepared, a thorough review of the most recent list of mining claims needs to be done to identify any potential conflicts with providing reasonable access to claims.

--Road 2610759 Road

This road is a tie-through between the Dixie Creek drainage and the Dixie Mountain Lookout Road, so only part of the road is located within the Southeast Galena analysis area. It is the only classified road located within the Dixie Butte Wildlife Emphasis Area, and is a popular travel route during hunting season. Substantial segments of this road have never been constructed to any official standard; some portions were probably originally constructed for mining access. The current condition of most of this road is relatively poor. The drainage is inadequate, and some segments are severely out-sloped and hazardous to drive. The existing maintenance level of the road from the beginning at its junction with road 2610 to milepost 4.4 is a **2**, with an objective maintenance level of **1**. From milepost 4.4 to the end of the road at its junction with road 2050, the existing maintenance level is listed as **1**, with an objective maintenance level of **1**. Parts of this road have been closed in the past, but the closures have not been effective, and have frequently been breached.

This analysis does not specifically recommend changes to the Road Management Objectives for this road, but has identified a need to do some further evaluation to determine what the future status of this road should be. If the road is to be left open, it should be reconstructed to provide for user safety. If it is closed or decommissioned, it needs to be done in an effective manner.

Previous Analysis and Decisions

Several Access and Travel Management (ATM) plans have been implemented within the analysis area in the past decade. In the area west of Forest road 4559 on the north side of the Middle Fork of the John Day River, the ***Lower Middle Fork ATM Plan*** was implemented in 1994; some changes to this plan were implemented in this same area through the ***Summit Restoration Plan*** in 1998. For the area east of Forest road 4559 and on the north side of the Middle Fork John Day River, the ***Upper Middle Fork ATM Plan*** was implemented in 1995. And for the portion of the analysis area that is south of the Middle Fork John Day River, the ***Northside Middle Fork ATM Plan*** was implemented in 1997.

The cumulative result of implementing those ATM plans was that a significant number of roads have been closed and decommissioned, which resulted in a decrease in both total road miles and open road density in the area. Based on monitoring and this analysis, not all of the road closures that were implemented with previous decisions have been effective, and not all of the roads that were decommissioned were left in a condition that meets current standards (for

decommissioning). This analysis also concluded that there are three roads that were previously decommissioned inside the analysis area that are still needed for long-term access and management of the area.

The Roads Analysis Team

The Southeast Galena roads analysis was accomplished by following team members, with support from others, including GIS personnel:

Mark Lysne	Civil Engineer/Geologist	Engineering/Writer Editor
Kim Conlee	Civil Engineering Technician	Engineering
Dan Hagen	Forestry Technician	Access & Travel Management
Mary Lou Welby	Hydrologist	Hydrology/Soils/Aquatics
Perry Edwards	Fisheries Biologist	Fisheries/Aquatics
Ken Schuetz	Wildlife Biologist	Terrestrial Biology
Jean Wood	Botanist	Botany/Ecology/Noxious Weeds
Allan Tschida	Realty Specialist	Lands, Non-Recreation Special Uses
Shannon Winegar	Forestry Technician	Recreation, Recreation Special Uses
Elaine Kohrman	Economist	Economics and Social Uses
Bryan Lynch	Silviculturalist/Fire Planning	Fire and Fuels
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James Sullens	Forestry Technician	Logging Systems
Don Rotell	Archeologist	History, Archeology
Connie Jenkins	GIS Assistant	GIS Reports & Maps
Dee McConnell	GIS Assistant	GIS Reports & Maps
Karen Scharpf	GIS Coordinator	GIS Reports & Maps

Location and Scope

The ***Galena Watershed Analysis*** was completed in June of 1999 and covered the entire watershed, which is only a portion of the Forest Lands in the Middle Fork of the John Day River Sub-Basin. The Galena Watershed Analysis made a number of recommendations related to roads and road management, one of which was to develop an updated Access and Travel Management Plan (ATM) for Galena Watershed. This roads analysis covers the area within seven of the subwatersheds of the Galena watershed (listed in Table 1), which make up the southeast half of the watershed. The analysis area is located about 25 air miles northeast of John

Day, Oregon. The transportation system in the remainder of the watershed (the northwest half) will be addressed with another road analysis effort in the future. Both documents are intended to become addendums to the Galena Watershed Analysis.

Table 1: Subwatersheds and Land Ownership within the Southeast Galena Roads Analysis area:

SWS NAME	SWS NUMBER	SWS ACRES	MALHEUR NF ACRES	UMATILLA OR WALLOWA-WHITMAN ACRES	PRIVATE ACRES
Davis/Placer Gulch	30201	7,462	6,966	0	496
Vinegar	30203	7,585	7,118	411	56
Vincent	30205	3,769	3,758	0	11
L.Boulder/Deerhorn	30207	10,983	10,614	0	369
Tincup/L.Butte	30209	7,430	7,173	0	257
Butte	30211	4,861	4,854	0	7
Granite Boulder	30213	7,383	6,631	713	39
TOTAL		**49,473**	**47,114**	**1,124**	**1,235**

NOTE: SWS = Subwatershed L. = Little

Table 2: Forest Acres by Subwatershed and management area in the Southeast Galena Roads Analysis Area:

SWS NAME	SWS NFS ACRES	MA 1 1/	MA 4A	MA 7	MA 13	MA 14 2/	MA 21	RHCA 3/
Davis/Placer Gulch	6,966	5,154	0	0	379	97	304	1,031
Vinegar	7,118	4,466	0	786	568	22	0	1,277
Vincent	3,758	3,181	0	0	1	8	0	568
L.Boulder/Deerhorn	10,614	6,461	1,027	340	275	558	341	1,576
Tincup/L.Butte	7,173	2,823	1,949	0	400	508	358	1,125
Butte	4,854	1,267	993	0	0	25	1,751	804
Granite Boulder	6,631	1,805	901	3,011	28	0	0	886
TOTAL	**49,473**	**25,157**	**4,870**	**4,137**	**1,651**	**1,218**	**2,754**	**7,267**

1/ MA 2 and Middleground of MA 14 2/ Foreground only 3/ MA 3B (anadromous fish) acres are accounted for in RHCA acres

Objectives

The primary objectives of this roads analysis are to:

Identify the need for changes by comparing the current road system to the desired condition;

Balance the need for access with the need to minimize risks by examining ecological, social and economic issues related to roads;

Furnish maps, tables, and narratives that display and describe transportation management recommendations and opportunities that will address future access needs, probable road maintenance funding, and environmental concerns.

Historic Use – Roaded Areas

The development of access routes and historic use of the area is well documented in the ***Galena Watershed Analysis.*** Railroad logging played a prominent role in the history of the watershed. Railroad logging began in the analysis area when the Oregon Lumber Company (OLC) built railroad spurs off from the Sumpter Valley railroad system into the area starting in 1905. The OLC constructed a narrow gauge railway from the town of Bates down the Middle Fork of the John Day River toward the mining towns of Susanville and Galena in 1916. The OLC spurs in the project area were used between 1917 and 1947.

Railroad logging site types in the project area include: linear segments of railroad grade in various conditions, trestles and other earthwork engineering features, and remnant logging camp/temporary occupation sites. Spurs of this system extend from the mainline up major tributaries of the Middle Fork such as Vinegar Creek, Deerhorn and Butte Creek. Remnant railroad logging camps are located in the Vinegar Creek and Deerhorn Creek drainages.

The road system has also evolved over time. The Forest Service was building roads for fire access starting in about 1925, and much of the area was well roaded by 1950. But the majority of the Forest roads in the area were constructed between 1960 and 1995. The area can be accessed from many directions but the primary access is east from John Day on U.S. Highway 26 to the junction with State Highway 7, north on State Highway 7 to the junction with County Road 20, then west on County Road 20 along the Middle Fork John Day River. The main Forest Service roads that access the analysis area include all or portions of roads 2010, 2050, 2055, 2610, 2612, 2614, 4550, 4557, and 4559.

Historic Use – Roadless Areas

Portions of two Malheur ***Land and Resource Management Plan*** inventoried Roadless areas are within the analysis area: Greenhorn—about 6,519 acres on the north side of the analysis area and Dixie-Butte —about 7,865 acres on the south side of the analysis area.

In the Dixie Butte and Greenhorn Roadless Areas, the emphasis is to have these areas function as biological strongholds for populations of threatened and endangered species as well as provide large, relatively undisturbed areas for wildlife dependent on this character. Benefiting uses

include opportunities for dispersed outdoor recreation that emphasizes little to no evidence of management activities that might detract from a natural setting.

Dixie Butte Roadless Area

The Dixie Butte roadless area is located in the northern portion of the Malheur National Forest and southeast portion of the project area. The roadless area includes almost all of the land that comprises the Dixie Butte Wildlife Emphasis Area, as well as significant areas located outside of the boundaries of the Wildlife Emphasis Area. The roadless area consists of Dixie Butte (elevation 7,592 feet) and portions of the surrounding drainages tributary to the Middle Fork of the John Day River and the main stem John Day River. Dixie Butte is a prominent landmark that rises above the surrounding forested areas. Side slopes are steep at higher elevations, and bench-like at lower elevations.

Vegetation on the summit of Dixie Butte is primarily open sagebrush and ground plants. Tree species in the areas near the tree line include sub-alpine fir, engelmann spruce, and white bark pine. At midslope elevations, tree species include grand fir, western white pine, douglas-fir, western larch, lodgepole pine, and engelmann spruce. In the lower elevations, tree species include ponderosa pine, douglas-fir, grand fir, and western larch. Generally, the upper elevations have not been managed or logged. As a result of fire suppression vegetation changes have occurred over time. The results include unnaturally heavy tree stocking levels and accumulations of fuels and slash. Even with this alteration, the higher elevation forests are similar to historic conditions for forests with intense, low frequency fire regimes.

The same type of railroad logging described under **Historic Use – Roaded Areas**, took place in the lower elevations of the Dixie Butte Roadless Area. The lower forests are heavily altered by past railroad logging, truck logging, and fire exclusion. There are few large trees and re-growth is very dense (high stocking), and tree composition is different than historic conditions expected for forests with frequent, low intensity fire regimes.

Current recreational uses include hiking, cross-country skiing, snowmobile riding, hunting, prospecting, camping, mushroom harvest, and viewing scenery. The area provides summer habitat for mule deer and Rocky mountain elk, habitat for cougar, bear, bobcat, and other small game mammals. Butte, Little Butte, Deerhorn, and Davis Creek flow north into the Middle Fork of the John Day River and provide resident trout fishing as well as spawning and rearing habitat for steelhead. Some of the streams provide rearing habitat for Chinook salmon.

There is one primitive road, Forest Road 2610759, which bisects the Dixie Butte Wildlife Emphasis Area portion of the roadless area. This road is part of a loop access route to the Dixie Summit area, and it is a popular travel route during hunting season.

Greenhorn Mountain Roadless Area

This area is located along the northern boundary of the Malheur National Forest on both the Malheur and Umatilla National Forests and in both Grant and Baker County. The Greenhorn Roadless Area extends along the divide between the Middle and North Forks of the John Day River. Much of the roadless area boundary is in common with the boundary of the Vinegar Hill-

Indian Rock Scenic Area, but the roadless area includes lands that are located outside of the Scenic Area. Almost all of the Scenic Area is located inside of the roadless area boundary.

About 87 % of the total area is forested, and about 40% of the total area is within the analysis area. Most of the area on and near ridge tops is undulating terrain consisting of open alpine meadows. Below these ridge tops, however are sharp breaks in the terrain, particularly to the north, with rock cliffs dropping away to steep drainages below. Vegetation on ridge tops and side slopes include meadows of alpine sagebrush, elk sedge, and alpine fescue, as well as stands of white bark pine and sub alpine fir, and spruce bogs. Upland flats and north-facing side slopes support white fir, lodgepole pine, larch and douglas-fir, with ground cover of pine grass, elk sedge and huckleberry. Most of the area within the analysis area is south facing and has a drier environment. Lower elevations include moist forests with grand-fir, douglas-fir, and western larch, and drier forests with predominantly ponderosa pine and western larch.

Both the vegetation and drainages were altered prior to establishment of the roadless boundary, as a result of past logging practices, grazing, mining, and fire exclusion. Forest stands in some areas, and particularly along both sides of the ridge dividing Little Boulder Creek and Windlass Creek, are in poor condition. In these areas, heavy fuel accumulations and a high fire risk have developed as a result of insect damage and disease.

Current uses include hiking, cross-country skiing, riding of snowmobiles, hunting, prospecting, camping, mushroom harvest and viewing scenery. The area provides summer habitat for mule deer and Rocky mountain elk along with habitat for cougar, bear, bobcat, lynx, and other small game mammals. The unique alpine habitat provides an opportunity to view uncommon bird life such as the pine grosbeak and the northern three-toed woodpecker. Many of the streams provide trout fishing opportunities and contain spawning and rearing habitat for steelhead.

Areas Contiguous to Roadless Areas With Potential Roadless Values

The team conducted a cursory analysis to determine whether the analysis area includes roadless areas or areas with minimal classified roads that are located outside of the LRMP designated roadless areas (i.e. Dixie Butte and Greenhorn Mountain "Appendix C LRMP" Roadless Areas).

Using the criteria and process specified in the **National Forest System Land Resource Management Planning; Final Rule** (cf. 36 CFR part 294 special areas; Roadless Area Conservation; Final Rule 294.11; January 2001), the team identified three areas within the analysis area that are contiguous to currently designated roadless areas, which currently have very few or no classified roads, and are of a size and configuration that might warrant future evaluation as potential candidate areas (for preserving any inherent characteristics associated with roadless conditions). These areas border existing inventoried roadless areas, but do not overlap with them. This analysis does not include recommendations to develop any new motorized access within the three areas identified. Management options for these areas will be preserved until the ***Land and Resource Management Plan*** revision for the Forest is completed.

Existing Road System Conditions (including benefits, problems, and risks):

Most of the current roads were constructed to support timber-related land management objectives. Each mile of road is dependent on maintenance to keep the road safe for users, to keep environmental risks at an acceptable level, and to protect the road investments. The roads were constructed with the expectation that timber-based land allocations would generate funding needed for road maintenance on a long-term basis.

The **Land and Resource Management Plan** (LRMP) for the Malheur National Forest (1990) displayed projected timber harvest of over 200 MMBF annually. Amendments to the plan, listing of Threatened and Endangered (T&E) species, and other recent developments have drastically limited the amount of annual timber harvest from the Forest. As a result, the opportunities to reconstruct or maintain roads that were traditionally associated with timber harvest activities have declined substantially during the past decade. The Cooperative Work Forest Service (CWFS) trust funds that are collected through deposits generated from timber haul have also declined substantially within the same timeframe.

A cursory comparison between the total amounts of appropriated funding the Forest receives to perform road maintenance today compared to the same funding a decade ago reveals that the total dollar amount has not changed significantly. The Forest has recently acquired the added road maintenance responsibilities for the Snow Mountain District, which added over 2000 miles of roads to the maintenance program. So while the cost per mile to accomplish road maintenance has risen steadily through inflation over the past decade, the funding has not. The net result is that the Forest has less funding available to maintain a significantly larger number of road miles, and it no longer receives contributions through timber sale activities that are comparable to the past levels (to help fund road maintenance activities).

Existing open road densities in the SE Galena planning area generally meet or exceed Forest Plan standards, which the LMRP clearly intended to be monitored on a ***watershed*** basis (Chapter IV, page 22, Roads). If monitoring were done on a **subwatershed** basis, the Tincup/Little Butte and Granite Boulder subwatersheds would not meet big game winter range (MA-4a) road density goals. In winter range, the standard for open road density is to not exceed 2.2 miles of open road per square mile. Currently, the Tincup/Little Butte and Granite Boulder Subwatersheds have open road densities of 3.47 and 6.74 miles per square mile respectively.

Existing Open and Closed Road Miles and Road Densities

The table that follows displays the current road densities and total road miles by subwatershed in the analysis area:

Table 3 - Existing Road Miles and Road Densities by Subwatershed

SUBWATERSHED	Total miles	Total road density (miles of road per square mile)	Open miles	Closed miles	Open road density (miles of road per square mile)
Davis/Placer Gulch	45.3	3.9	22.9	22.4	2.0
Vinegar	42.8	3.6	22.1	20.7	1.9
Vincent	30.2	5.1	9.7	20.5	1.6
Little Boulder/Deer horn	41.7	2.4	19.8	21.9	1.2
Tin Cup/Little Butte	37.1	3.2	25.5	11.6	2.2
Butte	28.2	3.7	7.8	20.4	1.0
Granite Boulder	40.1	3.5	25.6	14.5	2.2
GRAND TOTAL	**265.4**	**3.4**	**133.4**	**132.0**	**1.7**

The numbers and mileages listed are based on a 6/26/2002 GIS query, are rounded to the nearest tenth of a mile, and include all inventoried Forest roads as well as other known roads that are not under Forest Service jurisdiction.

Benefits

When considering effects of roads on natural resources, it is relatively simple to compile a list of existing or potential negative effects that roads can have on any single resource area. It is much more difficult to quantify all of the benefits that roads provide for human uses. The road system in the analysis area continues to serve a wide variety of resources, including recreation, timber, range, fuels management, fire protection, minerals, special and permitted uses, and access to private property. In addition to roads, other man-made routes within the analysis area include trails, snowmobile routes, overhead electric power lines, buried phone and tele-communication cables, and irrigation ditches.

Providing a reasonable and efficient road access system within the analysis area remains critical to being able to sustain all of these activities at a reasonable cost.

Problems and Risks

In recent years most of the available funding has been directed towards maintaining the Forest Arterial and Collector roads (Level 3 to 5 roads), which receive the highest traffic use. The maintenance needs of local roads (Level 1 and 2 roads) have often been deferred, because the funds to maintain the roads to standard are simply unavailable. The overall result is that much of the Forest road system is in a downward or deteriorating condition, and this is particularly true for many Level 2 roads (maintained for high-clearance vehicles only), which remain open despite receiving little routine maintenance. Maintenance Level 1 roads are placed in a closed status, and should not require much maintenance beyond periodic monitoring. But many closures, including those in the analysis area, have not been effective and have been breached.

Recent road condition surveys indicate that most of the roads in the Southeast Galena analysis area have at least some deferred maintenance needs, which can have undesirable effects on both user safety and other resource values. The amount of deferred maintenance work needed varies greatly from road to road.

The overall result of all of these existing conditions is a need to reduce road related problems and risks in the analysis area. This can be accomplished in a variety of different ways, including road improvements, relocation, closures, and decommissioning.

Desired Road System Conditions

The desired goal is to provide a road system that is safe, affordable, has minimal ecological impacts, and meets immediate and projected long-term public and resource management needs. Resource management needs are largely based on **LRMP** direction, including management area prescriptions. The current **LRMP** provides general direction for transportation system management and states: "Roads will be planned, designed, constructed and maintained to the minimum level necessary to meet integrated land management objectives (i.e. the needs of all the resources)." The **LRMP** also includes management direction to reach specific maximum open road density standards for winter range, summer range, and wildlife emphasis areas (**LRMP**, TABLE I-1), which are to be monitored on a ***watershed*** basis.

This roads analysis focused on recommendations for moving the areas transportation system towards desired conditions, as identified in the ***Galena Watershed Analysis***, including:

- Identifying roads that are no longer needed for management activities;
- Identifying roads that are needed on an intermittent basis, and determining which roads should be closed;
- Reconstructing or relocating needed roads or road segments that are causing unacceptable impacts to riparian areas;
- Improving road drainage or drainage structures on both open and closed roads;
- Armoring stream crossings on most native surface roads to reduce road related sediment delivery to streams;
- Reducing road densities in subwatersheds that are functioning at risk or functioning at unacceptable risk;

- Designing and installing road drainage on new and existing roads that requires minimal maintenance;
- Reconstructing roads that will be kept open to meet user safety needs, and accommodate expected traffic levels;
- Prioritizing road decommissioning activities and road maintenance needs;
- Meet road density management goals for big game.

General Issues

The general issues related to road construction, reconstruction, relocation, maintenance, decommissioning, closures, and other road management actions typically include:

Economics -

Although an adequate transportation system is essential for managing vegetation and other resources, current and projected funding levels for road maintenance are not likely to adequately cover the total road maintenance needs for the existing transportation system. Potential funding associated with vegetation management activities may not be enough to sustain road construction, reconstruction, and maintenance needed for those activities.

Aquatics and Water Quality –

Roads interact and influence the production and movement of both fine and coarse textured sediment, impacting water quality. Roads can capture and channel surface flows, and road cuts can intercept subsurface flows and convert them to surface flows, routing water more quickly to adjacent stream channels. Road location inside riparian areas can alter the meander patterns of adjacent streams, affecting a stream's ability to move sediment. Roads within riparian areas potentially affect a host of processes and resources associated with the areas, such as the availability of large wood, access to streams by recreationists, and movement of wildlife from upland areas to and through riparian areas.

Roads influence the health and distribution of fish and other aquatic species by several mechanisms. Impacts to riparian areas may include loss of streamside shade (influencing water temperatures), loss of riparian vegetation, soil compaction, loss of floodplains, destabilization of adjacent stream reaches, changes in sediment levels and routing, poaching, vandalism, and litter. Culverts at stream crossings often present barriers to passage for some aquatic species during some flow conditions. Road management and maintenance activities can also impact stream channels and aquatic species, depending on factors such as the age of a road, type of surface material, proximity to the stream, the number and type of stream crossings, and the type of management and maintenance activities.

Terrestrial Wildlife -

The Forest road network can alter wildlife habitats and negatively impact wildlife populations. Generally speaking, human influences on the forest are greatest near roads and decrease steadily with increasing distance from roads. The Forest ***Land and Resource Management Plan***

established standards and goals for open road densities to reduce impacts on wildlife species (to be monitored on a watershed basis).

The two most significant negative effects of roads on terrestrial wildlife are that they provide avenues for resource extraction and human activity, and they can present barriers to wildlife movement.

Resource extraction, particularly timber harvest, can fragment and degrade wildlife habitat. Increased human activity typically leads to increased wildlife disturbance. Increased access may increase hunting pressure on species such as deer, elk and bear. Most hunters camp and hunt close to roads.

The barrier effect is sensitive to road width and traffic density. As road widths increase and the amount of traffic increases, roads become more effective barriers to wildlife movement.

Botanical -

Historically, roads were built along riparian lowlands and ridgelines due to both economics and feasibility. When roads are constructed, road cuts and fills alter the existing habitat. This can result in changes to drainage patterns, soil distribution, and allow introduction of noxious weeds, and may cumulatively result in alteration of the existing plant community.

People, animals and machinery move noxious weeds from place to place. Open roads provide frequently disturbed habitats, which favors the establishment of weeds. Weed populations are often found along road shoulders, in dispersed campsites, hunting camps, trailheads, timber harvest landings, or anywhere ground-disturbing activities occur. Road maintenance activities can also contribute to the spread of weed seed along the roadway, including through haul of materials to and from quarry sites and waste disposal areas.

Fire and Fuels -

Roads have both a positive and negative effect on wildland fire suppression and fuels management. As a benefit, road networks provide access to water sources, lookouts, helispots, and other resources needed for fire suppression and fuel management activities. In roaded areas, response time is reduced, thereby increasing firefighter efficiency and effectiveness in suppressing both human and natural fires.

Roads also provide barriers or fire breaks for fire suppression and fuels activities. From a safety standpoint, roads provide anchor points for construction of fire-lines, and provide escape routes and safety zones.

Forest roads and other forms of transportation systems also have negative impacts, including an increased risk of human-caused fires. Human-caused fires along roadways in the Forest tend to have a random distribution.

Forest Products -

Roads provide access to the forest for planning, designing and implementing a wide range of vegetation management activities. The roads also provide access for equipment used for logging and harvesting operations, and provide access for people and equipment needed to complete subsequent vegetation management treatments. Most timber harvest occurs within 1,500 feet of

a road, because economics favor using either skyline or ground based harvesting methods compared to more expensive helicopter logging systems.

In addition, roads provide access for gathering special forest products such as Christmas trees, mushrooms, posts and poles, and firewood. Non-timber products such as firewood and fence posts, are usually collected relatively close to roads.

Recreation -

Maintaining a viable road system is key to providing the diverse recreation settings desired and identified in the LRMP. At the same time, the existence and/or condition of roads could contribute to overuse and, ultimately, a diminishment of some visitors' recreation experiences.

The Forest provides recreation settings of varying characteristics ranging from large, remote undeveloped areas to small, easily accessed and highly developed sites. The analysis area includes two developed campgrounds, the Middle Fork Campground and Deerhorn Campground. There are also a relatively large number of dispersed campsites, which are used primarily by hunters.

The existing road system provides adequate access to dispersed camping sites. The analysis area also includes several trails and trailheads. Some trails and trailheads have adequate road access, but access to others is only marginal or in some cases inadequate to meet the current level of demand and use.

Heritage -

Heritage Resources include many forms of archaeological, historical, and cultural properties. Archaeological sites typically exist in the form of surface and subsurface deposits of stone tools and debris resulting from tool manufacture and maintenance. Road construction, maintenance, use, and associated erosion can potentially destroy or damage the integrity of archaeological deposits.

Historic sites, in contrast, exhibit a broader range of artifact types, materials, and features. They sometimes include standing structures as a dominant component, though an archaeological component may also exist. Historic properties also include engineering features and travel corridors, such as early roads, trails, railroad routes, monuments, dams, and bridges. Some existing roads were developed or constructed over historic transportation routes, particularly old railroad grades.

Traditional Cultural Properties (TCP's) are places associated with the traditional beliefs of a Native American group about its origins, its cultural history, or the nature of the world. Traditional cultural activities of contemporary indigenous communities are often practiced at such places. TCP's may not be marked by discernible physical remains.

Social –

Two thirds of the analysis area has historically had ample motorized access, while the remaining third of the area is essentially roadless. As a result of publicity generated by opponents and supporters of the past ATM planning and implementation, there is a heightened awareness on the issues of motor vehicle access on the Forest. Many snowmobilers, four-wheel drive enthusiasts, and all terrain vehicle riders are strongly opposed to any loss of motorized access. Proposals to

close, decommission, or construct any significant amount of roads is usually controversial, and will be met with both strong support and strong opposition from various interest groups.

Road Densities-

The Forest **LRMP (**Chapter IV, Desired Future Conditions) provides direction to address road related concerns for fish and wildlife: 1) By the year 1999 - Maximum open road densities of 3.2, 2.2, and 1.5 miles of open road per square mile area in summer range, winter range, and wildlife emphasis areas respectively; 2) By the year 2039 – Road closures, both year-around and seasonal, will have achieved open road densities of 1.5 and 1.0 miles per square mile area in summer and winter range respectively. The road densities are to be monitored on a watershed basis.

The regulatory agencies, the **United States Fish & Wildlife Service** (USFW) and **National Marine Fisheries Service** (NMFS), use total road densities as an indicator of watershed function. The matrix of pathways and indicators for bull trout (USFW-1998) lists watersheds with total road densities of <1 mi/mi^2 with no valley bottom roads as **Properly Functioning**, 1-2.4 mi/mi^2 with some valley bottom roads as **Functioning at Risk**, and densities over 2.4 mi/mi^2 as **Functioning at Unacceptable Risk**. The matrix of pathways and indicators for steelhead (NMFS-1996) lists watersheds with total road densities of <2 mi/mi^2 with no valley bottom roads as **Properly Functioning**, 2-3 mi/mi^2 with some valley bottom roads as **Functioning at Risk**, and densities over 3 mi/mi^2 with many valley bottom roads as **Not Properly Functioning**.

But utilizing total road density as the primary measure of potential impact to riparian species and function is simplistic at best. The real or potential resource impacts of any road are dependent on many variables. The condition of both open and closed roads is a critical factor when considering the magnitude of resource impacts that result from use of roads for management activities, recreation, or other permitted uses. The assumption in using total road density is that all roads are either similar, or the same. But they are not the same. There are big differences between open roads and effectively closed roads. There are also big differences between valley bottom roads located immediately adjacent to a stream and those located a significant distance from streams. In terms of road related impacts to resources, some roads can cause enormous problems; others have little impact at all. If roads are not the same, the concept of using total road density as a primary indicator of watershed function is flawed.

An alternative to relying on road density standards is to identify the actual road impacts through an analysis process like a roads analysis or watershed analysis, and to monitor accomplishments of the restoration needs identified through the analysis. Monitoring accomplishment of the restoration needs is more meaningful than measuring changes in road densities, and has the potential to provide much greater benefits to affected resources.

Summary and Conclusions

General-

Road condition surveys indicate most of the roads in the analysis area have at least some deferred maintenance needs related to user safety and or other resource concerns. This analysis identified many opportunities to reduce road related problems and risks within the analysis area through improvement of existing roads, relocation of some road segments, closing some roads that are currently open, and decommissioning roads that are no longer needed. Some of the road condition information and recommended improvements are already entered into the Forest INFRA roads database, but much of it is available only in the form of field notes and forms that were used as each road was individually assessed for this analysis.

Implementation of the recommended changes to the road system in the analysis area will help put into place a road system that better fits today's needs for access. Cumulatively, these changes will significantly reduce the total road miles, total road density, open road density, RHCA road miles, and the overall road related resource impacts in the area. As the road system is "downsized", more users will be concentrated on fewer miles of open roads, and it will be critical to make improvements to many of the roads that remain open. As most or all of the recommended changes are implemented, they will also provide for increased user safety, a reduction in Forest Service liabilities related to safety, and a reduction in the level of funding needed to maintain the road system that remains in the analysis area.

The most significant opportunities to reduce road related impacts from roads that are recommended to remain a part of the transportation system involve improvements to road drainage systems. The function and efficiency of road drainage systems is critical to minimizing erosion and reducing road related impacts to streams, water quality, and other aquatic resources. The type of work needed is essentially improving or installing road drainage so that it: 1) requires minimal maintenance, 2) adequately disperses intercepted water, and 3) hydrologically disconnects the roads from drainages to the extent feasible. Other road improvements that can reduce road related impacts include upgrades to road surfacing materials.

Funding Opportunities

Funding to implement recommended changes to the road system could be derived from many different sources. Maintenance and reconstruction of roads can often be accomplished in association with timber harvest activities; road closures and decommissioning can also be funded through harvest activities if the same roads are used for timber haul. Appropriated funding can be used to accomplish some road improvement work, particularly work that fits the definition of road maintenance, but the amount of funding available has been very limited, and is likely to remain so in the foreseeable future.

A lot of the recommended work would be most readily accomplished through other internal or external funding sources. This type of work would include replacing culverts that are generally functional other than problems with fish passage, road decommissioning, road closures, and major drainage improvements on roads that are not planned for any timber activities likely to occur in the near future. Other internal funding sources could include Capital Investment Funds, Deferred Maintenance Funds, Demo funds, and 10% funds. Possible external funding might include Title II funding, challenge cost-share agreements, BPA funding, and other sources.

Priorities for Road Restoration Work

Virtually all of the changes will require identifying and securing some source of funding to accomplish the work. Finding and pursuing the best source of funding to accomplish the recommended changes will be key to timely accomplishment of the work identified. Some of the recommendations will require decisions through the NEPA analysis process, and consultation with regulatory agencies before they can be implemented. Other recommendations can be implemented as road maintenance, which will not require NEPA analysis. So despite what the overall priorities for resource protection or improvements might be, the timing of accomplishment will be dependent on how and when funding opportunities occur and other pre-requisite needs are met.

The road tables in Appendix B identify which road segments have identified work needs, and whether the needed work relates to closures, decommissioning, maintenance, reconstruction, etc. The tables also identify whether or not specific road segments are expected to be used for timber harvest or haul activities in the near future. But predicting if and when any future harvest activities will take place is uncertain at best. All of these variables need to be considered in determining what type of funding is most appropriate to accomplish implementation of specific changes to the access system.

All other factors being equal, it would be best to accomplish as much work as possible in association with harvest activities on roads that are likely to be used for those activities. But those same roads may have urgent needs that cannot wait until harvest activities are underway.

Recommendations to implement changes and or improvements to the area road system should generally be prioritized or focused as follows, in order of decreasing importance:

- Roads in RHCA areas along fish bearing streams with T&E Species, with granitic or Clarno soil types;
- Roads in RHCA areas along fish bearing streams with T&E Species, with soil types other than granitic or Clarno soils;
- Roads in RHCA areas along fish bearing streams without T&E Species, with granitic or Clarno soil types;
- Roads in RHCA areas along fish bearing streams without T&E species, with soil types other than granitic or Clarno soils;
- Roads in RHCA areas along non-fish bearing streams with granitic or Clarno soil types:
- Roads in RHCA areas along non-fish bearing streams with soil types other than granitic or Clarno soils;
- Roads outside of RHCA areas with granitic or Clarno soil types;
- Roads outside of RHCA areas with soil types other than granitic or Clarno soils.

This prioritization is not intended to be absolute, as there are likely to be other factors that might be more important in specific cases, such as a plugged culvert that requires immediate attention.

Recommended Changes to Access System

Fish Passage - Road Crossing Problems

In 2001 the Forest initiated a Forest-wide evaluation of road crossing sites where structures exist that could present barriers to fish passage. The evaluation process included surveys and assessments at each identified crossing site on fish bearing streams. The surveys were completed at most of these crossing sites located within the project area. The information collected was entered into a database, and further evaluated to determine whether individual sites present a barrier to any life stage of native fish, under any flow conditions. If the results indicate the crossing does not present a barrier to any life stage of native fish under any flow conditions, the crossing was rated as **green**. If the results indicate the crossing does present a barrier to some life stage under some flow conditions, it was rated as **red**. If the information collected was not sufficient to clearly indicate one way or another, the crossing was rated as **gray**, meaning that a more detailed analysis is needed to determine whether the crossing is a barrier or not. The table that follows indicates the results for all of the crossings evaluated to date; the numbers in the table are expected to change some as the database is refined and sites not yet surveyed are completed and entered.

Table 4 – Fish Passage at Road Crossing Sites

SWS NAME	Total Culvert Crossings	Green	Gray	Red
Davis/Placer Gulch	1			1
Vinegar	7	1	1	5
Vincent	6	1		5
L.Boulder/Deerhorn	4	1	1	2
Tincup/L.Butte	8		2	6
Butte	3	1		2
Granite Boulder	4			4
TOTAL	**33**	**4**	**4**	**25**

Priorities for modification or replacement of the structures have not yet been developed. Funding to modify or replace these structures is typically not available associated with timber sales. But once the priorities have been established, the Forest plans to pursue other funding opportunities to begin modification or replacement of all problem structures in the project area.

In addition to the existing culvert repairs or replacements, other work needed to improve fish passage includes installation of a large (fish-friendly) culvert to replace the existing ford where road 2614000 crosses Davis Creek. This installation could be funded in association with harvest activities if the road is used for timber haul.

If the recommended connecter road across Deerhorn Creek to access the east half of the Deerhorn subwatershed and Little Butte subwatershed areas is constructed, either a large culvert or a bridge will need to be installed at the crossing site. This work could be funded through harvest activities if the road is constructed in association with harvest activities.

Roads with Deferred Maintenance Needs

Most of the roads in the area have maintenance needs that have been deferred over time, and virtually all of them would benefit from drainage improvements. The amount of work needed varies from road to road, but typically includes one or more of the following work activities: adding or repair of drainage structures (culverts, drain dips, grade sags, rocked fords, and cross ditches), surface and ditch blading, spot rocking, surface rock replacement, brushing, constructing additional turnouts, and other work related to either safety or resource protection.

The District Hydrologist raised a concern that there are few stream crossing sites, where the existing culvert is properly sized and placed at the correct stream gradient, but the culvert elevation, tends to hold entrenched streams at an artificially low elevation. This occurs where the stream reach was already entrenched or down-cut at the time the crossing was originally installed, usually a result of disturbances that occurred prior to the road construction. These conditions result in the stream channel becoming isolated from its adjacent floodplain.

Where entrenched stream reaches exist, and as large wood naturally enters the stream channel and or as other channel improvements are implemented, the desired goals include natural channel recovery and re-establishing connections between the former floodplains and adjacent stream reaches. The extent of this type of problem in the analysis areas has not yet been identified, but when culvert replacements or repairs are planned in stream reaches where entrenchment or other alterations to natural conditions have occurred, it is critical that the culvert installations be carefully planned and designed to help promote channel recovery and complement other watershed improvements in the adjacent stream reaches.

Roads Recommended for Reconstruction

Approximately 16 miles of roads in the analysis area are recommended for reconstruction. In some cases this is because roads or road segments need to be relocated outside of RHCA's, and in other cases the roads need substantial improvements before they can meet access needs.

Reconstruction – Relocation

In cases where long-term access is still needed but a portion or segment of the existing road is located where it severely impacts riparian and streamside areas, the segment(s) that are poorly located are recommended for decommissioning. Approximate relocation routes are displayed on the maps in Appendix B. All of the relocated segments are recommended to be open for public and administrative use. Where the relocated segments occur, the intent is not to reduce motorized access, but to reduce resource impacts associated with motorized access. This road analysis recommends approximately 3.3 miles of relocated road segments.

Reconstruction – Improvement

There were about 12.7 miles of roads identified that are recommended for reconstruction improvements. These are all roads that were identified as needed for long-term access in the analysis area, but they were not originally constructed to a standard that allows for efficient use

for the type of access needed. The improvements recommended will result in the roads becoming higher standard facilities than they were originally constructed to. These include: 1) several miles of local roads, 2) two roads that are "collector" or primary access routes which are in need of major improvements, and 3) several segments of existing roads, that when combined with some relocated road segments would provide a "collector" road where this type of road is needed for management and other uses, but no efficient facility currently exists (Deerhorn connector road). Descriptions of the three primary access routes in need of reconstruction are included in the paragraphs that follow.

--Road 2010 – Vinegar Hill Road

This road is one of the two main access routes to the Vinegar Hill – Indian Rock Scenic Area. It provides access to two trailheads, and receives relatively heavy recreational use. The road is in relatively good condition up to about milepost 7.8 (about a half mile below the Blackeye Trail trailhead), but beyond that point it needs major improvements to drainage, the road surface, and some other improvements related to user safety. The existing maintenance level of the first 7.8 miles is **3**, and the objective maintenance level is also **3**. The existing maintenance level for the remainder of the road is **2**, and the objective maintenance level is **3**.

--Road 2610 - Dixie Lookout Road

This road accesses the Dixie Mountain Lookout, the Dixie Mountain Communications Site, and receives relatively heavy recreational use, particularly by hunters. The road is currently in relatively poor condition, the road drainage is mostly dysfunctional, and it needs some major work related to user safety. The existing maintenance level for this road from the beginning at US Highway 26 to milepost 4.25 is listed as **3**, and the objective maintenance level is **3**. But based on recent road condition surveys, the real current condition is **2** at best. The existing and objective maintenance level from milepost 4.25 to the lookout at milepost 5.45 is **2**.

--Road 2614000

Based on this analysis, Segments of road 2614, 2614402, and 2614452 located west of Davis Creek and east of Deerhorn Creek are recommended for reconstruction, into a single road that would serve as a collector road for the area. Beyond the Davis Creek ford the existing road segments are primitive, and there is a real need to develop a collector road to provide access for general management activities, including fire protection and suppression. The section of road 2614 past the ford on Davis creek would be decommissioned and replaced with a new segment that is relocated outside of the RHCA.

Roads Currently Closed or Recommended for Closure

Roads that are placed in a closed status are not all equal with regard to access or resource impacts. Roads that are in a closed status, where closures are effective, can significantly reduce maintenance funding needs and resource impacts. Some roads that are needed for access for several different types of uses, and other roads are needed primarily only when timber harvest activities are taking place. Roads that are needed only for timber harvest on an intermittent basis with long intervals between uses (10 years or more), are recommended for placement into an "inactivated" status whenever this is practical (see Glossary).

As decisions to implement new closures or re-close existing closed roads are developed, the method of closure, the type of closure device, and the location of the closure device need to be

designed specifically for each road. The objectives of a road closure can only be met if the closure is effective, and implementing successful closures is critical to the credibility of future access and travel management actions.

Some new road closures can be implemented through timber sale activities, while new closures on roads not used for timber harvest will require securing other types of funding.

Roads with Recommended Changes in Open or Closed Status

--Currently Open to Closed Year Around

These are roads that are currently open that are recommended for year around closures, either to prevent resource damage or meet other Forest Plan standards and goals for road densities. The analysis identified approximately 20 miles of currently open roads that are recommended for a change in status to year around closures.

--Currently Open to Seasonal Closure

The analysis identified approximately 12.5 miles of roads that are currently open that are recommended for seasonal closure (December through March) to meet goals for Winter Range big game habitat.

--Currently Closed to Open

This analysis identified about 7.9 miles of roads that are currently closed, that are recommended for change to an open status. These road miles include:

- About 3 miles of roads that are currently "disconnected" in the area west of Deerhorn Creek;
- About 2.4 miles of road that is needed to access a proposed trailhead relocation for the Davis Creek Trail;
- A portion of road 2010072. If this road is opened, it will provide motorized access to an area where very little access is currently available, and it already has an improved (crushed aggregate) surface. The existing closure device has only been partially effective, and has often been breached. The reason the existing closure was implemented was for wildlife habitat; even with this road open the road densities in the watershed will meet all LMRP standards;
- And a few other road segments that will improve available access to mining claims, dispersed recreation sites, and other needs.

Current System Roads Recommended for Decommissioning

The analysis recommends about 62 miles of existing classified roads for decommissioning, including about 16 miles of road that are currently open, and 46 miles of roads that are currently closed. Over 23 miles of these roads are located within RHCA areas. Roads that are recommended for decommissioning were selected based on one or both of the following criteria:

- The roads that are no longer needed for access or management;
- Access is still needed in the local area, but the existing road or segment is located in an RHCA and use is resulting in resource damage; in these cases, each road was evaluated

to determine if relocation or improvements to the existing road was the best long-term solution. For roads where relocation was determined to be the best solution, the existing road or road segments are recommended for decommissioning.

Road segments recommended for decommissioning include segments of three roads that currently access mining claims, but none of these claims are known to have active operations in progress, and the Forest has not received plans of operations for them in recent years. These include segments of road 2614, road 2010101, and road 2010292. As plans to implement recommended decommissioning of roads are prepared, a thorough review of the most recent list of mining claims and Plans of Operations needs to be done.

If the mining claims remain active, for the short term it is recommended that only the segments beyond the claim be decommissioned, and that the segments needed to access the claim be closed and available by permit only. This is necessary to provide reasonable access for proposed mining activities if the claims are still active. Because new mining claims can be filed or existing ones allowed to lapse at any time, review of the most recent mining claims records should be done as part of any plans to implement road decommissioning.

--Road 4559 (North of Junction with Road 4559283)

An intense rainstorm in the summer of 1998 triggered a debris torrent that swept down Lemon Creek, plugging and washing out road crossings as it moved down slope. The Lemon Creek crossing of road 4559 was among the sites damaged. Although this crossing had a relatively large diameter culvert, it was completely plugged and water was diverted water both over and down road 4559 for several hundred feet. As an emergency measure to prevent further damage to the road and other resources, the culvert and some of the debris were removed to restore Lemon Creek back into its natural channel. A temporary road closure barricade was placed just downstream from the damaged area.

Road 4559 is located within the Granite Boulder Creek RHCA, which is a Bull Trout occupied stream. The segment beyond Lemon Cabin is an old mining road, with a native surface, which has never been constructed to any Forest Service standard. It does not have functional drainage, and opening it to motorized use without major reconstruction would allow a substantial and chronic sediment delivery into Granite Boulder Creek. There is also an old wooden bridge located just above the Lemon Cabin site, which is currently failing and unsafe for any motorized use. Restoring this road segment would require installing a large culvert or a bridge at Lemon Creek, major road drainage and surface improvements, and replacement of the failing bridge over Granite Boulder Creek. The road is not needed for any foreseeable harvest activities.

Prior to this event (1994) the road was closed at approximately milepost 2.5 with a locked gate for "watershed improvement", and the road beyond the closure has both an operational and objective maintenance level of **1**. The closed segment of the road previously provided motorized access to Lemon Cabin, a trailhead for one end of the Blackeye Trail (within the Vinegar-Hill Indian Rock Scenic Area), and some mining claims (no longer active).

Motorized access to the 4559 Blackeye Trailhead has not been available since 1994, and plans for modifying the trail system to reflect lack of motorized access have been underway for some time. Restoration of the segment needed to access the trailhead was considered with this analysis. Based on this analysis and the overall high costs compared to low benefits of restoring

the road segment, it is recommended that the segment of road 4559 beyond its junction with road 4559283 (approximately milepost 2.1) be decommissioned.

Previously Decommissioned Roads

Current restoration standards for decommissioned roads are different than those that were used by the Forest in the past. Under current standards, when a road is decommissioned, the restoration work needs to leave the roadbed in a hydrologically disconnected state. Knowing that at least some of the previously decommissioned roads in the analysis area probably did not fully meet restoration goals, previously decommissioned roads inside the analysis area were assessed to determine the effectiveness of past work.

--Previously Decommissioned Roads Needed for Long-Term Access

Some of the road decisions implemented through previous ATM plans inadvertently overlooked some of the long-term access needs for the area. During this analysis it became apparent that there were three roads that were previously decommissioned and taken off the road system, that are still needed for long-term vegetation management in the analysis area. In both of these cases, waterbars or cross ditches were constructed in the roads, and they were then blocked with large troughs and berms and left to re-vegetate naturally. The roads were not re-contoured, so full road prisms are still present on the landscape. This analysis recommends that roads 2010311, 2010430, and 2010771 be placed back on the Forest Transportation System. These roads have a combined length of 2.2 miles, and their length is included in the miles recommended for new construction. After harvest activities are completed these roads are recommended for long-term closure or "inactivated" status.

--Previously Decommissioned Roads in Need of Additional Restoration Work

As a result of these surveys approximately 20% of the total road miles that were previously decommissioned were determined to need additional restoration work to meet today's standards for decommissioned roads. Of these miles needing additional work, approximately 70% need only relatively minor work (mostly hand work), while the 30% are in need of more extensive work that will require equipment use and access (to remove culverts or do similar work).

Recommended New Construction Routes

--General

During the analysis process the potential need for constructing new access into some areas was identified. Some of these would only be needed for timber harvest in specific areas, while others are needed for access for multiple resource needs. The total road miles of potential new construction identified is 18.8 miles (including the 2.2 miles of existing decommissioned road recommended to be returned to classified road status). If new roads are constructed to access areas for timber harvest only, it is expected that new roads would not be open to the general public for motorized access. Motorized use would probably be only for harvest activities, and once those activities are completed, motorized use will be available only on a permit basis.

The approximate locations of possible new access routes are displayed on the maps in Appendix B. This analysis did not attempt to identify or analyze the potential need for temporary roads for

short-term timber access, and it is possible that with further field review, temporary roads could better provide access to some of the locations where it is displayed as proposed classified road.

--Deerhorn Creek Connector Road, and Rationale

This analysis determined that there is a need to provide long-term vehicle access to the Little Butte Creek drainage and the west half of the Deerhorn Creek drainage, for general management activities and for fire protection and suppression in the local area. There are some existing classified roads in this area, but all of them are currently inaccessible. They became inaccessible or disconnected a few years ago when a portion of road 2000020 was decommissioned to prevent resource damage. Before that segment was decommissioned, it allowed at least seasonal access to other roads from Grant County Road 20, by using a ford that crossed the Middle Fork of the John Day River.

The recommendations of this analysis include constructing a connector road, from near the current end of Forest Road 2614452, which would tie into portions of the existing road system to the west. Some of the currently disconnected roads are recommended for decommissioning, and others are recommended for reconstruction and to remain a part of the transportation system.

Future Road System

The future road system that would result if all of the recommendations from this road analysis were implemented is displayed on the "future condition" map in Appendix C. The net changes from the existing road system if all of the recommended changes were implemented are shown in the table that follows:

Table 5: Future Road Miles and Road Densities by Subwatershed*

SUBWATERSHED	Total miles	Total road density (miles of road per square mile)	Open miles	Closed miles**	Open road density (miles of road per square mile)
Davis/Placer Gulch	37.4	3.2	18.4	19.0	1.6
Vinegar	35.1	3.0	20.3	14.8	1.7
Vincent	29.1	4.9	10.6	18.5	1.8
Little Boulder/Deerhorn	36.6	2.1	17.1	19.5	1.0
Tincup/Little Butte	32.1	2.8	12.0	20.1	1.0
Butte	20.7	2.7	7.2	13.5	0.9
Granite Boulder	31.4	2.7	11.1	20.3	1.0
GRAND TOTAL	**222.4**	**2.9**	**96.7**	**125.7**	**1.3**

* **NOTE:** Includes 18.8 miles of recommended new construction

****NOTE:** Includes about 12.5 miles of seasonal closures

The numbers and mileages listed are based on a 6/26/2002 GIS query, are rounded to the nearest tenth of a mile, and include all inventoried Forest roads as well as other known roads that are not under Forest Service jurisdiction. Comparing the above table with Table 3 on page 13 displays the magnitude of recommended changes to the existing transportation system.

ANALYSIS QUESTIONS

EF1 – EF5	*Ecosystem Functions and Processes*
AQ1 – AQ14	*Aquatic, Riparian Zone, and Water Quality*
TW1 – TW4	*Terrestrial Wildlife*
EC1 – EC3	*Economics*
TM1 – TM3	*Timber Management*
MM1	*Minerals Management*
RM1	*Range Management*
WP1 – WP3	*Water Production*
SP1	*Special Forest Products*
SU1	*Special Use Permits*
GT1 – GT4	*General Public Transportation*
AU1 – AU2	*Administrative Use*
PT1 – PT4	*Protection*
UR1- UR5	*Unroaded Recreation*
RR1 – RR5	*Roaded Recreation*
PV1 – PV4	*Passive-Use Value*
SI1 – SI10	*Social Issues*
CR1	*Civil Rights and Environmental Justice*

ECOSYSTEM FUNCTIONS AND PROCESSES (EF)

EF1: ***What ecological attributes, particularly those unique to the region, would be affected by roading of currently unroaded areas?***

The Dixie Butte and Greenhorn Roadless Areas provide quality habitat for species that require large contiguous blocks of old-growth forest including such species as pileated woodpecker, pine martens and fishers. Species which are particularly sensitive to habitat alternation or disturbance, such as wolverine, marten, fisher and lynx, likely benefit from the relatively undeveloped condition of these areas. Elk and deer use the area for both summer and winter range; elk, in particular favor the isolated conditions for security and low level of disturbance. Both the Dixie Butte and Greenhorn Roadless Areas may be more important now than in the past in supporting species viability and biodiversity, due to cumulative degradation and loss of other habitat in adjacent landscapes. New roads in unroaded areas may adversely affect those species listed above.

EF2*: To what degree do the presence, type, and location of roads increase the introduction and spread of exotic plant and animal species, insects, diseases, and parasites? What are the potential effects of such introductions to plant and animal species and ecosystem function in the area?*

There are no known sites of sensitive plant populations along open roads within the area, nor are weed infestations currently threatening sensitive species that have been documented away from roads.

The road system is a significant vector for exotic plant species and noxious weeds into the analysis area. There are currently approximately 40 identified noxious weed sites in the analysis area, most of which are relatively small. These sites have been mapped, and are have either already been placed on a GIS layer, or soon will be. Manual treatments for all of the known sites with weeds that present significant threats are planned for the coming field season and expected to continue in the future as needed.

Most known infestations of exotic plants occur along the current road system and associated areas of soil disturbance. Noxious weed species documented within the analysis area, or along perimeter roads include Canada thistle (*Cirsium arvense*), Scotch thistle (*Onopardum acanthium*), Dalmatian toadflax (*Linaria dalmatica*), St. Johnswort (*Hypericum perforatum*), houndstongue (*Cynoglossum officinale*), tansy ragwort (*Senecio jacobea*), spotted knapweed (*Centaurea maculosa*), diffuse knapweed (*C. diffusa*), and yellow starthistle (*C. solstitialis*). Other widespread exotic plant species include cheatgrass (*Bromus tectorum*), Kentucky bluegrass (*Poa pratensis*), mullein (*Verbascum thapsus*), white Dutch clover (*Trifolium repens*), dandelion (*Taraxacum officinale*), burnet (*Sanguisorba occidentalis*), birdsfoot trefoil (*Lotus corniculatus*), bull thistle (*Cirsium vulgare*), timothy (*Phleum pratense*), intermediate wheatgrass (*Agropyron intermedium*), and orchardgrass (*Dactylis glomerata*).

Roads that receive much use and recurring maintenance provide a continually disturbed substrate that is the preferred seedbed for invading exotics. By providing sites for infestation, they also provide a local seed source for subsequent spread of weeds to undisturbed forest ground.

The road system is not likely to contribute to the spread of exotic animal species, or to introduce new exotic insects or diseases.

EF3: To what degree does the presence, type, and location of roads contribute to the control of insects, diseases, and parasites?

In general, road access facilitates both the chances of spreading and the control of forest insects, disease, and parasites. Whether the control is direct (such as burning or de-barking of infested materials) or indirect (an attempt to reduce insect and disease impact by altering stand conditions), roading certainly facilitates these control efforts by allowing crews and equipment to easily access and treat infested sites.

EF4: ***How does the road system affect ecological disturbance in the area?***

Pre-existing roads have little impact upon insect and disease populations. New road construction can increase insect and disease populations when host material is cut and not treated or removed. Additional impact can occur when host trees are damaged during construction. The damaged host trees can serve as foci for insect and disease attack, allowing populations to build up and spread to adjacent lands.

EF5: ***What are the adverse effects of noise caused by developing, using and maintaining roads?***

Approximately two thirds of the analysis area is already relatively heavily roaded, and this is not known to be an issue for users or resources in this area. The LRMP for the Malheur National Forest does set maximum desired road density standards for big game summer range at 3.2 miles per square mile, at 2.2 miles per square mile for big game winter range, and 1.5 miles per square mile for Wildlife Emphasis areas. These limits are set primarily to provide adequate big game habitat. In addition, the Canada Lynx Conservation Assessment and Strategy (Ruediger et al., 2000) recommends that total road density in lynx habitat not exceed 2.0 miles per square mile.

AQUATIC, RIPARIAN ZONE, AND WATER QUALITY

AQ1: ***How and where does the road system modify the surface and subsurface hydrology of the area?***

The hydrology of the area is highly variable because of variations in historical disturbances and other controlling factors. The geology and soils vary spatially, with elevation, and in the amount of surface exposure. Precipitation varies with elevation, which ranges from about 3700 to 8100 feet. Snowmelt and precipitation intensities are controlled by local weather events, and the season, cause, and magnitude of peak flows are also variable.

As a result, the level of alteration of natural hydrology is also highly varied. In addition to the existing road system, much of the area has been modified by other historic activities including hardrock, hydraulic and dredge mining, railroad logging, and intensive sheep and cattle grazing. Although most of these activities are no longer occurring at anywhere near historical levels, the past activities altered some of the basic factors controlling the hydrology of the landscape, by removing soil, exposing bedrock and subsoils, and changing valley bottom and stream channel morphology. As a result, the hydrologic system no longer functions at its potential, and many stream channels are in a degraded but apparent stable condition.

Even the relatively large unroaded areas within the analysis area have been impacted by some of these historic activities. The hydrology of these unroaded areas is altered to some degree, which may affect down slope road/hydrology interactions. Much of the variability in the project area related to historic impacts has only recently been identified, and has not yet been clearly defined, described, or thoroughly understood.

So the effects of roads on the surface and subsurface hydrology of the area need be considered in the context of a landscape where hydrological processes have previously been (and continue to be) modified by other historical activities.

The road system modifies the surface and subsurface hydrology throughout the roaded portion of the project area, primarily in four ways, all of which contribute to accelerated and concentrated runoff:

- Roads intercept subsurface flow, bring it to the surface in cutslopes and ditches, and route it off the landscape, as surface runoff, more rapidly than in unroaded landscapes;
- Roads intercept and concentrate surface runoff from impervious surfaces, including both the roaded area and other areas of disturbance, which may have concentrated local surface and subsurface flows. These modifications tend to be more extreme in areas with clayey surface or subsurface soils;
- Roads concentrate surface runoff in ditches.
- Road culverts that are misaligned, road maintenance practices that create berms, and other roadway protection practices can isolate or continue to isolate stream channels from former floodplains, which limits groundwater interactions between the two geomorphic features and reduces access to water storage zones resulting in reduced late season flows.

Generally, where channel down cutting has occurred and caused disconnection/isolation between channels and floodplains, it was caused by activities other than roading (although early trail access may have contributed to the impairment of channel/floodplain interactions).

Accelerated and concentrated run-off modifies hydrologic function in three ways:

- Snowmelt and other runoff leave the landscape earlier in the season, increasing peak and near peak flows;
- As a result of the first modification, runoff is not captured and stored as efficiently, which reduces the amount of subsurface water available for release as summer base flows;
- Concentrated flows contribute to chronic, slightly elevated erosion, which is primarily expressed as the headward expansion and increasing size of small drainage systems, particularly in clayey and/or shallow soils and in areas of previous disturbance (see AQ2).

Problems related to interception of surface and subsurface flows are probably most pronounced on roads that are located in the lower third of the slope, especially in the toeslope area. Changes in geology and or soils commonly occur near the valley bottom, where subsurface water is often closer to the surface, and is more likely to be intercepted within the roadway. Similar concerns exist for roads traversing through “scabby” areas with shallow soils, and roads that are located down slope from these types of areas. Roads and road problems in the analysis area have not

been classified by slope position with the exception of roads located in RHCA's or valley bottoms.

Surface flow is intercepted and concentrated by most roads to varying degrees, depending on the type of soil and parent material, the type of road surface, road grade, spacing between cross drains, and slope aspect.

The spacing of drainage relief structures along most graveled or improved roads is usually adequate to prevent detrimental concentrations of flows, particularly on roads through areas with deep volcanic ash surface soils. But on roads where cross drain spacing is excessive, erosion occurs in the ditches and at the outlets of drainage structures. Roads that have segments that were identified as having culvert problems or inadequate cross drain spacing include 2612878, 2612000, 2612706, 2612655, 2612621, 2010873, 2010618, 2010980, 2010993, 2010986, 2010260, 2055532, 2050072, and an unidentified road in the Butte drainage.

The problems caused by having too widely spaced drainage structures are compounded when native surface roads occur on clayey soils and subsoils or on granitics. Clayey soils tend to absorb water slowly, so a greater portion of precipitation or snowmelt will occur as surface flows, which results in an increased amount of surface flow carried by roads. Many of the roads listed in the paragraph above are located on clayey soils. Granitic soils are easily detached and vulnerable to rapid and deep gullying once an erosional nickpoint has been initiated by concentrated flows; some of the roads listed above are located on granitic soils.

Water from roadside seeps, springs, or other sources was observed on the following roads: 2010999, 2010980, 2010545, 2000020, 2055532 and 2614452. Ruts that channel water were observed on roads 2612000, 2614000, 2612878, 2010980, 2010545, 2010993, and an unidentified road in the Vinegar drainage. Roads also capture run-off that has already been concentrated in other disturbed areas upslope. The amount of runoff captured is increased when ruts have formed in the roads from wet weather use, particularly on the clay soils and especially on Clarno-like soils. Another road that was identified as having general drainage problems was road 2612570.

In some locations roads have "captured" stream channels, disrupting normal stream channel processes. In some cases, road surface elevations are below bankfull elevations, so when stream flows overflow out of their channels, some of the flood waters run down the road and cause erosion to occur. In other situations, stream channels and or flat ground immediately adjacent to them has been used for either classified or unclassified roads. Over time, the stream channel has become synonymous with the driving surface. Roads that have segments where the roadbeds that are intermingled with stream channels or constrain natural migration of stream channels include 2612774, 2614229, 2000663, 2010243, and 2614348.

Problems related to increased peak and near peak flows and subsequent reduced summer base flows are aggravated when stream channels are disconnected from the associated floodplains by roads. When culverts, berms, and other structures installed to protect roads from natural stream channel movement, the capability of floodplains to capture and store water during high flows is adversely affected. When stream channels are isolated from floodplains it also increases the risk of adverse impacts occurring during flood events, the magnitude of the hazard, and reduces the water storage capacity of the floodplains.

Several roads that have segments that present a risk of impacting riparian function or other watershed processes were identified. Generally these were located in RHCA's and lacked engineering improvements to minimize effects on aquatic resources. Identified roads include 2614402, 2614452, 2010035, 2010036, 4550694, and 2050035.

The District Hydrologist also noted that there are a few roads in the analysis area that run up and down the slope rather than across it, but was not able to identify the roads by road number. If this type of road is unimproved, the roadbed can be below natural ground level, which makes the roadbed prone to capturing and channeling surface runoff during intense rain or rapid snowmelt events. Conventional drainage structures may require long outlet ditches to be effective at controlling water in these cases, which may not be feasible on some roads. Any decommissioning or improvement activities on these types of road need to be carefully designed to provide functional drainage.

Another risk factor related to modification of natural hydrologic processes is road density. The ***Galena Watershed Assessment*** identified and displayed road densities by subwatershed. In the subwatersheds that include both designated roadless areas and roaded areas, the total road densities for the subwatersheds can be misleading. The road densities in the roaded portion of the subwatershed are significantly higher than for the overall watershed, and the potential for roads to modify surface and subsurface flows is also higher.

Landscape conditions resulting from past activities combined with natural soil conditions can result in concentrations of surface and subsurface waters, which in some cases can contribute to causing debris torrents and debris flows. When these types of events occur in channels with road crossings, the features of the road segment(s) in the draws can be heavily damaged or removed by the event. How frequently these types of slope movements occur is unknown, but a reasonable estimate is that several small ones occur annually on the Forest, with larger ones occurring on a less frequent basis (See AQ3). Roads located near the top of hillslopes could be a contributing factor to these types of events, but they are usually a result of a combination of other historical disturbances and or natural conditions. Downslope road crossings rarely increase the frequency or magnitude of these events.

The magnitude of peak and near peak flow increases is unknown, but is probably not significant enough to damage streams in properly functioning condition. This conclusion is supported by observations that in urbanizing watersheds, degradation of stream channels and fish habitat is often not measurable until impermeable surfaces approaches 10% of the land's surface assuming streams were initially in Proper Functioning Condition. However, few streams in the planning area are considered to be in Properly Functioning Condition, as a result of past impacts, and some may not be able to handle storm events larger than predicted for 25-year flood events.

Although roads do not approach this 10% threshold in the planning area, the after effects of other historic disturbance have changed the patterns of infiltration and run-off, in effect causing the rate at which water is shed in this area to move closer to that expected when 10% of the area is in roads.

AQ2*: How and where does the road system generate surface erosion?*

Surface erosion occurs on most roads because their surfaces, cut slopes, fill slopes, and ditches are often composed of erodible material, deficient in ground cover, which is exposed to runoff.

Erosion is greatest during and immediately after road construction, and thereafter declines greatly, usually within three or four years. Factors that influence surface erosion on established roads include the road surface material, ground cover, erodibility of soils, steepness of the road grade, spacing between cross drains, and the amount of runoff (especially where roads capture runoff and route it down the road).

Surface erosion within the roadway is usually relatively limited on roads with functional drainage. It is most pronounced on native surfaced roads and in poorly vegetated ditches, but some of this type of surface erosion occurs even on improved or gravel surfaced roads. Ruts as shallow as ¼ inch can form channels down the surface, concentrate flows, and cause surface erosion. These conditions are most characteristic of roads on clayey subsoils and, to a lesser extent on native surface roads on other subsoils. Similar erosion is found on roads in granitic soils. Roads that have segments with erosion problems related to ditches include 2612706 and 2612570. Roads with road surface erosion problems include 2612000, 2614000, 2612878, 2010980, 2010204, 2010545, 2010993, 2612878, 2612774, 2614263, 2010986, 2055364, 2050072, and unidentified roads in Vinegar, Deerhorn, and a small un-named drainage.

Other roads have soils and conditions similar to those listed above, and have the potential to develop the same types of surface erosion problems: 2010999, 2010980, 2000020, 2055532 and the 2614452 road, where seeps or other water was observed on the road surface.

Roads can also increase surface erosion beyond the roadway. When drainage structures are adequately spaced and located, they route the concentrated flows into areas such that additional surface erosion beyond the cross drain outlet does not occur. Roads can increase surface erosion beyond the roadway when cross drains are not adequately spaced or located. Erosion can take place around the drainage outlets and in extreme cases 50 feet or more beyond the edge of the road. This is particularly true when road drainage concentrates runoff onto scabs or other areas where water does not readily infiltrate. Road surface erosion usually has little aquatic or water quality consequences, except where roads are hydrologically connected to streams (see AQ6 below). The quantity of surface erosion entering streams is unknown, as the degree of hydrological connectivity is not well documented or inventoried.

Examples of other conditions that can cause erosion include locations where poorly drained side roads drain onto another roadbed or ditches, and locations where concentrated runoff from a road connects with a skidtrail down slope.

Stream crossings and other low points along roads typically have sediment deposits (of various depths and sizes) where runoff puddles. Road related sediment deposits also occur at grade changes or settling points along drainage paths beyond where concentrated water leaves a road. These deposits will occur along the drainage path until either the water is greatly dispersed, all of the sediment is trapped, or it enters a stream channel. These problems are most frequently seen along crossings on the clayey or granitic soils, but depending on cross drain spacing, can occur on any soil types.

Road and channel erosion also occurs in any types of soils when roads “capture” intermittent or perennial streams, which results in active erosion of the roadbed. Concentration of flows on roadbeds from blocked ditches or other sources may channel water into streams and contributing to stream bank and bed erosion and eventual mingling of stream and roadbeds.

AQ3: How and where does the road system affect mass wasting?

Mass wasting is a natural process within the analysis area, particularly in the Clarno Formation areas. Roads can increase the natural frequency of mass wasting by concentrating surface flows, intercepting and rerouting subsurface flows, and constructing artificial or unnaturally steep slopes. While mass wasting related to the road system has not historically been a significant problem in the area, road drainage and maintenance is critical to prevent it from becoming so.

Natural features of the landscape indicate that large-scale debris flows and torrents are a natural geomorphic process in the area, but that large events of this type happen very infrequently (hundreds of years or longer intervals between large-scale events). As discussed in AQ1, hillslope roads rarely initiate these types of events. They are usually result of unusual natural runoff concentration caused by natural conditions or by other historical, non-road disturbance(s). Roads may be affected if they are located where stream segments are eroded by debris flow events.

Two slumps occur along County Road 20, near Butte Creek and west of Vincent Creek. Road related slope movements are caused either by undercutting of natural slopes by road construction or where roads or other ground disturbing activities altered natural surface and subsurface drainage. Slumps in nearby subwatersheds in similar soils and geology types usually occurred as a result of concentrated water running off poorly drained roads onto marginally stable areas. Ancient slumps are also fairly common landscape features based on evidence exposed in road cuts and on mapping of "ancient landslide" material in the Soil Resource Inventory. These areas are prone to be wetter and to require additional drainage to maintain stability; when drained adequately roadbed stability is comparable to that in the rest of the project area.

AQ4: How and where do road-stream crossings influence local stream channels and water quality?

Stream crossings influence local stream crossings wherever culverts are either undersized, or misaligned. A survey of culverts on fish bearing streams was completed in the planning area during the 2001 field season and data are currently being compiled and analyzed. The results of this survey are expected to provide definitive information about culvert influences on stream channels.

Concentrated flows and or sediment are often delivered to stream channels at road crossing sites as discussed under AQ1. Concentrated flows that reach streams earlier contribute to summer temperature water quality degradation because the flows are not stored on the landscape for late season release. Determining the quantity of sediment delivery to streams at road crossings has not been done, and there are no streams in the planning area on the Section 303(d) list of State Water Quality Impaired Bodies for sediment. Sediment is delivered directly to streams at several road fords in the analysis area. Roads that have some locations where sediment delivery is chronic include 2612621, 2614229, 2010482, 2010260, 2010499, 2010429, and 2045035. Roads where the risk of sediment delivery is relatively high include 2612774, 2614000, 2612570, 2612604, 2010669, 2010376, 2010980, 2010993, 2010691, 2010101, and an unidentified road in Butte Creek drainage.

Stream crossings with culverts influence water quality and channel morphology when they are installed at elevations that resulted from previous degradation of the local stream reach. Even if the culverts are aligned properly sized appropriately, if they are installed at unnaturally low or

degraded elevations, they result is continued isolation of floodplains from the channels, prevent natural channel-floodplain interactions and recovery, and increase the risk of downstream damage during high flows.

There are also a number of crossings of intermittent channels or large ephemeral draws that lack drainage structures, increasing risk of road failure and sediment delivery to downstream channels. The sites are not listed here, but are noted on existing condition maps in the Forest Hydrology department.

Some historic crossings have eroded allowing the roadbed to capture the stream or causing the stream to erode into multiple channels; roads with these conditions are listed in AQ1. Influence of road-stream crossings on water quality is covered in AQ5, AQ6, AQ9, AQ11, and AQ12 that follow.

AQ5: How and where does the road system create potential for pollutants, such as chemical spills, oils, de-icing salts, or herbicides, to enter surface waters?

Road crossings, and other close approaches between roads and streams, create the greatest potential for pollutants to enter surface waters, especially where roads are hydrologically connected to streams (see AQ6).

Risk of exposure is related to the level of activities occurring in area at a given time. When the Forest Service or adjacent landowners are conducting activities on or in the vicinity of a given road system, they are more likely to be carrying materials with potential for pollution if an accident occurs. Past chemical spills in the Galena watershed have usually been tied to periods the amount of local activities occurring was relatively high. But most Forest roads in the Southeast Galena planning area are not major transportation routes. Few are tie through roads, so most public use is just to access local forest areas. Generally, the limited use results in limited exposure to potential pollutants on these roads.

Dust abatement chemicals such as magnesium chloride or lignin sulfonate are sometimes used as prescribed mitigations for Forest management activities, and petroleum spills are also possible.

Potential for pollutants is highest along County Road 20, which serves numerous landowners and also as a local highway connecting State and Federal highways. Spills along County Road 20 could affect the Middle Fork of the John Day and the lower segments of some tributaries.

There is also a potential that the segment of the Middle Fork of the John Day in the planning area could be affected by chemical spills occurring upstream near State Highway 7 or U. S. Highway 26. Both these roads are major transportation routes, so the risk of a spill occurring is higher than along the other roads in the planning area. Pollutants from a spill along one of these roads would be diluted by the time stream flow reached the planning area, and amount of dilution would vary depending on the size of the spill amount of flow at the time of the spill.

AQ6: How and where is the road system "hydrologically connected" to the stream system? How do the connections affect water quality and quantity (such as, delivery of sediments, chemicals, thermal increases, elevated peak flows)?

A stream system consists of streams and other places with surface runoff, including draws, wetlands, and scabs. Roads are hydrologically connected at crossings and other places where roads closely approach streams, so that water and sediment from the road can directly enter a stream. "Closely approach" usually means about 25 feet or less, from road edge to channel edge. Near road crossings, the spacing of adjacent ditch relief drains and the road surface drainage affects the degree of hydrologic connectivity.

As noted in AQ2 and AQ5, the connections degrade water quality through road related sediment, and potentially by routing chemicals to streams. The connections themselves probably do not affect thermal increases, though proximity of roads to streams can affect thermal increases, by decreasing shade and woody debris, and possibly by decreasing low flows. As noted in AQ1 above, the connections increase peak flows, and on certain stream segments, increased peak flows can increase sediment.

The road system is hydrologically connected to the stream system at crossings as described in AQ1 and AQ4. Generally it appears that inputs at most crossings are relatively small but chronic, contributing cumulatively to an already disturbed landscape. Peak and near peak flows are elevated as a result of the overall disturbance. Summer base flows, consequently, are reduced, contributing to summer temperature water quality degradation.

AQ7: What downstream beneficial uses of water exist in the area? What changes in uses and demand are expected over time? How are they affected or put at risk by road-derived pollutants?

The primary beneficial uses are for cold-water fish. Fish species in the analysis area include steelhead and bull trout, which are both listed as Threatened, and chinook salmon and redband trout, which are both listed as Sensitive. Other beneficial uses include irrigation and recreation. Few changes are expected in use and demand, although as irrigation systems become more efficient and as landownership objectives change, more in-stream water may be dedicated to in-stream flow. The primary limiting factor for fish habitat is stream temperature, which is influenced indirectly by roads as described in AQ1 and other questions in the first section. The **Galena Watershed Analysis** (page 3-31) identifies the portion of the Middle Fork of the John Day River located within the analysis area and segments of eight tributaries as Oregon State 303(d) listed for water temperature.

Irrigation and recreation are affected only to a minor extent. Flow modification caused by withdrawals for irrigation affects stream temperature and other fish habitat parameters, and the resulting lower flows may affect downstream recreational use of the Middle Fork John Day River.

Road related sediment or road-derived pollutants present the greatest potential for adversely affecting fish and aquatic life. Sediment can decrease oxygen in spawning gravels and, in extreme cases sediment can cover spawning gravels, decrease channel roughness, fill in pools, decrease cover, and make the stream wider, shallower, and warmer. Thermal increases can stress and even kill cold-water fish. Chemical pollutants can also potentially stress or kill fish.

AQ8: How and where does the road system affect wetlands?

Road and road use adjacent to or lying within wetland environments can disrupt natural water flow, produce road related sediment, and increase potential contamination from vehicle use. In

addition, road use and other human activities impact the quality of habitat for wildlife and aquatic species. Roads appear to have only a minor influence on the condition of the meadows along the Middle Fork of the John Day River and the adjacent low elevation meadows of the tributaries, based on observation and available information.

The wetlands along the Middle Fork of the John Day River have been affected primarily by dredge mining and river channelization (using a bulldozer). Culvert placements at tributary streams along County Road 20 appear to be holding some tributary channels at lower elevations, because of previously down-cutting, which may be affecting the recovery of meadows along the Middle Fork (i.e. Caribou Creek). As described previously, the location of culverts and road crossings along tributary streams limit the recovery of wetlands that were previously isolated from adjacent stream channels due to down cutting. Roads occasionally cross seeps, diverting their drainage and reducing the natural size of wetlands.

AQ9: How does the road system alter physical channel dynamics,* including *isolation of floodplains; constraints on channel migration; and the movement of large wood, fine organic matter, and sediment?

Valley bottom roads and roads within RHCA's and floodplains interrupt overland flows and can divert water flow into ditches and culverts, cause erosion and deliver sediment into streams. Soil disturbance of the road prism within a floodplain can contribute significant amounts of sediment into streams during periods when the floodplains are inundated during runoff events. Vehicle traffic on wet roads can cause considerable disturbance and sediment delivery to streams. Fine organic matter and natural channel migration and development are impacted where natural water flow and hydrology are interrupted. Movement of large wood is interrupted and sometimes removed for firewood by public users.

The greatest effects on these processes in the lower meadows and stream reaches are from historical activities other than roads, and the effects of those activities continue to impact these processes to a far greater degree than roads. Roads have a more significant effect on these processes in the areas further upslope, and particularly where roads continue to maintain isolation of floodplains that was initially caused by a variety of historical activities.

AQ10: How and where does the road system restrict the migration and movement of aquatic organisms? What aquatic species are affected and to what extent?

An estimated 20% of the culverts within the analysis area are not large enough to accommodate predicted 100-year flood events. Based on recent surveys, approximately 85% of the culverts on fish bearing stream reaches present a barrier to some life stage of native fish during some flow conditions. Culverts that become blocked or get washed out can also create barriers to fish and aquatic migration. Barriers adversely affect anadromous steelhead, salmon, and Bull Trout (T&E Listed Species), and resident trout in the analysis area. Other fish and aquatic species in the riparian ecosystems are also affected.

AQ11: How does the road system affect shading, litterfall, and riparian plant communities?

The removal of tree cover and ground vegetation during road construction and maintenance removes shading and the potential for litterfall. Roads in RHCA's also affect plant communities through soil disturbance, water flow alteration, plant community composition changes, and removal of large wood by woodcutters and campers. Roads provide access to RHCA's that can

lead to development of dispersed campsites along streams, where disturbance and pollution often occur.

AQ12: How* and *where does the road system contribute to fishing, poaching, or direct habitat loss for at-risk aquatic species?

The road system provides fishermen access to streams throughout the watersheds, which contain listed fish species including steelhead, salmon, and bull trout. Road systems provide camping opportunities and can concentrate recreation use along streams. Increased poaching, fishing pressure, and habitat loss are direct results from road system access and camping within RHCA's. Direct habitat loss is along the streams where dispersed and developed campgrounds exist and where road stream crossings exist.

AQ13: How and where does the road system facilitate the introduction of non-native aquatic species?

There are no known incidences of introduction or stocking of non-native fish or other aquatic species within the analysis area, and the Oregon Department of Fish and Wildlife has no known plans to introduce any in the future. Road systems provide public access, and could make it easier for an illegal introduction of non-native aquatic species to occur, but this has not been a problem in the area.

AQ14: To what extent does the road system overlap with areas of exceptionally high aquatic diversity or productivity, or areas containing rare or unique aquatic species or species of interest?

Many of the aspen sites in the analysis area are currently in a decadent condition; successful reproduction is minimal, and many sites are in a state of decline as a result of a variety of impacts. The road system does provide easy access to some of the aspen sites, and those with roaded access tend to be favored as camping areas. The impacts associated with road systems and human access and activities within and adjacent to aspen clones can result in degradation to these unique species, impacting soils, water flow, and riparian qualities,

TERRESTRIAL WILDLIFE

TW1: What are the direct effects of the road system on terrestrial* species *habitat?

Roads have several effects, mostly adverse, on wildlife habitat. Road construction removes habitat, increases the likelihood of disturbance, increases competition among some species, alters animal and plant species composition in affected areas, creates movement barriers, increases mortality (trapping, hunting, road kills, etc), and increases the likelihood of poaching.

Initial road construction causes immediate loss of habitat within the roadway, by converting habitat into non-habitat. Depending upon the amount and kind of maintenance and use, the conversion can be permanent, unless vegetation grows in the roadway again.

Greater access means reduced seclusion habitat, which is very important to some species, including wolverines and wolves, which use roaded areas less than unroaded areas. Roads themselves are not a problem, but the loss of seclusion habitat is. In SE Galena, the Dixie Butte and Greenhorn Roadless Areas likely provide the best habitat for these species. Road construction is more constrained in the Vinegar Hill-Indian Rock Scenic Area and Dixie Butte

Wildlife Area portions of these roadless areas. The Forest Plan permits higher levels of management, including road construction, in the remaining portions of these roadless areas.

For species that will not cross or are hesitant to cross roads, a road becomes a barrier and fragments habitat. This can reduce habitat available for dispersing individuals and reduce the rate of gene flow within a population. The wider the road and the higher the standard, the more likely it is that an animal will hesitate or not cross it. In SE Galena, County Road 20, a paved highway, likely provides the greatest barrier to wildlife movement. Forest Service roads are often graveled or native surfaced and are less impacting; however, even lower grade Forest Service roads can cause hesitation in some animals.

In the past, roads were often constructed in riparian areas, which either degraded or eliminated riparian vegetation. About 75% of the terrestrial wildlife species found in the Blue Mountains are either directly dependent on riparian habitats or utilize them more than other habitats (Thomas et al., 1979). Wildlife uses these areas for water, shade, food and cover. These areas often provide travel corridors or migration routes. Elk and deer often use these areas for calving and fawning. Several wildlife species are strongly associated with riparian hardwoods, including Lewis's woodpecker, Williamson's sapsucker, red-naped sapsucker, downy woodpecker, and willow flycatcher. Aspen, in particular, is favored by several species for foraging and breeding.

Roads constructed through aspen stands can reduce the size of the clone and influence the water table either adversely or positively affecting aspen habitat. Aspen is a very important habitat type, used by many species for foraging and breeding. Some species, such as the red-napped sapsucker, are highly associated with aspen; they will occur elsewhere, but their density is much higher in aspen. On the Malheur National Forest, some of the greatest diversity of bird species per unit area occurs in aspen stands.

Snags as well as live trees are removed during road construction. Few snags will ever be allowed to remain near open roads because they present a hazard to the public, and because they are available as firewood. Most firewood harvest occurs legally; however, illegal cutting also occurs. Where road densities are high, the average snag density can be expected to be very low.

Roads also increase the amount of "edge" habitat that is preferred by some species. This can be a disadvantage to other species as a result of increased competition. The brown-headed cowbird is a brood parasite, laying its eggs in the nest of another species. Habitat created by road construction can allow brown-headed cowbirds into areas that previously were not suitable habitat. Some species, especially warblers, have very high nest failure rates when parasitized by brown-headed cowbirds.

Pools in roads or created by plugged culverts provide temporary habitat for frogs to breed. Eggs can be laid and tadpole reared in pools, which might increase habitat if young are able to mature and disperse before the pool dries. A pool that dries before the young mature can be detrimental to the population. Also, one vehicle trip through one of these pools could kill all tadpoles present.

TW2: How does the road system facilitate human activities that affect habitat?

Roads allow a higher frequency and density of humans than would occur otherwise. This increases disturbance and makes habitat less useable for some species. Such species as wolverine, wolf, and elk appear particularly sensitive to disturbance. Animals could be displaced from high road density areas, concentrating use into smaller areas. Increased disturbance can

cause reduced reproductive success or failure for sensitive species, such as the Canada lynx, northern goshawk, and bald eagle.

Typically, greater access is a precursor to higher levels of management. In SE Galena, many roads provide access for timber harvest and associated activities. Harvest often fragments and degrades habitat, at least for those species that prefer interior habitat to edge habitat.

Roads provide additional access for camping. Near campsites, vegetation is often removed or altered. More miles of road also reduce the unroaded areas available for recreation. Recreationists seeking an unroaded experience are concentrated into limited areas, such as wilderness areas or roadless areas, which are being used increasingly. This can further reduce refugia for animals sensitive to disturbance.

Loss of snags and down wood occurs at a higher rate along roads due to easy access for firewood gathering.

Snowmobiles access higher elevations during seasons formerly not used by very many people. They compact snow, which is believed to allow carnivores, such as coyotes and bobcats, into higher country during the winter. These carnivores are thought to compete with lynx for forage, which might increase lynx mortality due to starvation, or can cause direct lynx mortality.

TW3: How does the road system affect legal and illegal human activities (including trapping, hunting, poaching, harassment, road kill, or illegal kill levels)? What are the effects on wildlife species?

Many people are not willing, or in some cases, not capable of hiking far to hunt or trap. Increased road density can mean increased hunting, poaching, and trapping. Poachers tend to stay on roads because their activity is illegal, and they want to kill and remove the animal before getting caught. Constructing roads into previously unroaded areas further reduces refugia for animals to escape from hunters, to eat, and rest.

Snowmobile routes into high country facilitate trapping. Areas that can now be accessed by a snowmobile in a day, historically took several days to access by an individual on snowshoes. The high country, which was only used by trappers willing to spend several days pursuing their prey, is now available to the recreational trapper. In some areas, trapping can seriously deplete populations.

Increased road densities can lead to increased accidental road kill. Roads with the highest standards, such as interstate highways, have the highest rates of animal mortality. However, animals can be and are killed on any standard of road as long as any types of vehicles use them.

TW4: How does the road system directly affect unique communities or special features in the area?

Roads that are built through rock outcrops, mountain mahogany or aspen stands can remove unique habitat. Mountain mahogany is used as forage by big-game animals and breeding and foraging habitat for many other species. On the Malheur National Forest, mountain mahogany is not reproducing successfully in most areas for many reasons, so the loss of individual plants or stands is important to its distribution on the forest. Aspen on the Malheur National Forest is about 5% of what was historically and now occurs only as a few individual trees or stands of a few acres. A road built through an aspen clone has the potential to entirely remove the clone.

Because individual trees in clones are genetically identical, loss of the clone can mean loss of genetic material.

Most noxious weeds are introduced along roads. Roads through unique habitats increase the likelihood that noxious weeds will become established and occupy sites otherwise occupied by native species. In the past, road cut slopes were stabilized using various seed mixtures, often containing non-native species. These species now occur within the forest as well as along roads. In some cases, these species are consumed as forage and probably don't adversely affect herbivores; however, native plant species are reduced in areas occupied by non-native plants, which can result in a reduction in forage for some herbivores. For instance, orchard grass is not highly palatable, but it occupies areas historically occupied by native plants. On the other hand, clovers, many of which are non-native, are highly palatable and are consumed by birds and mammals.

ECONOMICS

EC1: How does the road system affect the Agency's direct cost and direct revenues used in assessing financial efficiency?

The history behind the Malheur's current road system has an important role in how we consider its financial efficiency. The Forest's roads were built primarily to access timber harvest units and for other administrative purposes. High timber revenues coupled with recreation benefits and access for firefighters made the roads financially efficient to build and maintain. With recent drastic reductions in timber harvest levels, the primary source of revenue that maintained the current road system fundamentally changed. The objective of the economic questions is to address costs, budget and overall financial efficiency of the current road system.

The current road system provides both positive and negative cash flows. The major source of revenue associated with roads is timber sales. Direct costs include recurrent road maintenance and resource restoration or protection costs related to increased motorized use in roaded areas. At present, direct costs exceed direct revenues. Given current agency funding and sources of revenue, an increase in open road mileage will compound the negative cash flow. However, these costs can be mitigated or minimized if roads are properly constructed, reconstructed, and maintained, and un-needed roads are closed, or decommissioned. All foreseeable projects are likely to result in fewer miles of high-cost open road in the analysis area.

Although the direct costs of road construction, maintenance, and mitigation measures exceed the direct revenues resulting from timber, and other commodities, many resource management objectives could not be accomplished or would cost a great deal more without an adequate road system.

EC2: How does the road system affect the priced and non-priced consequences included in economic efficiency analysis used to assess net benefits to society?

The road user groups in the analysis area that contribute the most significant recreation-related economic benefits are big game hunters. These users contribute revenue through the purchase of equipment, supplies, and services for their activities. Non-local hunters contribute additional revenue by staying at local hotels, eating at restaurants, and shopping.

The construction, maintenance, or decommissioning of roads within the analysis area is not expected to have a significant long-term impact on the economic benefits derived from

recreation unless there is a significant reduction in the total mileage of roads available for recreational use. Some short-term displacement of individual users may occur as a result of project related road activities.

EC3: How does the road system affect the distribution of benefits and costs among affected people?

The road system allows access for the number and amount of activities that occur in the area. Without the road system, the benefits and costs associated with hunters, recreational driving, firewood cutting, and other users would be reduced.

Snowmobiling may not be impacted by lack of a road system. The terrain's topography and vegetation cover lend themselves to allow snowmobiling with or without an intact road system. Although the road system tends to concentrate and funnel most users to certain trail areas, there is also a significant amount of off-trail and off-road snowmobile and ATV use in this analysis area.

TIMBER MANAGEMENT

TM1: How does the road spacing and location affect logging system feasibility?

The most efficient road spacing that would maximize timber stumpage values is not feasible because it would result in road densities and resource impacts conflicting with other resource management objectives. Generally, road construction is only allowed where it is determined to be economically and technically necessary to achieve resource management objectives.

The existing road system spacing and location is adequate to allow feasible harvest of most timber stands with either ground based or skyline logging systems except as noted in TM2. However, there are some stands that cannot currently be harvested without either accessing through new road construction, or using helicopter-based logging systems. Helicopter logging costs are typically not feasible for the type of timber available during current and recent market conditions.

TM2: How does the road system affect managing the suitable timber base and other lands?

The current road system is usually adequate for timber management in the Butte, Vincent, and Vinegar subwatersheds.

Portions of the Davis/Placer subwatershed also have adequate access, but the portions west of Davis Creek do not currently have adequate access. In the Deerhorn and Little Butte subwatersheds, road 2614 and branches needs relocation and reconstruction to adequately access the area between Deerhorn Creek and Davis Creek. Several segments are located in riparian areas and should be relocated. The rest are basically jeep roads that are native surface, narrow, and winding. The area west of Deerhorn Creek has no current access; the road system there is currently isolated not accessible. Timber haul is not feasible in the area west of Davis Creek at this time. Either timber harvesting must be forgone or expensive helicopter logging must be done to fly the logs out to the nearest suitable roads.

Native surface roads with inadequate drainage currently access the much of the local area west of the 2055 road in the Tincup/Little Butte subwatershed. These roads are unsuitable for timber hauling much of the year (restricted to only dry conditions). These roads need to be reconstructed to extend the time periods when they would be suitable for timber haul. The local

roads east of the 2055 road were recently reconstructed by the Moe timber sale, and are adequate for timber management.

The existing road system needs a number of other changes in order to allow more efficient access for management. These include work needed on roads that have deteriorated significantly as a result of deferred maintenance and changing the status of a few roads from decommissioned to closed (these roads were previously decommissioned without the benefit of a thorough interdisciplinary analysis to determine long term access needs of the area).

Temporary roads can also be utilized in many cases to reduce the density of permanent open roads, and the associated maintenance costs. This roads analysis did not attempt to assess the long-term need for temporary roads, as they are typically identified on a project basis to meet short-term needs.

TM3: How does the road system affect access to timber stands needing silvicultural treatment?

The current road system is adequate for non-commercial silvicultural treatments throughout the Butte, Vincent, and Vinegar subwatersheds. Portions of the Davis/Placer subwatershed are also adequate, but the portions west of Davis Creek are inadequately accessed. In the Deerhorn and Little Butte subwatersheds the 2614 and branches needs relocation and reconstruction to adequately access the area between Deerhorn Creek and Davis Creek. The access needs for commercial silvicultural treatments is described in the answer to TM2, above.

MINERALS MANAGEMENT

MM1: How does the road system affect access to locatable, leasable, and salable minerals?

There are currently only about 10 active mining claims in the area. But the amount of speculation, interest, and actual level of mining activity is dramatically influenced by the market values of locatable minerals, which are currently relatively low. The number of mining claims and related activities could increase very rapidly from the current level if market prices became significantly higher. As changes in market prices occur, it will change the demand for roaded access associated with mining operations.

Three roads that are recommended for decommissioning include segments that access current claims, but neither of the claims is known to have active operations in progress, and the Forest has not received plans of operations for them in recent years. These include segments of road 2614, road 2010101, and road 2010292. As plans to implement recommended decommissioning of roads are prepared, a thorough review of the most recent list of mining Plans of Operations needs to be done, and it may be necessary to place some of the road segments in a closed status (accessed by permit only), rather than decommissioning them, at least for the short-term.

The Forest Service has a number of developed rock materials sources in the area, used primarily for aggregate surfacing for system roads. Some improvements to the existing access roads would be beneficial, but overall the access to these sources is adequate. Common variety minerals from the materials sources are available and occasionally sold, primarily for use on adjacent private lands.

RANGE MANAGEMENT

RM1: How does the road system affect access to range allotments?

The existing road system is used by both livestock permittees and for permit administration activities. Any foreseeable changes in the transportation system will maintain adequate access for these activities.

WATER PRODUCTION

WP1: How does the road system affect access, constructing, maintaining, monitoring, and operating water diversions, impoundments, and distribution canals or pipes?

There are privately owned irrigation ditch diversions on National Forest System (NFS) lands in Vinegar Creek, Vincent Creek, and Granite Boulder Creek. In most cases, the point of diversion and a portion of the constructed ditches are located on NFS lands. Proposed management activities are not expected to curtail existing access, however, coordination with these ditch owners is recommended to avoid any potential conflicts. See SU1 for more details.

WP2: How does road development and use affect water quality in municipal watersheds?

There are no municipal watersheds within or downstream of the analysis area.

WP3: How does the road system affect access to hydroelectric power generation?

There is no hydropower facility accessed by the road systems in the analysis area.

SPECIAL FOREST PRODUCTS

SP1: How does the road system affect access for collecting forest* products*?

Virtually the entire existing road system is used for collecting special forest products for personal use such as mushroom gathering. The existing road system is generally adequate for commercial special forest products, such firewood cutting, and posts and poles.

When roads are decommissioned or closed it reduces access for some of these types of uses. But most of the roads that are recommended for decommissioning are already closed, and many are located in RHCA areas, where firewood cutting and other harvests are already prohibited. Any foreseeable changes in the area transportation system are expected to maintain adequate access for these types of activities.

SPECIAL USE PERMITS

SU1: How does the road system affect managing special-use permit sites (concessionaires, communications sites, utility corridors, and so on)?

This analysis area contains 3 non-recreation special use permits, 3 ditch easement applications, and intermittent short-term use by Outfitter and guides. The non-recreational permits and easement applications consist of a powerline, buried telephone cable and ditches. For the majority of the planning area, the proposed access plan won't affect these permits.

Road system changes have the potential to adversely affect access to permitted facilities. Certain access points must be provided for maintenance and management activities to the utilities and ditches. Proposed closures of access roads with barricades and gates will not eliminate access altogether, but will restrict access by requiring road closure permits, and increase costs incurred by the permittee's by having to remove and replace barricades.

There is an existing communication site located on top of Dixie Butte that is accessed by Forest Road 2610. The Forest Service, other governmental agencies, and private organizations use this communication site. This road is currently in very poor condition, and if improvements to the road surface and drainage were made, it would reduce adverse road impacts as well as greatly improve administrative access to the communication site and lookout.

This analysis area can contain two or more recreation temporary special use permits, which are recurring short-term permits, typically about 10 days in duration for any single year. The recreational permits are for outfitter guide operations. While the existing road system is helpful in dispersing hunters in the analysis area, the recommended changes are not expected to significantly these permits.

GENERAL PUBLIC TRANSPORTATION

GT1: How does the road system connect to public roads and provide primary access to communities?

There are few tie-through roads in the area that are used for other than local Forest access in the area. So the roads that provide primary access to and between area communities are limited to County roads or State and Federal Highways.

Virtually all of the local roads connect to County roads or State and Federal Highways, either directly or via Forest collector and arterial roads.

GT2: How does the road system connect large blocks of land in other ownership to public roads? (ad-hoc communities, subdivisions, inholdings, and so on)

The majority of other ownership lands within and adjacent to the project area are accessed by utilizing United State Highways 7 and 26, County Road 20, along with Forest system roads tied into these public transportation systems. The current access management plan is not expected to adversely impact access to non-Federal lands, however, coordination with these owners is recommended to avoid potential conflicts. Known Forest system roads used by these other owners are listed below.

Roads 2010 and 2010292 are currently open and provide access to a small within holding on Vincent Creek.

Roads 2010 and 2010148 provide access to the Umatilla National Forest and to scattered patented mining claims (private lands) within the Vinegar Hill – Indian Rock Scenic Area. Road 2010 is open, while road 2010148 is closed to motorized vehicles without a permit.

Road 4550 and 4550018 provide access to private lands commonly known as the Oxbow Ranch. Road 4550 is an open road, while road 4550018 is open to the public only on those portions of the road that are located on National Forest System lands. No current public right-of-way exists for the segments of this road that are located on private lands, which includes almost the entire segment of the road between Granite Boulder Creek west to the end of the road where it joins Grant County Road 20. This portion of the road was known as the County Road 20 bypass, and was used for commercial hauling until the new bridge on County Road 20 was recently installed. The Forest has the ability to access an isolated piece of road 4550018 and National Forest System (NFS) lands in the Beaver Creek area via its own transportation system using roads that

are currently closed that tie in with road 4555. Conversely, the Oxbow Ranch uses road 4550018 across Beaver Creek as a private road during management activities associated with the ranch. Long term transportation plans and authorizing documents need to be developed in this area addressing future Forest Service and private access needs.

Road 4550999 is used by the Oxbow Ranch to access and maintain irrigation ditches; this road is recommended for closure, with a gate on the portion of road that provides access to the ditches.

Roads 2610 and 2614 are open roads and provide access to private lands in the Bridge Creek/Placer Gulch area.

Road 2612 is open and provides access to private lands in the North Fork Bridge Creek area.

GT3: How does the road system affect managing roads with shared ownership or with limited jurisdiction? (RS2477, cost-share, prescriptive rights, FLPMA easements, FRTA easements, DOT easements)?

Proposed management activities are not expected to change present use. Within the project area, the only USDA easement grant is for County Road 20 along the Middle Fork of the John Day River, which has a variable width right-of-way. At this time there are no RS2477 claims, or cost-share roads. However, there are potential RS2744 or prescriptive right claims within the project area, especially on road 2010148, which provides access to patented mining claims (private lands) within the Vinegar Hill - Indian Rock Scenic Area. This same road also provides access to southern portion of the scenic area on the Umatilla National Forest.

GT4: How does the road system address the safety of road users?

While use of Forest Roads for logging activities has declined significantly, the Forest has been experiencing significant increases in overall recreational use. Traffic conflicts are expected to rise with future increases in population, tourist visits, and recreational use in the analysis area, and also because as open road densities are reduced through road closures and decommissioning, more users will use fewer miles of road.

Road Condition Assessment surveys, conducted in recent years revealed substantial deferred maintenance work items related to health and safety, some of which are considered critical. Critical safety deferred maintenance work items include: aggregate placement, turnout construction/reconstruction, brushing and clearing for sight distance and signing.

As much as current road maintenance funding levels allow, the classified roads in the analysis area are maintained and signed in accordance with their maintenance level and traffic service level. Additional reconstruction and maintenance work may be required to accommodate increased traffic use on roads that are to be left open.

ADMINISTRATIVE USE

AU1: How does the road system affect access needed for research, inventory, and monitoring?

To date the existing road system has been adequate for research, inventory, and monitoring needs.

AU2: How does the road system affect investigative or enforcement activities?

All of the open and gated roads in the analysis area provide vehicular access for both investigative and enforcement activities. The most prevalent recreation-related activities needing patrol are hunting related activities and summer/fall illegal use of motorized vehicles off roads. While the roads provide access for these activities, they also provide access for law enforcement personnel to conduct preventative and enforcement patrols.

PROTECTION

PT1: How does the road system affect fuels management?

About one third the analysis area is not accessible for fuels management activities due to lack of roads. A small part of the inaccessible area contains a fire regime defined as having infrequent fires of high intensities (spruce-fir and sub-alpine fir types) where there are no plans to manage fuels. The rest of the inaccessible area generally has dense stocking and high fuel loadings and is in need of fuels treatments.

The area south of the Middle Fork has a large portion with native surface roads that are narrow and deeply rutted. Many of these roads are not safely drivable making it dangerous to conduct prescribed burning for much of that area. Mechanical treatment of fuels involving removing excess fuels either by timber sales or service contracts is also limited in the areas with poor road conditions. The rest of the road system in the area is adequate to conduct fuels reduction projects.

PT2: How does the road system affect risk to fire fighters and to public safety?

The area south of the Middle Fork from Dixie Butte to Austin Junction has roads that are not passable for most vehicles (jeep roads) and much of this area also has few "safety zones" for firefighters to escape to in an emergency situation, as there are few openings in the dense forest canopies. Firefighters would need to hike long distances to reach safety zones in the event of a fast moving wildfire. This increases the risk of entrapment when performing fire suppression or prescribed fire activities in this area. Fires that escape initial attack in this area would threaten Austin House, homes on the north and east sides of the area and travelers on Highway 26, Highway 7 and County Road 20 because there are limited opportunities to defend against wildfires until these roads are reached.

Road 2010 is a major access point to the Indian Rock – Vinegar Hill Scenic area. The last three miles of this are very narrow with few turnouts and few opportunities to pass other vehicles. When meeting another vehicle, one of them often has to back a long way to find a place to pass. This creates a dangerous situation for fire fighters attempting to respond to a fire and the public that would be attempting to evacuate the area.

Most of the road systems in the analysis area start along County Road 20 and dead end at the upper elevations. Fires that start in the lower elevations can trap fire fighters or the public that happen to be on roads that are adjacent to or crossed by wildfires below them. The last three miles of Road 2010 is particularly vulnerable to being crossed by a wild fire because it traverses the upper part of steep mountainous terrain.

PT3: How does the road system affect the capacity of the Forest Service and cooperators to suppress wildfires?

The road system provides relatively rapid access for ground based fire suppression forces to manage wildfires for about two thirds of the area. Most of the roads can be utilized as fire breaks due to locations and fuel types present.

The areas with no roads, or those areas with narrow roads not passable for most types of vehicles, can be staffed with smoke jumpers or helitack crews, provided they are available and use of helicopters and airplanes can be utilized to drop water or retardant. However, if extended attack is needed or if project fires are in these areas, it is difficult to staff the fires or to bring in equipment. The result is a reduced capacity to suppress the fires and larger fires may be the result.

PT4: How does the road system contribute to airborne dust emissions resulting in reduced visibility and human health concerns?

This is not an issue except for short periods in local areas where management activities are taking place. Management activities design criteria insure that dust abatement is included for those activity areas when deemed necessary.

UNROADED RECREATION

UR1: Is there now or will there be in the future excess supply or excess demand for unroaded recreation opportunities?

The unroaded areas will continue to provide opportunities for solitude and outdoor recreation. This larger-scale question is addressed in the LRMP for the Forest.

UR2: Is developing new roads into unroaded areas, decommissioning of existing roads, or changing the maintenance of existing roads causing substantial changes in the quantity, quality, or type of unroaded recreation opportunities?

Several system and non-system roads and "jeep trails" in the analysis area have been closed under the LRMP. This resulted in an increase in both the quantity and quality of opportunities available for unroaded recreation within the analysis area. Long-term projections for road densities on the Forest in general are expected to continue to decrease, which should also increase the quantity and quality of unroaded opportunities.

UR3: What are the adverse effects of noise and other disturbances caused by developing, using, and maintaining roads, on the quantity, quality, and type of unroaded recreation opportunities?

This is not considered a significant issue within the analysis area. Potential effects include increased sights and sounds of people, and equipment adjacent to portions of the planning area. The vegetation and topography in the analysis area is such that summertime recreationists in unroaded areas are usually not within the road system's noise and disturbance zone of influence.

UR4: Who participates in unroaded recreation in the areas affected by constructing, maintaining, and decommissioning roads?

Although snowmobile recreation occurs, hunters and ATV use comprise the largest segment of the unroaded recreationists in the analysis area. Essentially all of the hunters, snowmobilers, and ATV users utilize motor vehicles to gain access to the area and then pursue their activity in the unroaded environment.

UR5: What are these participants' attachments to the area, how strong are their feelings, and are alternative opportunities and locations available?

People that are seeking remoteness and solitude use the area. There are numerous alternative locations for summer unroaded activities within a reasonable distance from the analysis area. Nearby, the Strawberry Mountain Wilderness and off Forest on the Umatilla National Forest the North Fork John Day Wilderness.

ROADED RECREATION

RR1: Is there now or will there be in the future excess supply or excess demand for roaded recreation opportunities?

This question is beyond the scope of this road analysis; the larger-scale question is addressed in the LRMP for the Forest. However, two-thirds of the planning area is relatively heavily roaded currently. And it can reasonably be expected that as human populations increase and as recreational technologies advance, there will be an associated increase in demand for road-related recreation activities.

Off-highway vehicles (OHV) such as motorcycles and All Terrain Vehicles (ATVs) are increasing in popularity and the demand for open roads and trails that restrict full-sized motor vehicles has increased in recent years. As development and congestion continues in more heavily populated areas, the planning area will see increased use from those who are seeking a more secluded environment. As public demand for fast and efficient access to the forest environment increases, the road system will become increasingly important to provide that access.

RR2: Is developing new roads into unroaded areas, decommissioning of existing roads, or changing maintenance of existing roads causing substantial changes in the quantity, quality, or type of roaded recreation opportunities?

As with recreation sites, the maintenance of a viable road system is a key to providing the diverse recreation opportunities available on the Forest. In addition to dispersed camping opportunities, the analysis area also has two developed campgrounds (Middle Fork Campground and Deerhorn Campground), and several trailheads. Some existing trails and trailheads have adequate road access, but access to others is only marginal or in some cases currently inadequate to meet the demand.

There are no current proposals to build new roads into roadless areas identified in Appendix C of the Malheur LRMP. Current direction is that most new road constructed for primarily for harvest activities will not be left open to the public. These roads may be available on a permit only basis if needed. In most areas it will be necessary to reduce both total road densities and open road densities, in order to meet LRMP goals, protect resources from road related impacts, and reduce maintenance costs.

Foreseeable changes in the Access and Travel Management plan for the Southeast Galena analysis area are not expected to cause substantial changes in the quality or type of roaded recreation opportunities. They will however result in a reduction of the number of road miles open to these types of activities. This will result in concentrating greater numbers of users on fewer miles of open roads, which could have some undesirable effects on the quality of recreational experience, and cause some overuse in these areas. As more users are concentrated on fewer miles of open roads, having safe, well-maintained roads will become more critical.

The main recreation access concerns are related to certain areas with very limited motorized access, and in some cases loop-type or tie-through roads. Closing of road segments in a manner that effectively eliminates tie-through or loop- type access will almost always be controversial. Road system changes have the potential to adversely affect access to some popular areas.

RR3: What are the adverse effects of noise and other disturbances caused by constructing, using, and maintaining roads on the quantity, quality, or type of roaded recreation opportunities?

This is not considered a significant issue within the analysis area. It can be reasonably expected that road recreationists will experience temporary disturbance and inconvenience in terms of short duration travel delays, dusty road conditions, and the need to drive more carefully due to increased encounters with road construction and maintenance machinery. Non-motorized road users such as mountain bicyclists may experience the highest level of adverse effects due to dust and fumes from machinery.

RR4: Who participates in roaded recreation in the areas affected by road constructing, changes in road maintenance, or road decommissioning?

The most significant use is by hunters during the big game seasons, with the heaviest use occurring from August through November. Other users include recreational drivers, dispersed campers, firewood and other miscellaneous special forest product gatherers, ATV and horn gathering drivers. Snowmobile riders and cross-country skiers use the area during the winter season, particularly the two designated snowmobile trails, including the Vincent Snowmobile Trail-256, and Bridge Creek Snowmobile Trail-256. All Terrain Vehicles use occurs on the Davis Creek Trail-244.

RR5: What are these participants' attachments to the area, how strong are their feelings, and are alternative opportunities and locations available?

Much of the attachment to the roaded portion of the analysis area is because of familiarity with the area and from the quick and easy access from County Road 20 and U.S. Highway 26. The part of the analysis area has had extensive road access for many decades and generations of families have recreated there. Due to the secluded feeling that the area gives, it creates a strong emotional and psychological bond, which gives people a very strong affinity for the area.

County Road 20 is a high standard, double-lane paved road that runs right through the middle of the analysis area. While there are many alternative locations on the Malheur National Forest that have a similar range of recreational opportunities, not many that have such quick and easy access available on such a high-standard road. This is probably one of the primary reasons the analysis area is so popular with recreationists.

PASSIVE-USE VALUE

PV1: Do areas planned for road construction, closure, or decommissioning have unique physical or biological characteristics, such as unique natural features and threatened or endangered species?

While no unique physical or biological characteristics, or unique natural features have been identified within the planning area, it does provide potential habitat for several T&E listed species including Mid-Columbia River summer-run steelhead, Columbia River Basin bull trout, Canada lynx, gray wolf and bald eagle.

PV2: Do areas planned for road construction, closure, or decommissioning have unique cultural, traditional, symbolic, sacred, spiritual, or religious significance?

At this time, there are no known areas of cultural, traditional, symbolic, sacred, spiritual, or religious significance in the Southeast Galena planning area. Consultation and communication with the Confederated Tribes of the Warm Springs Indian Reservation (CTWSR), the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) and the Burns Paiute Indian Tribe has not resulted in the identification of any such areas. Cultural resource inventories, which have covered approximately 60% of the planning area, have likewise failed to identify places that may be associated with important cultural practices of a contemporary community.

PV3: What, if any, groups of people (ethnic groups, subcultures, and so on) hold cultural, symbolic, spiritual, traditional, or religious values for areas planned for road entry or road closure?

American Indian groups or bands from the Great Basin and Columbia Plateau used the Southeast Galena planning area during historic and ethnographic periods. The Umatilla, Cayuse, Walla Walla, Tenino, and Paiute people all historically foraged in the Middle Fork of the John Day River on a seasonal basis (Suphan 1974; Blyth 1938; Stewart 1939). The study conducted by Suphan (1974), identified an ethnographic Umatilla/Cayuse/Tenino hunting and fishing camp near the mouth of Granite Boulder Creek known as "Pe-sown-e-a". In 1832, Hudson's Bay Company trapper John Work reported an encounter with several families of "Mountain Snakes" on the Middle Fork of the John Day River (Suphan 1974). Paiute Indians were commonly referred to as "Snakes" or "Diggers by Europeans and Euroamericans throughout the 19th century although the ethnic affiliation of these people is unknown. In 1864, European, Asian, and Euro-American miners rushed into the planning area and industrial scale mining continued intermittently for the subsequent 80 years. Chinese placer mine operators inhabited an area in Davis Creek known as "Happy Camp" in the latter years of the 19th century (Oregon DOGMI 1941).

Presently, the planning area is within territories ceded to the United States by the bands of the Warm Springs Indian Reservation in 1855. The Southeast Galena planning area is also considered a "traditional use" area by bands of the Umatilla Indian Reservation and the Burns Paiute. Government-to-government consultation with these federally recognized tribes has not resulted in the identification of any localities in the planning area that hold spiritual or religious value with the tribes. No other groups or individuals have informed the Forest Service that the planning area may be important for religious or spiritual practices.

PV4: Will constructing, closing, or decommissioning roads substantially affect passive-use values?

Road system changes will affect different passive use values to varying degrees. For example, building additional roads or increasing motorized use will favor those forest users seeking motorized recreation; while closing roads and road obliteration will favor those forest users seeking a non-motorized experience.

People generally do assign "passive use=value to natural resources, especially roadless areas" and other natural areas or areas with unique characteristics. Building roads into such areas may

reduce passive-use values or may serve values that require roaded access. Conversely, decommissioning roads may also increase or decrease passive-use values depending on the environmental effects of the activities. Although extensive scientific studies and information exists on passive-use and other non-market values, there is little evidence on quantifying the relationship among roads, roadless landscapes, and passive-use values. Several studies conclude that people assign passive-use values to roadless areas in very specific places (USDA 2001). Determining the parameters that apply to specific decisions would require further studies.

SOCIAL ISSUES

SI1: What are people's perceived needs and values for roads? How does road management affect people's dependence on, need for, and desire for roads?

This larger-scale question is addressed in the LRMP for the Forest (Also see PV2-PV4, SI 12-14, SI8, and SI10).

SI2: What are people's perceived needs and values for access? How does road management affect people's dependence on, need for, and desire for access?

As a result of publicity generated by opponents and supporters of the past ATM planning and implementation, there is a heightened awareness on the issues of motor vehicle access on the Forest. Snowmobilers, 4WD enthusiasts, and ATV riders are strongly opposed to any loss of motorized access. Two thirds of the analysis area has historically had ample motorized access, while the remaining third of the area is essentially roadless. Any proposals to close or decommission large portions of the road system will be met with both strong support and strong opposition.

SI3: How does the road system affect access to paleontological, archaeological, and historic sites?

Cultural resource management activities of the past 20 years in addition to the inventory conducted in support of the Southeast Galena project have resulted in the survey of approximately 60% of the planning area and identification of 70 cultural resource properties that are potentially eligible for the National Register of Historic Places (NRHP).

There have not been any paleontological inventories completed in the planning area.

Access has not been identified as detrimental to the archaeological record in the planning area. It is not anticipated that road management in the planning area will impact any identified significant cultural resource properties in any manner. All significant properties will most likely be avoided by road construction or reconstruction activities. If avoidance is not practical, it will be necessary to resolve adverse effects on a significant historic property in consultation with the Oregon SHPO (State Historic Preservation Officer) and the Federal ACHP (Advisory Council on Historic Preservation).

SI4: How does the road system affect cultural and traditional uses (such as plant gathering, and access to traditional and cultural sites) and American Indian treaty rights?

The Southeast Galena Analysis Area is within territories ceded to the United States by the bands of the Warm Springs Indian Reservation in 1855. The area is also considered a "traditional use" area by bands of the Umatilla Indian Reservation and the Burns Paiutes. Government-to-government consultation with these federally recognized tribes has not resulted in the

identification of any localities in the planning area that hold spiritual or religious value with the tribes. No other groups or individuals have informed the Forest Service that the planning area may be important for religious or spiritual practices.

However, access and travel management within the planning area could potentially affect the ability of Indian tribes to access traditional use areas or exercise treaty-reserved rights. In general, all of the Columbia Basin tribes hold treaty-reserved rights to access "usual and accustomed fishing grounds and stations", as well as areas traditionally used for hunting and gathering of edible plants. The tribes have expressed concerns related to access and traditional use areas during previous roads analyses conducted on the Malheur National Forest. Access and travel planning should be done in consultation with the Confederated Tribes of the Warm Springs Indian Reservation (CTWSR), the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), and the Burns Paiute Indian Reservation.

SI5: How does road management effect historic sites?

The Southeast Galena Analysis Area contains a portion of the Sumpter Valley Railway (SVRy) system, which was added to the National Register of Historic Places in 1987. Approximately 20 miles of the SVRy narrow gauge system are within the boundaries of the planning area; the vast majority of which have been converted to Forest Service roads. Generally speaking, the segment of railway within the Southeast Galena Analysis Area does not retain sufficient integrity to contribute to the overall significance of the system. All sections of railroad grade in the Southeast Galena planning area may be recommended for reconstruction or decommissioning during the analysis.

SI6: How does road management affect community social and economic health (for example, lifestyles, businesses, tourism industry, infrastructure maintenance)?

This larger-scale question is addressed in the Malheur National Forest LRMP.

SI7: What is the perceived social and economic dependency of a community on an unroaded area versus the value of that unroaded area for its intrinsic existence and symbolic values.

This larger-scale question is addressed in the Malheur National Forest LRMP.

SI8: How does road management affect wilderness attributes, including natural integrity, natural appearance, opportunities for solitude, and opportunities for primitive recreation?

None, as there are no wilderness attributes inside or adjacent to the analysis area.

SI9: What are traditional uses of animal and plant species in the area of the analysis?

Species of fauna which were used by tribes or bands of American Indians that foraged in the analysis area prior to Euro American contact include: mule deer, Rocky Mountain elk, and anadromous fish. Traditionally important plant species that occur within the analysis area include species of: biscuitroot, bitterroot, onion, and huckleberry.

SI10: How does road management affect people's sense of place?

In the Dixie Butte and Greenhorn Roadless Areas, the emphasis is to have these areas function as biological strongholds for populations of threatened and endangered species as well as provide large, relatively undisturbed areas for wildlife dependent on this character. Benefiting uses include opportunities for dispersed non-motorized outdoor recreation.

Outside of the roadless areas, road management is the backbone of much of this area's traditional "sense of place". Ties to the land are based on the lifestyles of people that make their living off of the land. These parts of the analysis area are dedicated to multiple uses of resources, including timber harvesting, grazing, and mineral extraction.

Hunting is another use associated with the land that impacts the "sense of place" for many users. The existing road management benefits the majority of recreationists in the area, especially those seeking a motorized recreation type of experience. Since most of the area is very roaded, it provides a roaded "sense of place" for timber, range, and recreation users. As more roads are closed, it will upset many of the traditional users. Wilderness users would support road closures, but most wilderness users go elsewhere for a wilderness experience or an "unroaded sense of place", and probably do not have a history of use in this area.

Sense of place in the Southeast Galena area is provided, in part, by elements of the cultural environment that connects visitors with history of railroad logging in the Blue Mountains. People who grew up in Bates or the local area like to travel the area. Older residents of the local towns like to be able to go to areas they used when they were living in the area.

There are areas that have local sentimental value or significance, because people have traditionally recreated there, lived nearby, have had family gatherings in these areas, or because people are particularly interested in local history. The old Bates Mill town-site and pond are located just west of the junction of County 20 with OR State Hwy. 7. There are people in the local area who used to live there or whose relatives worked there.

CIVIL RIGHTS AND ENVIRONMENTAL JUSTICE

CR1: How does the road system, or its management, affect certain groups of people (minority, ethnic, cultural, racial, disabled, and low income groups)?

Although the road system and its management does not provide many accommodations specifically for disabled people, the roads in the Southeast Galena analysis area are being used by all groups of people (including minority, ethnic, cultural, racial, disabled, or low-income). To the best of our knowledge, the current road system and its management are not adversely impacting the civil rights of any group.

If the recommendations from this analysis are implemented, it will result in overall improvements to roads that remain on the Forest transportation system, and decreases in both total and open road miles over the long-term. Varying impacts would occur to disabled people, low-income groups that require motorized access to participate in recreational activities such as hunting, dispersed camping, firewood gathering, or collection of non-timber forest products. Impacts would also include easier access to some areas that are inaccessible or difficult to access. This creates opportunities for disabled and others that currently are restricted due to existing conditions of the transportation system.

APPENDIX A – Roads Glossary *[see next page]*

Road – **A motor vehicle travelway over 50 inches wide, unless designated and managed as a trail. A road may be classified, unclassified, or temporary.**

(1) ***Classified road*****. A road wholly or partially within or adjacent to National Forest System lands that is determined to be needed for long-term motor vehicle access, including State roads, County roads, privately owned roads, National Forest System roads, and other roads authorized by the Forest Service. If a system road is no longer necessary for long-term resource management it is considered a candidate for decommissioning.**

(2) ***Unclassified Road*****. A road on National Forest System lands that is not managed as part of the forest transportation system, such as unplanned roads, abandoned travelways, and off-road vehicle tracks that have not been designated and managed as a trail; and those roads that were once under permit or other authorization and were not decommissioned upon the termination of the authorization.**

(3) ***Temporary Road.*** **A road authorized by contract, permit, lease, other written authorization, or emergency operation, not intended to be part of the forest transportation system and not necessary for long-term resource management.**

Decommissioned Roads *– Roads that are considered permanently removed from service and the Forest Transportation System, either because there is no reasonably foreseeable need for the road, or because its continued use is not compatible with other resource protection needs, or both. The goal is to leave them in a condition that will not require custodial maintenance. All stream crossing structures are removed and the stream crossing areas are reshaped to resemble a natural condition. All culverts, roadside ditches, and ruts are removed. The road surface is shaped so that no segments provide a continuous surface flow path to a stream channel. This is typically accomplished by outsloping the road surface, constructing frequent cross ditches, or a combination of both. Revegetation of decommissioned roads can occur naturally or may be accomplished by other methods to get cover within ten years after the last activity, as required by the National Forest Management Act.*

Obliterated Roads *– are a type of decommissioned roads, on which the restoration work includes pulling back the fill materials and reshaping the roadway to restore natural contours.*

Closed Roads *– are roads on which motorized traffic has been excluded by regulation, barricade blockage, or by obscuring the entrance. A closed road remains on the Forest Road Transportation System, and is still an operating facility, but one on which motorized traffic has been removed (year-long or seasonal). Closed roads are expected to be needed on an occasional or intermittent basis, and require periodic monitoring and basic custodial maintenance.*

Inactivated Road *– are a class of closed roads where a management decision has determined the road is not needed for an interval of at least ten years. Motorized traffic is excluded for an indefinite period of time by regulation, barricade blockage, or by*

obscuring the entrance. All stream crossing structures are removed, and the stream crossing areas are reshaped to resemble a natural condition. All culverts, roadside ditches, and ruts are removed. The road surface is shaped so that no segments provide a continuous surface flow path to a stream channel. This is typically accomplished by out sloping the road surface, constructing frequent cross ditches, or a combination of both. An inactivated road remains on the Forest Road Transportation System, but is left in a condition where basic custodial maintenance is not necessary. If a later decision determines the road should be decommissioned, no additional work would usually be needed.

***Open Road** – A road, or segment thereof, that is open to the general public without restrictions other than general traffic control or restrictions based on size, weight, or class of vehicle. An otherwise open road may be closed during scheduled periods, extreme weather conditions, or emergencies.*

***Road construction*. Activity that results in the addition of forest classified road miles or temporary road miles.**

***Road maintenance*. The ongoing upkeep of a road necessary to retain or restore the road to the approved road management objective**.

***Road reconstruction*. Activity that results in improvement or realignment of an existing classified road defined as follows;**

(1) Road improvement. Activity that results in an increase of an existing road's traffic service level, expansion of its capacity, or a change in its original design function.

(2) Road realignment. Activity that results in a new location of an existing road or portions of an existing road, and treatment of the old roadway.

APPENDIX B – ROAD TABLES

The tables in this appendix display the existing status and recommended future status of each road segment in the analysis area. The Key for the tables is as follows:

EX_CONDITION = Existing Condition; All existing roads are shown as being in one of the three following categories:

O = Open

C = Closed

D = Decommissioned

FUTURE_CONDITION = Recommended Future Condition;

EO = Existing Open (An currently open road segment that is recommended to remain open);

NO = New Open (A proposed new construct road that is recommended to be left open or a currently closed road is recommended to changed to open status);

EC = Existing Closed (A currently closed road that is recommended to remain closed);

NC = New Closure (A proposed new construct road that is recommended to be left closed or an existing open road that is recommended to be changed to a closed status);

ED = Existing Decommission (An existing decommissioned road that is recommended to remain decommissioned);

ND = New Decommission (An existing open or closed road that is recommended to be decommissioned);

SC = Seasonal Closure [An existing open or closed road is recommended to change to a seasonally closed status (December through March)]

The first two lines on the first page of the tables are the cumulative mileages for all of the recommended new road construction (hence no road numbers), and their proposed future status (New Open or New Closed). These mileage numbers do not include the three roads that were previously decommissioned that this road analysis recommends be placed back on the Forest road system as classified roads. Those roads are listed individually as roads 2010311, 2010430, and 2010771.

APPENDIX G--Appendix B --SE GALENA EXISTING ROUTE STATUS
(ONLY ROADS WITHIN PROJECT BOUNDARY)
7/3/2002

ID	EX_CONDITION	FUTURE_CONDITION	LENGTH
	New Construct	NC	13.35
	New Construct	NO	3.28
2000020	C	ND	1.11
2000020	C	NO	2.05
2000024	C	ND	0.17
2000025	O	EO	0.33
2000026	D	ED	0.27
2000027	D	ED	0.2
2000042	C	ND	0.23
2000048	C	NO	1.03
2000058	C	NO	0.12
2000078	C	ND	0.05
2000080	C	ND	0.21
2000120	D	ED	1.09
2000120	O	EO	5.47
2000121	O	EO	0.14
2000131	O	EO	0.22
2000136	O	EO	0.15
2000139	C	ND	1.42
2000139	C	NO	0.17
2000380	C	ND	0.31
2000380	O	NC	0.27
2000542	O	EO	0.45
2000542	O	ND	0.12
2000563	O	EO	0.21
2000612	D	ED	0.74
2000629	C	ND	0.62
2000646	D	ED	0.45
2000647	D	ED	0.2
2000663	O	EO	0.11
2000680	O	EO	1.83
2000681	D	ED	0.14
2010000	O	EO	13.53
2010013	D	ED	0.41
2010015	C	EC	0.84
2010021	D	ED	0.24
2010028	D	ED	0.29
2010029	D	ED	0.16
2010035	O	EO	0.57
2010035	O	ND	0.21
2010036	O	ND	0.38
2010045	D	ED	1.24
2010046	C	EC	0.13
2010047	D	ED	0.26
2010067	D	ED	0.77
2010072	C	NO	1.26
2010072	O	EO	0.86
2010073	C	EC	0.75
2010101	O	ND	0.18

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(ONLY ROADS WITHIN PROJECT BOUNDARY)
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ID	EX_CONDITION	FUTURE_CONDITION	LENGTH
2010108	D	ED	0.83
2010125	D	ED	0.26
2010142	D	ED	0.22
2010148	C	EC	1.5
2010158	C	EC	0.55
2010159	C	EC	1.58
2010159	C	ND	0.04
2010160	C	ND	0.75
2010161	C	ND	1.24
2010168	D	ED	0.04
2010184	D	ED	1.49
2010184	O	EO	0.53
2010188	C	EC	0.09
2010198	D	ED	0.19
2010204	D	ED	0.35
2010214	C	ND	0.61
2010219	O	ND	0.27
2010243	C	ND	0.58
2010260	D	ED	0.47
2010260	O	EO	0.31
2010261	O	EO	0.08
2010277	C	EC	0.12
2010292	C	ND	0.42
2010292	O	EO	0.64
2010292	O	ND	0.28
2010294	C	EC	0.32
2010294	C	ND	0.63
2010311	C	EC	0.36
2010311	D	NC	1.01
2010328	C	EC	2.01
2010329	D	ED	0.13
2010345	C	EC	1.8
2010346	D	ED	0.39
2010362	C	EC	0.79
2010370	D	ED	0.31
2010376	C	EC	0.39
2010376	C	ND	1.18
2010377	C	ND	0.38
2010379	D	ED	1.26
2010396	C	ND	0.44
2010396	O	ND	0.29
2010429	O	ND	0.21
2010430	D	ED	0.46
2010430	D	NC	0.44
2010432	C	EC	1.06
2010434	C	ND	0.11
2010482	D	ED	0.31
2010499	C	ND	0.25
2010499	O	ND	0.03
2010533	C	ND	0.35
2010533	D	ED	0.79

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(ONLY ROADS WITHIN PROJECT BOUNDARY)
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ID	EX_CONDITION	FUTURE_CONDITION	LENGTH
2010534	C	ND	0.08
2010544	C	EC	0.13
2010545	C	NO	0.82
2010547	O	EO	0.1
2010549	D	ED	0.13
2010567	C	EC	0.32
2010567	C	ND	0.19
2010584	C	EC	0.15
2010584	C	ND	0.33
2010601	C	EC	0.22
2010601	C	ND	0.19
2010618	O	EO	5.78
2010630	C	EC	0.27
2010631	C	EC	1.52
2010631	C	ND	1.26
2010632	C	EC	0.76
2010632	C	ND	0.24
2010633	C	ND	0.36
2010634	D	ED	0.32
2010635	D	ED	0.56
2010636	D	ED	0.11
2010669	C	EC	0.26
2010686	D	ED	0.31
2010687	D	ED	0.08
2010689	D	ED	0.09
2010691	C	EC	0.08
2010703	C	EC	1.79
2010704	D	ED	0.45
2010720	D	ED	0.29
2010737	O	EO	0.36
2010738	O	ND	0.3
2010771	D	NC	0.75
2010805	C	ND	0.45
2010807	C	ND	1.89
2010807	O	EO	0.19
2010824	D	ED	0.2
2010839	C	EC	0.39
2010873	O	EO	1.55
2010874	O	EO	0.12
2010874	O	ND	0
2010890	O	ND	0.41
2010891	O	ND	0.3
2010907	D	ED	0.51
2010924	C	EC	0.43
2010940	C	ND	0.08
2010940	C	NO	0.18
2010941	C	EC	0.8
2010941	C	ND	0.34
2010942	D	ED	0.19
2010949	C	EC	0.5
2010949	C	ND	1

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(ONLY ROADS WITHIN PROJECT BOUNDARY)
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ID	EX_CONDITION	FUTURE_CONDITION	LENGTH
2010950	C	EC	0.28
2010958	C	ND	0.32
2010958	O	EO	0.18
2010959	C	EC	0.35
2010959	C	ND	0.13
2010960	O	EO	0.07
2010966	D	ED	0.29
2010966	O	EO	0.13
2010969	D	ED	0.17
2010976	C	ND	0.4
2010979	C	EC	0.39
2010980	C	EC	1.97
2010983	C	EC	0.15
2010984	C	EC	0.55
2010984	C	ND	0.12
2010985	C	EC	0.55
2010986	C	EC	1.94
2010986	C	NO	0.15
2010987	C	NO	0.21
2010988	D	ED	0.2
2010989	D	ED	0.26
2010991	D	ED	0.57
2010992	C	NO	0.03
2010992	D	ED	0.18
2010992	O	EO	0.06
2010993	O	EO	1.72
2010998	C	EC	0.51
2010998	C	ND	0.2
2010999	C	ND	0.24
2050000	O	EO	0.63
2050032	C	EC	1.23
2050032	C	NO	1.53
2050033	C	EC	0.46
2050034	C	ND	0.88
2050035	C	ND	0.21
2050035	O	EO	1.34
2050037	C	EC	0.5
2050038	C	EC	1.89
2050040	C	EC	0.57
2050068	C	ND	0.1
2050072	O	EO	0.97
2050072	O	NC	1.48
2050073	C	ND	0.41
2050074	C	ND	0.17
2050130	C	EC	0.28
2050201	C	EC	0.84
2050282	C	EC	0.24
2050302	C	EC	0.53
2050504	O	ND	0.11
2050648	D	ED	0.83
2050666	C	NO	0.08

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ID	EX_CONDITION	FUTURE_CONDITION	LENGTH
2050790	D	ED	0.1
2050791	C	EC	2.82
2050791	C	ND	1.65
2050792	D	ED	0.18
2050793	D	ED	0.1
2050808	D	ED	1.34
2050809	O	NC	0.21
2050825	C	EC	1.28
2050825	O	NC	0.44
2050826	C	EC	0.13
2050830	D	ED	0.74
2050831	D	ED	0.22
2050842	C	ND	0.22
2050843	C	ND	0.24
2050859	C	NO	0.32
2050876	C	ND	0.25
2050910	C	ND	0.17
2050924	C	ND	0.2
2050925	C	ND	0.15
2050926	C	EC	0.1
2050927	C	EC	0.57
2050927	C	ND	1.69
2050928	C	ND	0.66
2050929	D	ED	0.11
2050930	D	ED	0.38
2055000	O	EO	7.43
2055091	D	ED	1.27
2055106	O	NC	0.72
2055110	O	NC	0.02
2055110	O	ND	0.29
2055127	O	NC	0.38
2055161	C	EC	0.52
2055195	D	ED	0.12
2055278	D	ED	0.15
2055279	C	EC	4.22
2055280	C	EC	0.42
2055296	D	ED	0.06
2055330	C	EC	0.57
2055342	C	ND	0.57
2055343	C	EC	0.57
2055345	C	EC	0.86
2055347	D	ED	0.3
2055348	C	ND	0.33
2055364	C	EC	3.65
2055364	C	ND	0.1
2055364	O	NC	0.51
2055364	O	ND	0.3
2055365	C	EC	0.37
2055366	C	EC	0.53
2055367	C	EC	0.08
2055398	O	NC	1.12

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ID	EX_CONDITION	FUTURE_CONDITION	LENGTH
2055415	C	EC	0.62
2055432	D	ED	1.92
2055450	D	ED	1.14
2055452	C	EC	0.71
2055467	C	ND	0.45
2055479	C	ND	0.32
2055479	D	ED	0.85
2055484	C	EC	0.22
2055501	C	EC	0.37
2055518	C	EC	0.78
2055518	C	ND	0.33
2055531	C	ND	0.11
2055531	O	ND	1.1
2055532	C	EC	0.55
2055566	D	ED	0.22
2610000	O	EO	1.87
2610275	O	EO	0.04
2610365	O	ND	0.05
2610502	C	ND	0.06
2610574	C	EC	0.17
2610574	O	NC	0.07
2610575	O	ND	0.01
2610623	C	EC	0.25
2610623	O	EO	0.12
2610742	C	EC	0.44
2610759	O	EO	2.27
2610777	O	ND	0.38
2610779	O	ND	0.05
2610920	C	ND	0.06
2612000	O	EO	4.75
2612109	C	EC	1.33
2612114	D	ED	0.69
2612115	O	EO	0.05
2612123	D	ED	0.08
2612362	C	ND	0.03
2612483	C	EC	0.42
2612518	C	EC	0.15
2612518	C	NC	0.3
2612520	C	ND	0.13
2612569	C	ND	0.2
2612570	O	EO	3.09
2612571	C	EC	0.56
2612587	C	EC	2.2
2612588	C	ND	0.13
2612604	C	EC	0.74
2612604	C	ND	0.21
2612605	C	ND	0.18
2612621	C	ND	1.19
2612638	C	ND	0.13
2612639	C	ND	0.2
2612655	O	ND	0.75

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ID	EX_CONDITION	FUTURE_CONDITION	LENGTH
2612672	C	EC	0.9
2612673	D	ED	0.27
2612675	D	ED	0.28
2612688	C	ND	0.04
2612689	C	EC	0.13
2612692	O	NC	0.03
2612692	O	ND	0.08
2612706	C	EC	1.92
2612708	C	ND	0.87
2612710	D	ED	0.09
2612723	C	ND	0.57
2612740	O	NC	0.23
2612755	C	EC	0.32
2612755	C	ND	0.97
2612757	C	ND	0.09
2612774	D	ED	0.44
2612778	C	EC	0.42
2612878	C	EC	2.59
2612936	D	ED	0.43
2614000	O	EO	1.31
2614000	O	ND	1.48
2614033	O	EO	1.27
2614070	C	EC	1.63
2614107	O	ND	0.09
2614111	C	EC	0.24
2614128	C	EC	0.22
2614196	C	EC	0.38
2614229	D	ED	1.95
2614230	D	ED	0.22
2614232	D	ED	0.19
2614263	O	ND	0.71
2614314	O	ND	0.22
2614315	C	ND	0.16
2614316	C	ND	0.17
2614331	O	EO	3.15
2614331	O	NC	0.89
2614331	O	ND	2.27
2614332	O	NC	0.26
2614333	C	ND	0.37
2614334	C	ND	0.34
2614341	C	ND	0.09
2614348	O	ND	0.53
2614402	C	ND	1.34
2614402	O	EO	0.47
2614402	O	ND	0.49
2614403	C	ND	0.55
2614444	D	ED	0.65
2614445	D	ED	0.06
2614452	O	EO	1.89
2614453	O	NC	0.8
2614469	O	NC	1.17

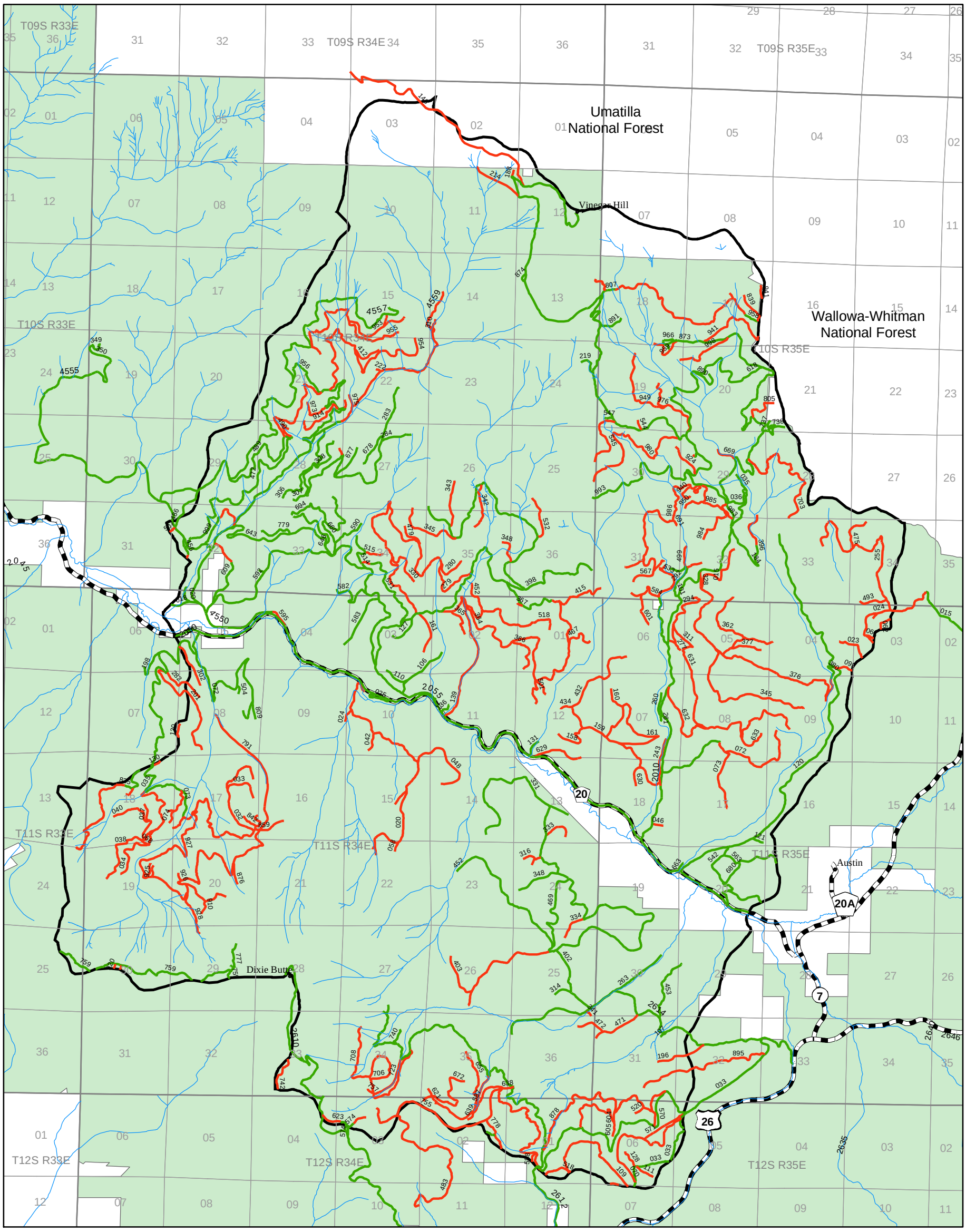
APPENDIX G--Appendix B --SE GALENA EXISTING ROUTE STATUS
(ONLY ROADS WITHIN PROJECT BOUNDARY)
7/3/2002

ID	EX_CONDITION	FUTURE_CONDITION	LENGTH
2614471	C	EC	0.6
2614472	C	EC	0.35
2614895	C	EC	0.41
2614895	C	ND	0.25
4550000	O	EO	2.74
4550018	O	EO	0.34
4550020	O	EO	0.21
4550191	D	ED	0.19
4550456	C	EC	0.04
4550456	O	NC	0.21
4550457	O	EO	0.04
4550472	C	ND	0.29
4550472	O	EO	0.12
4550472	O	NC	2.46
4550472	O	ND	0.03
4550486	O	EO	0.11
4550490	D	ED	0.11
4550507	C	EC	0.09
4550514	O	ND	0.57
4550515	C	ND	0.23
4550582	O	NC	0.43
4550582	O	ND	0.23
4550583	O	ND	0.72
4550590	O	NC	0.19
4550590	O	ND	0.25
4550592	O	NC	2.15
4550592	O	SC	2.31
4550593	O	NC	0.07
4550595	C	ND	0.24
4550595	O	EO	0.09
4550609	C	EC	0.31
4550609	O	NC	0.61
4550660	O	NC	1.08
4550660	O	ND	0.11
4550694	O	ND	0.64
4550999	C	ND	0.38
4550999	O	NC	0.25
4550999	O	ND	0.12
4557000	O	EO	5.73
4557158	C	EC	0.15
4557227	D	ED	1.16
4557228	D	ED	1.15
4557489	O	NC	1.48
4557490	C	ND	1.28
4557510	D	ED	0.37
4557938	C	EC	0.15
4557953	C	EC	0.01
4557953	C	ND	1.94
4557955	C	ND	0.79
4559000	C	ND	2.4
4559000	O	EO	0.77

-APPENDIX G--Appendix B -- SE GALENA EXISTING ROUTE STATUS
(ONLY ROADS WITHIN PROJECT BOUNDARY)
7/3/2002

ID	EX_CONDITION	FUTURE_CONDITION	LENGTH
4559000	O	ND	0.23
4559000	O	SC	1.29
4559214	C	EC	0.09
4559222	C	ND	0.07
4559282	D	ED	0.76
4559283	O	SC	3.81
4559284	O	SC	0.36
4559285	D	ED	0.12
4559306	O	NC	0.67
4559307	O	NC	0.19
4559308	O	NC	0.54
4559310	C	ND	0.19
4559408	D	ED	0.21
4559410	C	EC	0.1
4559412	C	ND	0.38
4559491	D	ED	0.23
4559643	O	SC	1.97
4559646	O	ND	0.75
4559677	O	NC	0.45
4559678	O	NC	0.43
4559779	O	ND	0.43
4559914	C	EC	0.69
4559937	D	ED	0.53
4559954	C	NC	2.72
4559956	O	SC	2.73
4559958	D	ED	1
4559972	D	ED	0.72
4559973	C	EC	0.38
4559975	C	ND	0.16
7000023	C	ND	0.41
7000024	C	EC	0.12
7000024	C	ND	0.55
7000061	C	ND	0.08
7000062	C	EC	0.3
7000099	C	EC	0.23
7000255	C	EC	2.4
7000475	C	EC	0.47
7000493	C	EC	0.35
7000660	D	ED	0.12
CO20000	O	EO	8.44
			==========
			325.08

Southeast Galena Roads Analysis
Existing Condition



Legend

- SE Galena Analysis Boundry
- Malheur National Forest
- Existing Closed Road
- Existing Open Road
- Category I and II Streams

Map 32

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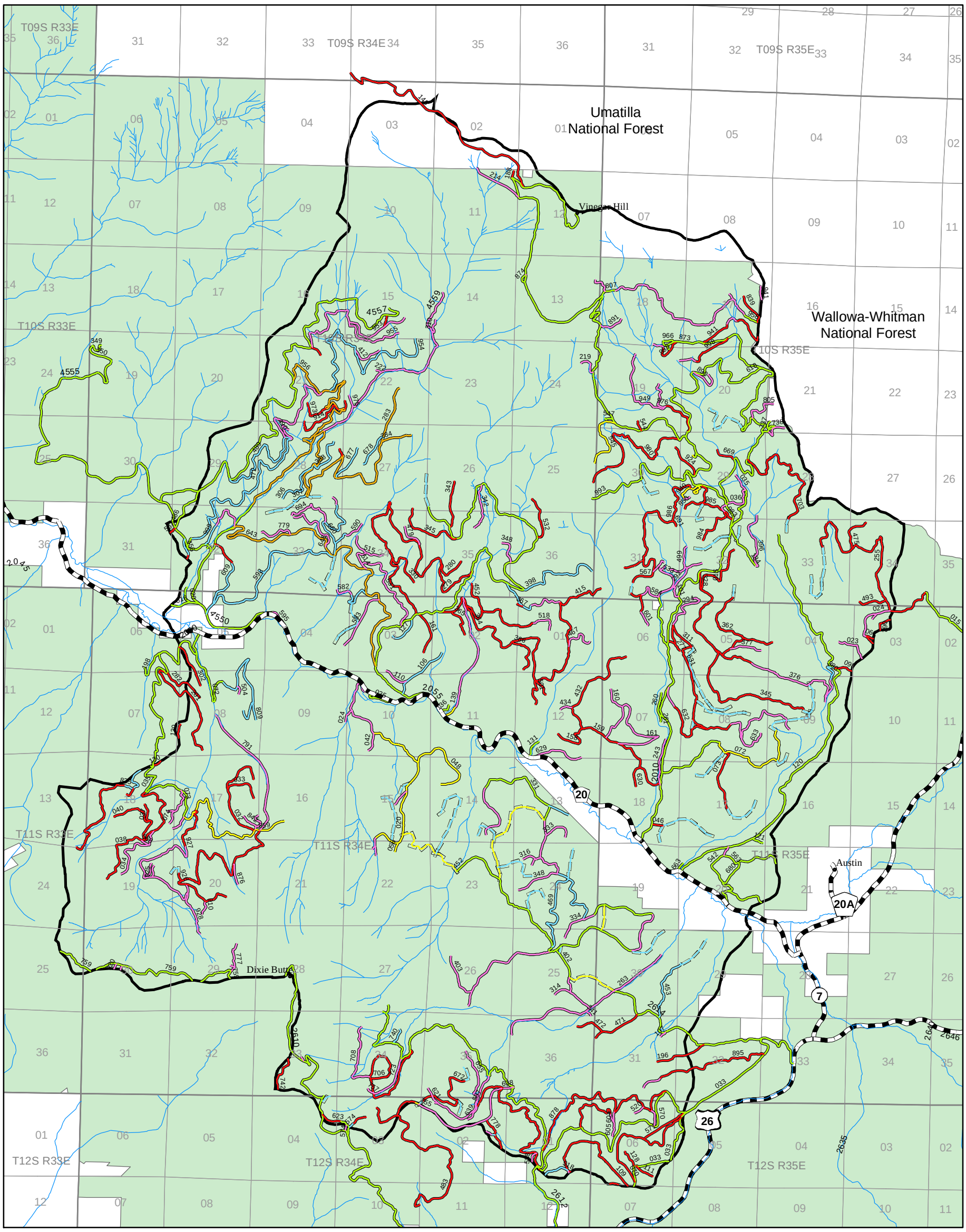
1 inch equals 1.189302 miles

0 0.375 0.75 1.5 2.25 3 Miles

Southeast Galena Roads Analysis
Recommended Changes to Existing System



Map 33

Legend

- Recommended Const.
- County Roads
- Existing Closure
- Existing Open
- New Closure
- New Decommission
- New Open
- Seasonal Closure
- Existing Roads
- Major Highways
- Category I and II Streams
- SE Galena Analysis Boundry
- Malheur National Forest

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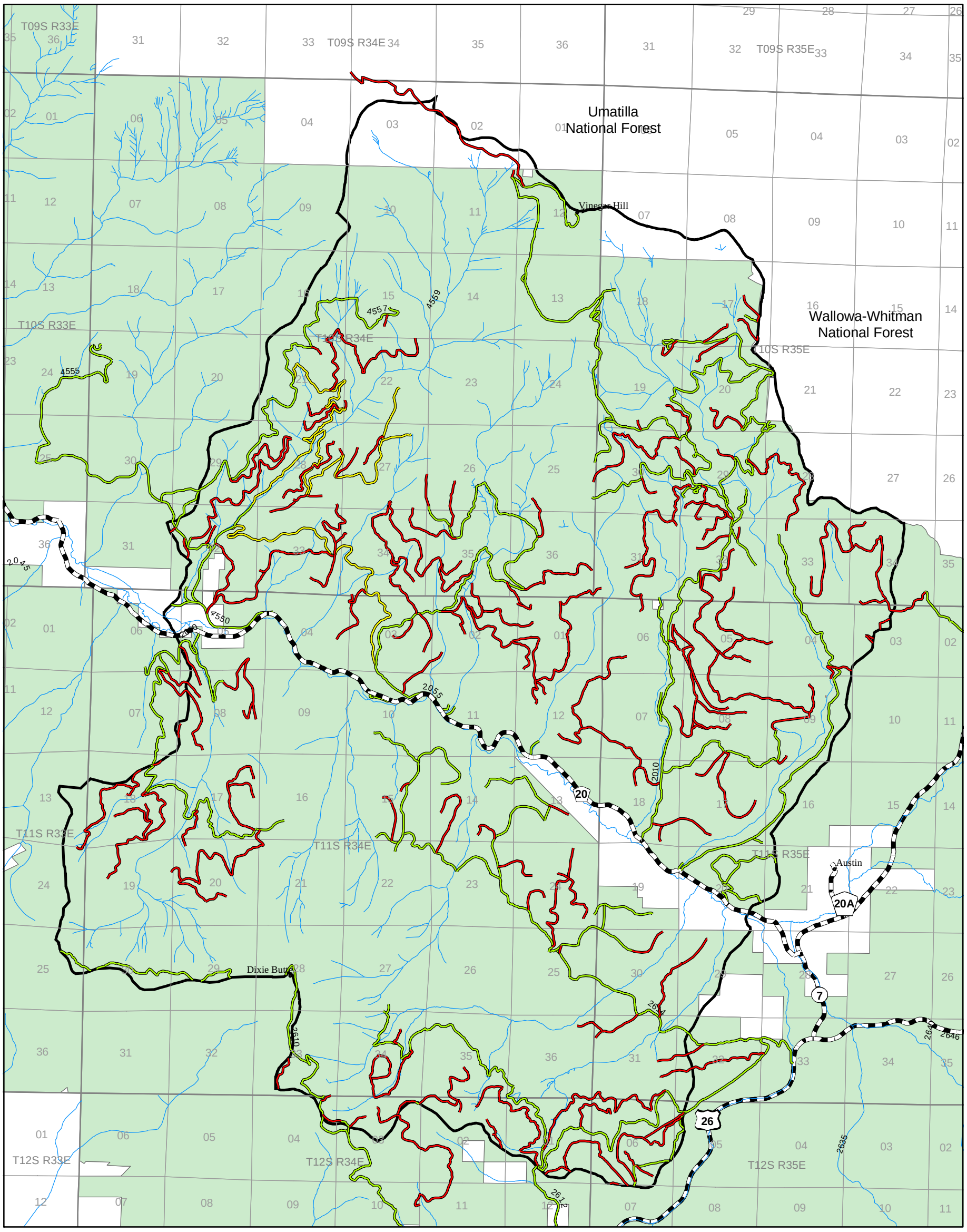
1 inch equals 1.189750 miles

Miles
0 0.375 0.75 1.5 2.25 3

Southeast Galena Roads Analysis
Recommended Future Road Management Objectives



Map 34

Legend

- Major Highways
- County Roads
- Future Closed
- Future Open
- Seasonal Closure
- Category I and II Streams
- SE Galena Analysis Boundry
- Malheur National Forest

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1 inch equals 1.189750 miles

0 0.375 0.75 1.5 2.25 3 Miles

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