



United States
Department of
Agriculture

Forest
Service

Malheur
National
Forest

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File Code: 1950

Date: November 14, 2006

Dear Reviewer:

Enclosed, for your review and comment, is a copy of the Draft Environmental Impact Statement (DEIS), for the Crawford Project.

The DEIS examines a "No Action" alternative and three "Action" alternatives for managing the Crawford Project area. Actions include timber harvest, fuel treatments, and road closure activities. Alternative 2 has been identified as the preferred alternative. This alternative also includes two nonsignificant Forest Plan Amendments for big game cover and dedicated old growth. The amount of satisfactory big game cover would fall below standards to allow commercial thinning to meet the purpose and need of promoting a change in species composition and structure to develop a trend toward more resilient historical vegetation conditions in upland forested stands. The other nonsignificant amendment would allow adjustment of Dedicated Old Growth areas and establishment of Replacement Old Growth areas.

Reviewers should provide the Forest Service with their comments during the review period of the draft environmental impact statement. This will enable the Forest Service to analyze and respond to the comments at one time and to use information acquired in the preparation of the final environmental impact statement, thus avoiding undue delay in the decisionmaking process. Reviewers have an obligation to structure their participation in the National Environmental Policy Act process so that it is meaningful and alerts the agency to the reviewers' position and contentions. Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519, 553 (1978). Environmental objections that could have been raised at the draft stage may be waived if not raised until after completion of the final environmental impact statement. City of Angoon v. Hodel (9th Circuit, 1986) and Wisconsin Heritages, Inc. v. Harris, 490 F. Supp. 1334, 1338 (E.D. Wis. 1980). Comments on the draft environmental impact statement should be specific and should address the adequacy of the statement and the merits of the alternatives discussed (40 CFR 1503.3).

Send comments to Ryan Falk at the address listed below or on-line line at: comments-pacificnorthwest-malheur-prairiecify@fs.fed.us. The 45 day comment period ends on January 8, 2007. Comments must meet content requirements of 36 CFR 215.6.



Send Written Comments to:

Ryan Falk, Environmental Coordinator
Prairie City Ranger District
P.O. Box 337
Prairie City, OR 97869
541-820-3800

Copies of the DEIS are available for review at the Malheur National Forest Offices in John Day, Oregon. The DEIS is also available on the Internet at www.fs.fed.us/r6/malheur.

I want to encourage you to review and comment on this DEIS. Your interest in the management of the Malheur National Forest is appreciated. If you have questions regarding this project, please contact Brooks Smith, Blue Mountain Acting District Ranger at 541-575-3000, or Ryan Falk, Crawford IDT Team Leader, at 541-820-3800.

Sincerely,

GARY L. "STAN" BENES
Forest Supervisor

Enclosure

Crawford Project

Timber Harvest, Fuel Treatments, Road Closure Activities

Draft Environment Impact Statement

Malheur National Forest
Blue Mountain Ranger District
Grant County, Oregon



DRAFT – November, 2006

Crawford Project EIS – Key Acronyms

BMP	Best Management Practices
CEQ	Council on Environmental Quality
DecAID	Decayed Wood Advisor
DBH	Diameter at Breast Height
DEIS	Draft Environmental Impact Statement
DOG	Dedicated Old Growth
EIS	Environmental Impact Statement
GIS	Geographic Information System
HEI	Habitat Effectiveness Index
HRV	Historical Range of Variability
IDT	Interdisciplinary Team
LOS	Late and Old Structure (Same as Old Forest)
LWD	Large Woody Debris
MA	Malheur Forest Plan Management Area
MIS	Management Indicator Species
MBF	Thousand Board Feet
NEPA	National Environmental Policy Act of 1969
NFMA	National Forest Management Act of 1976
NFS	National Forest System
OF	Old Forest (Same as Late and Old Structure)
OFMS	Old Forest Multi-Stratum (Forest Structural Stage)
OFSS	Old Forest Single-Stratum(Forest Structural Stage)
PACFISH	Interim Strategies for Managing Anadromous Fish Producing Watersheds
PETS	Proposed, Endangered, Threatened, or Sensitive species
PFA	Goshawk Post-fledgling Area
RHCA	Riparian Habitat Conservation Area
ROG	Replacement Old Growth
SI	Stand Initiation
SECC	Stem Exclusion Closed Canopy
SEOC	Stem Exclusion Open Canopy
UR	Understory Reinitiation
YFMS	Young Forest Multi-Stratum
WA	Watershed Assessment

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**Crawford Project
And
Proposed Nonsignificant Forest Plan Amendments
Draft Environmental Impact Statement
Grant County, Oregon**

Lead Agency: USDA Forest Service

Responsible Official: Gary L. “Stan” Benes, Forest Supervisor
Malheur National Forest
P. O. Box 909
John Day, OR 97845

For Information Contact: Ryan Falk, Planner
Prairie City Ranger District
P.O. Box 337
Prairie City, OR 97869
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Abstract: This Draft Environmental Impact Statement (DEIS) contains the Forest Service proposal for commercial timber harvest, prescribed burning, adjustments to dedicated old growth areas, and road closure and decommissioning activities within the Crawford Project area. The DEIS describes the effects of implementing four alternatives including a “No Action” alternative. The project area lies east of the John Day valley, in northeastern Oregon.

The purpose and need for these activities is to: 1) Promote a change in species composition and structure to develop a trend toward more resilient historical vegetation conditions in upland forested stands; 2) Decommission and close roads to reduce the risk of sedimentation reaching streams while meeting public and administrative access needs; 3) Adjust old growth boundaries to meet Malheur Forest Plan standards; 4) Capture the economic value of trees to provide wood products and jobs; 5) Develop future late and old structural single stratum wildlife habitats (LOS); 6) Reduce fire fuels by reducing density of standing vegetation, surface fuels, and ladder fuels; and 7) Implement the Highway 26 and Highway 7 Viewshed Corridor Plans

The proposed action (Alternative 2) includes 2,073 acres of commercial thinning and 119 acres of shelterwood harvest, 935 acres of associated precommercial thinning, activity fuels reduction and harvest road use activities. Approximately 8.6 miles of temporary roads would be developed to access the harvest areas. Temporary roads would be decommissioned after use. Approximately 6,800 thousand board feet (MBF) would be harvested. There would also be 5,300 acres of prescribed burning and 0.9 miles of roads closed and 17.8 miles decommissioned within the Mill Creek subwatershed.

Two Malheur Forest Plan nonsignificant amendments would be required for big game cover and dedicated old growth (DOG). The amount of satisfactory big game cover would fall below standards to allow commercial thinning to meet the purpose and need of promoting a change in species composition and structure to develop a trend toward more resilient historical vegetation conditions in upland forested stands. The other nonsignificant amendment would allow adjustment of DOG areas and establishment of replacement old growth areas (ROG). Within the project area there are three DOG habitats identified. These habitats do not currently meet Forest Plan standards for size. No ROGs have been identified nor have Pileated Woodpecker Feeding (PWFAs) areas been designated for two of the DOG areas.

Crawford Project EIS – Key Acronyms

Key issues include: 1) adverse impacts of timber harvest and road construction; and 2) reduction of big game cover. Beyond these key issues other issues were also analyzed. All issues are based upon public and agency comments received during the scoping process or are related to satisfying Federal, State, and local requirements or Malheur Forest Plan standards.

Four alternatives, including the no action and the proposed action, were fully analyzed to gain an understanding of potential impacts of different strategies for meeting project goals and objectives.

Review and Comment: Reviewers should provide the Forest Service with their comments during the review period of the DEIS. This will enable the Forest Service to analyze and respond to the comments at one time and to use information acquired in the preparation of the final environmental impact statement (FEIS), thus avoiding delay in the decision making process. Reviewers should structure their participation in the National Environmental Policy Act so that it is meaningful and alerts the agency to the reviewer's position and contentions. Environmental objections that could have been raised at the draft stage may be waived if not raised until after completion of the FEIS. Comments on the DEIS should be specific and should address the adequacy of the statement and the merits of the alternatives discussed (40 CFR 1503.3).

Send Comments to:

**Ryan Falk, Planner
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comments-pacificnorthwest-malheur-prairiecity@fs.fed.us

Executive Summary

Introduction

The Malheur National Forest, Blue Mountain Ranger District is proposing the Crawford Project that would treat forested stands, using timber harvest methods to decrease tree density, increase representation of fire-adapted tree species, as well as decrease existing and activity fuel levels. This proposed action would also implement a Road Access Travel Management Plan that would close and decommission roads to increase water quality.

The Crawford Project area refers to the portion of the Mill Creek subwatershed within the Malheur National Forest, Blue Mountain Ranger District that is north of U. S. Highway 26. This area is approximately 14,950 acres which is 83% of the subwatershed. Highway 26 is the administrative boundary between the Blue Mountain and Prairie City Ranger Districts. The three major drainages in the project area are Middle Fork John Day River, Crawford Creek, and Mill Creek.

Purpose of and Need for Action

The Crawford Project area is characterized by dense forested stands dominated by ponderosa pine in the dryer warmer, lower elevation areas, or stands of mixed conifer species in the wetter, cooler higher elevations that include ponderosa pine/grand fir/western larch/lodgepole. These dense stands are dominated by younger small diameter trees. This is a result of intensive railroad logging of the large ponderosa pine that began in the early 1900's. Since this initial timber harvest, there have been several timber sales to thin selected areas or to regenerate isolated timber stands. Extensive precommercial thinning also occurred in the re-grown ponderosa pine stands. The area has a fairly high road density due to these past logging activities, however many of the roads were closed to motor vehicles with barriers in the early 1990's. Other major physical features of the project area include two utility line corridors and two major highways.

This action is needed in order to comply with the goals and objectives outlined in the 1990 Malheur National Forest Land and Resource Management Plan (Forest Plan) as amended, which guides natural resource management activities and establishes management standards for lands administered by the Malheur National Forest. This EIS tiers to and relies upon the analysis found in the Forest Plan. This EIS is also tiered to a broader scale analysis (the Pacific Northwest Region Final Environmental Impact Statement for the Invasive Plant Program, 2005, hereby referred to as the R6 2005 FEIS. The R6 2005 FEIS culminated in a Record of Decision (R6 2005 ROD) that amended the Malheur National Forest Plan by adding management direction relative to invasive plants.

The needs for the proposed action are derived from the differences between current conditions and desired conditions. Desired conditions are based on Forest Plan direction and management objectives. The proposed action is designed to move resource conditions closer to the desired conditions and address the management direction provided by the Forest Plan.

Specific “NEED” statements have been developed. Each statement briefly compares the existing condition and desired conditions to show why the project is being proposed. Within each “Need” statement a link between the desired condition and management direction in the Malheur Forest Plan is provided.

Forest Composition and Density Reduction Need

The desired condition is to move forest vegetation conditions towards the Historic Range of Variability (HRV). A large portion of project area is composed of warm and hot-dry upland forest biophysical environments. These forest types have been affected by factors such as past harvest, insects, and exclusion of fire. The composition of these stands has changed from a forest dominated by ponderosa pine to denser mixed species stands composed of higher components of fir species. Changes in composition and structure have increased the risk of greater fire severity and insect damage. As identified in the Forest Plan, these risks can be minimized by maintaining stand vigor through the use of integrated pest management such as stocking level control (Forest Plan, Standard #98, pg IV-37).

Vegetation structure in the area has changed due to past management activities including timber harvest and years of successful fire suppression. Structural stages within the hot-dry and warm-dry biophysical environments comprise 72% of the biophysical environments in the analysis area and are outside of the HRV. In the past, ecosystem interactions included a natural disturbance regime that included frequent low intensity fire that supported a more resilient forest condition. These historic stands were more resilient to damage fire, insects, and disease and supported resistant trees species such as ponderosa pine growing in a more open condition.

When compared to historical conditions there is an excess of denser and younger stands of stem exclusion open canopy and young forest multi-stratum structural stages, and a lack of older more open grown stands of old forest single stratum, and old forest multi-stratum structural stages.

Fire intolerant fir species occur more commonly than they did historically. Tree density has increased. A greater number of multi-strata stands are present in more contiguous blocks within the hot-dry and warm-dry upland forest biophysical environments than were present historically. There are few large trees for wildlife habitat, particularly in ponderosa pine forested types. Vegetation is more vulnerable to insects and disease as a result of high tree densities.

The desired condition includes large trees that are well represented across the landscape in hot-dry, warm-dry and cool-moist upland forest biophysical environments. Fire tolerant ponderosa pine, western larch, and, to a lesser extent, Douglas-fir is the dominant conifer species in areas with flatter terrain and hot-dry growing conditions that represent approximately two-thirds of the analysis area. This portion of the project area is open and park-like, maintained by low intensity, frequent fire occurrence.

Multi-strata structural stage in hot-dry forests is present in a smaller proportion occurring only in areas that are left unburned through several fire cycles. Multi-strata structural stage in warm-dry forests would occur in moist areas such as north aspects.

A nonsignificant Forest Plan amendment is proposed to commercially thin 70 acres of satisfactory cover. Thinning activities would reduce satisfactory cover below Forest Plan

Standards to meet the purpose and need of promoting a change in species composition and structure to develop a trend toward more resilient historical vegetation conditions in upland forested stands. Most of the treatments would occur in Dry Forest types. These stands are considered outside the HRV), i.e., overstocked and likely unsustainable given the increasing risk of uncharacteristically severe fire and insect epidemics. These areas would likely fall out of cover within the next 25 years if not treated. Hiding/security cover patches would be maintained in all proposed units to minimize effects.

Road Reduction Need

There is the need to move the project area toward an efficient, properly located road system that provides adequate public and administrative access, while reducing the risk of sediment reaching streams. To meet this objective of reducing sediment, unneeded roads that cross streams or are adjacent to streams need to be decommissioned or closed.

The open road density within the entire sub-watershed (1.8 miles of road per square mile) is between the Forest Plan 1999 desired condition (3.2 miles per square mile) and 2039 desired condition (1.5 miles per square mile) for big game in summer range. However, within the framework of the existing road system, the road density and route location adjacent to streams may pose a risk to threatened fish species. Existing roads within the riparian areas are potential sediment producers.

The desired condition for the project area roads would be to provide safe and adequate roaded access for forest users while protecting aquatic resources. Roads impacting streams or not needed for future management activities would be closed or decommissioned. Roads which are not decommissioned would be improved to a more self-maintaining status so that less maintenance is needed and impacts from road sediment are decreased.

Old Growth Boundary Adjustment Need

The Forest Plan directs that Dedicated Old Growth (DOG) and Replacement Old Growth (ROG) areas are to be distributed across the landscape to provide for old-growth associated species on a Forest-wide basis. A portion of this old growth is designated as DOG or ROG and contributes to the Forest's old growth network (Forest Plan, Standards #4, 5, 6, 7, and 8, pgs IV-105 & 106). Old growth areas are to be inventoried and validated, with designations not meeting management requirement to be corrected utilizing an interdisciplinary process to develop recommendations for boundary adjustments and unit relocation.

The old growth network on the Malheur National Forest was first established in the early 1980's. Since then, new field validation and inventory methods have provided better information on habitat conditions and stand delineations.

Within the project area there are three DOG habitats identified. These habitats do not currently meet Forest Plan standards for size. No ROGs have been identified nor have Pileated Woodpecker Feeding (PWFAs) areas been designated for DOGs 335 and 134. DOG 335 does not meet Forest Plan standards for minimum size. In addition, with recent updates to the Forest Geographic Information System (GIS) layers, inaccurate depictions within the Forest Service database about habitat on the ground need to be corrected to match stand boundaries. These boundary adjustments better meet habitat requirements for old growth dependent species.

DOG unit boundary adjustments and ROG designations will require a nonsignificant Forest Plan amendment.

Timber Production Need

Timber harvesting plays an important role in the local area by providing employment and revenues. There is a need to make wood products available for local, regional, and national needs to provide jobs in the most cost-effective manner, while being sensitive to resource conditions such as the level of soil disturbance.

The Forest Plan includes direction to provide a sustainable flow of timber and associated wood products at a level that will contribute to economic stability and provide an economic return to the public. Wood material in the form of sawlogs and fiber will be utilized in a cost-effective manner, consistent with the various resource objectives and environment (Forest Plan goals 24 - 26, IV-2).

Wildlife Habitat Development Need

The amount, patch size, and distribution of old forest (OF) habitat in the Mill Creek subwatershed (project area) has declined from historic levels especially in the warm-dry and hot-dry upland forest biophysical environments. Past harvest of large ponderosa pine and fire exclusion has resulted in a loss of the old forest single-stratum (OFSS) forest structure. Species such as white-headed woodpecker depend on large open grown ponderosa pine stands associated with OFSS structure. There is a need to develop historic levels OFSS forest habitat for these species (Upper Middle Fork Watershed Assessment, pg 5-28).

Existing dense, low vigor stands are slowly developing large ponderosa pine stand structures. Stand densities are so high that competition for water, light, and nutrients is slowing and inhibiting growth to the larger tree size. Currently, approximately 3% of stands in the warm-dry biophysical environment are classified as OFSS. Historically 15 to 55% of this structure was estimated to exist. The hot-dry biophysical environment is totally lacking OFSS structure. Approximately 20-70% was estimated to exist historically.

The desired condition is to provide sustainable habitat for those wildlife species that prefer OFSS forest structures at historic levels. There is the need to maintain and develop open, park-like stand conditions where this condition occurred historically and manipulate vegetation in a manner to encourage the development and maintenance of large diameter trees with open canopy structure.

Fuels Hazard Reduction Need

The historic high frequency/low severity fire regime has changed in the warm and hot-dry upland forest biophysical environments. This fire regime controlled regeneration of fire intolerant species, maintained more open stand structures, maintained lower surface fuel loadings, and maintained low level impacts from insects and disease. Fire suppression and other forest management practices have altered these forest types resulting in a higher composition of fire intolerant species, more vertical and horizontal tree crown and canopy continuity, and higher levels of surface fuels. Reducing horizontal and vertical forested stand continuity and surface fuel loadings will reduce potential wildfire intensity and severity. There is a need for prescribed burning to reduce excess levels of fuels and promote fire tolerant species.

Both the tree density and the proportion of fire intolerant fir species have increased from historical conditions. Due to a lack of periodic fire and insect and disease mortality, surface fuels have increased and are more continuous at these increased loadings across the landscape than historical conditions. High surface fuel loadings increases the potential flame length of a fire thereby increasing the chance of a surface fire moving into the crowns.

The past harvest of large ponderosa pine trees and the absence of periodic fire have resulted in dense, younger, often multi-layered stands composed of more fir trees and less pines and larches than historically occurred. Smaller understory trees and the lower branches of larger fir trees provide "ladder fuels" enable wildfire to move into the tree crowns and increasing the probability for an active crown fire.

The denser stands of trees provide a continuous path for crown fire to spread across long distances. Fire behavior and severity are dependent on the properties of the surface, ladder and canopy fuel quantities and continuity both horizontally and vertically.

The desired condition would be multi-strata and single-strata structural stages with ladder fuels in dry upland forest types to occur in smaller proportion where several fire cycles have been missed. Fire tolerant ponderosa pine, western larch, and to a lesser extent, Douglas-fir are the dominant conifer species in the dry upland forest with large trees well represented. Surface fuel loadings are reduced and not continuous and this part of the project area is maintained by low intensity, frequent fire. These conditions reduce the probability of crown fire that is not characteristic of the project area, improve conditions for successful fire suppression when needed, and improve the ability of forest stands to survive wildfire.

Viewshed Corridor Plan Implementation Need

The Crawford Project area is part of the Highway 26 and Highway 7 visual corridors that crosses the Malheur National Forest. In management of these areas, the Forest Plan recommends a Corridor Viewshed Plan be completed outlining the existing and desired scenic conditions, as well as possible management opportunities. Viewshed corridor plans have been completed for both the Highway 26 (2000) and Highway 7 (1995) visual corridors. There is a need to implement the recommendations in these plans and move towards the desired condition identified in the Forest Plan. Specific recommendations in the Highway 7 plan include the use of thinning to improve stand health and tree vigor, and the reduction of tree stocking to promote the growth of large diameter trees. The Highway 26 viewshed plan recommends the use of thinning and prescribed fire to create more diverse distribution of trees in all diameters, and opening stands to accelerate growth of small and medium diameter pine trees.

Proposed Action

The Proposed Action is an alternative developed early in the NEPA planning process to accomplish stated purposes, needs, and goals based on the best information available at the time. It is the first alternative offered and is used to identify issues and develop other alternatives for further study.

Activity Descriptions and Objectives

Commercial Thinning and Precommercial Thinning Treatments

The proposal would decrease tree density by commercial thinning approximately 2,073 acres of predominantly fire intolerant species such as grand fir. Reducing selected tree densities would reduce the chance of extensive wildfire, change the species mix, and encourage growth of larger tree structure, moving the area toward a more resilient forest condition. Trees less than commercial size (generally 9 inches in diameter or less) would be cut as a post-harvest treatment to remove the suppressed understory and reduce the stocking level. This precommercial thinning would include approximately 935 acres. Thinning treatments would include some existing wildlife connectivity corridors linking late and old structural habitat (LOS). More trees would be retained in connectivity corridors to maintain a denser stand structure for wildlife movement between LOS habitats.

Shelterwood and Reforestation Treatments

The proposal includes shelterwood harvest on 119 acres. This prescription would remove undesirable trees from the middle and understory, thin desirable trees where they are over stocked, and reforest the resulting understocked areas. Undesirable trees are those that dependent on species or tree condition (insect, disease, damage) are not desirable for future management. Where suitable trees are available, a minimum of 20 trees per acre would be left to provide structural variety and future snag recruitment. Following the shelterwood harvest, there would be small Douglas-fir and grand fir trees remaining that are undesirable for future management. These small trees would be removed and non-stocked areas greater than ½ acre in size would be reforested with early seral species such as ponderosa pine and western larch tree seedlings. Planted areas would be monitored for growth and survival. Prior to planting, fuels created by the harvest and the cutting non commercial sized trees would be treated by grapple piling to reduce the fire hazard.

Fire and Fuel Treatments

All fire and fuel treatments address the need to reduce fuels and potential fire severity. There are several methods used to treat fuels. Those proposed with this project include commercial harvest, precommercial thinning, yarding tops attached, grapple piling, hand piling, burning piles, and prescribed fire. Yarding tops attached occurs during the harvest operations and brings material to the landing where it is piled and burned later if not utilized by some means. Grapple piling is done by a track excavator on slopes less than 35%. Piles are then burned when the potential for fire spread is minimal. Hand piling is primarily used on slopes greater than 35% with moderate to high fuel loads. Piles are also burned when the potential for fire spread is minimal.

Prescribed burning (underburning) would occur within an approximate 5,300 acre area of the 14,950 acre project area over the next 5 years. Within the 5,300 acres, not all acres would be burned and there are different objectives for areas with resource concerns. Burning would be accomplished in the fall and spring times of year when weather and moisture conditions are appropriate and after much of the mechanical work is completed. These burn operations would be coordinated with the Grazing Permittee and the Rangeland Management Specialist administering the affected allotments. Where possible the burning would be fit to the grazing systems being used on the affected allotments to minimize impacts to the permittee's ranch operations.

Adjustments of Dedicated Old Growth and Additions to Replacement Old-Growth

A nonsignificant Forest Plan amendment would be required to adjust the Dedicated Old Growth (DOG) areas within the Crawford Project area to allow for re-delineation and incorporation of suitable late and old structure (LOS) habitats within these DOGs.

The designation of Replacement Old Growth areas (ROGs) would incorporate suitable LOS or older structure stands to provide suitable replacement areas for the associated DOGs. Pileated woodpecker feeding areas would also be delineated as appropriate to provide suitable foraging habitat for Pileated woodpeckers.

Road Activities

The overall objective is to reduce road related impacts to water quality and fish habitat. To meet this objective, approximately 17.8 miles of roads currently closed to motorized vehicles would be decommissioned. The decommissioned roads would be bermed at the beginning of the road, the road surface subsoiled where feasible, seeded and mulched, drainage provided for the road surface, and culverts will be removed and disposed of. Many of these roads are within sensitive areas such as riparian habitat conservation areas.

The desired condition 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. The desired condition is largely based on Forest Plan, Malheur Forest Road Analysis, and the Crawford Roads Analysis. The general Forest Plan direction for transportation system management states: "Roads will be planned, designed, constructed and maintained to the minimum level necessary to meet integrated land management objectives".

Further details of the Proposed Action (analyzed in this document as "Alternative 2") are discussed later in the alternatives section along with descriptions of all alternatives considered or analyzed.

Issues

Significant issues, otherwise known as key issues, for the Crawford Project came from the public, other agencies, organizations and businesses, and Forest Service resource specialists. Issues are defined as a point of discussion, debate, or dispute about environmental effects. Key issues are used to formulate alternatives, prescribe mitigation measures, and analyze environmental effects. Issues are "significant" because of the extent of their geographic distribution, the duration of their effects, or the intensity of interest or resource conflict (40 CFR 1508.27).

Key issues are normally considered the basis for alternative development. However, there are a variety of ways to address key issues within any specific alternative. Key issues may be addressed by simply avoiding environmental consequences by elimination of an action that would impact a given resource. For example, if impacts to a specific stream segment are a key issue, project alternatives that avoid all potential impacts to the stream segment address this issue. A summary of the key issues are summarized below.

1) Roads and Commercial Timber Harvest

There is a concern that the proposed ground disturbing activities associated with road construction and commercial timber harvest could degrade water quality and impact soil productivity. These ground disturbing activities may also indirectly impact habitat for aquatic species including listed and sensitive aquatic species. Aquatic species of concern present within the project include summer steelhead, Chinook salmon, and redband trout. There is also historic bull trout habitat. The proposed harvest activities combined with past impacts including, extensive past timber harvest and ongoing grazing may cumulatively affect water quality.

2) Big Game Cover

Commercial thinning is proposed on approximately 70 acres identified as satisfactory big game cover. Currently satisfactory cover is 2.7% of the Mill Creek subwatershed, below the Forest Plan standard of 12%. These forested areas provide some of the highest quality cover habitat available for big game species (elk) in the project area. Thinning these acres would degrade the satisfactory cover by decreasing the tree density which in turn reduces the average canopy closure needed to maintain this standard. This thinning reduces the cover percentage further below Forest Plan standards to approximately 2.3%.

Alternatives Considered but Eliminated from Detailed Study

Designate Larger ROGs

The interdisciplinary team (IDT) considered developing alternatives that included set asides of new, larger Replacement Old Growth (ROGs) areas.

Require Winter Logging

The interdisciplinary team considered restricting ground skidding to frozen soil or snow covered conditions.

Prohibit Temporary Road Construction Adjacent Highway 7

Eliminate the need for construction of temporary roads adjacent to Highway 7 by instead skyline logging this area

Eliminate RHCA Log Haul

Constructing new haul roads outside of RHCAs was considered to avoid use of existing roads within the RHCAs.

Construct New System Roads rather than Temporary Roads

An alternative to include the construction of new system roads versus constructing temporary roads was considered.

Retain Current Motorized Vehicles Access

An alternative to retain all existing drivable roads in an open status was considered to maintain current public motorized vehicle access.

Relocate FS 2620 Road to Reduce Impacts to Fish Habitat (Main Crawford Creek Rd)

An alternative was considered to relocate FS Road 2620 outside of the RHCA to reduce impacts to fish habitat.

Increase Timber Harvest

Thinning additional densely forested areas with commercial harvest was considered.

Alternatives Considered in Detail

Alternative 1 - No Action Alternative

The purpose of this alternative is to allow current processes to continue, along with associated risks and benefits, in the Crawford Project Area. The No Action alternative is required by NEPA. In this document the no action alternative means the proposed project (which includes all activities identified in the proposed action) would not take place at this time. Alternative 1 is designed to represent the existing condition. It serves as a baseline to compare and describe the differences and effects between taking no action and implementing action alternatives.

Alternative 2 – Proposed Action

This alternative was designed to meet the purpose and need for action and was developed from the recommendations in the Upper Middle Fork John Day Watershed Assessment and management direction in the Malheur Forest Plan. The rationale for development is described previously in the proposed action section.

The following are Alternative 2 activities descriptions.

Timber Harvest

- Commercial Thinning – 2,073 acres
- Shelterwood Harvest – 119 acres

There are two different harvest prescriptions that would be implemented with the alternative, commercial thinning and shelterwood harvest. Both harvest prescriptions would be completed using ground based harvest systems. The commercial thinning prescription promotes ecologically appropriate compositional and structural conditions in order to increase resiliency and promote development of structural and wildlife habitat conditions currently lacking across the area and watershed as a whole.

Road Use during Timber Harvest

- Temporary road construction – 8.6 miles. Temporary roads would be constructed in several short segments ranging from a few hundred feet to approximately a mile in length.
- Road reconstruction - 10.9 miles
- Road maintenance – 35.2 miles

Precommercial Thinning

- Precommercial thinning – 935 acres

Following timber harvest, areas with remaining high density would be thinned by further removal of small diameter trees (generally less than 9 inches in diameter) to achieve desired stand conditions. The precommercial thinning prescription is recommended where the small trees to be cut are not merchantable saw log sized material. The objective is to reduce ladder fuels by reducing the amount of live or dead fuels, and increasing tree growth.

Reforestation

- Conifer Planting – 119 acres

Following the shelterwood harvest, areas that are understocked and greater than ½ acre in size would be planted with early seral (ponderosa pine and western larch) conifer tree seedlings.

Activity Fuels Treatments

- Yard tops attached – 507 acres
- Hand pile – 174 acres
- Grapple pile – 877 acres
-

Prescribed Fire

- Prescribed burning – 5,300 acres

Prescribed burning (underburning) would occur within an approximate 5,300 acre area of the 14,950 acre project area over the next 5 years. Within the 5,300 acres, not all acres would be burned and there are different objectives for areas with resource concerns. Burning would be accomplished in the fall and spring times of year when weather and moisture conditions are appropriate and after much of the mechanical work is completed

Road Closures and Decommissioning

- Gated or signed closures – 0.7 miles
- Bermed or signed closures – 0.2 miles
- Decommissioning – 17.8 miles
- Opening of closed roads – 1.7 miles

The new road closures would be gated or bermed and restrict yearlong use to motorized vehicles. Decommissioning would eliminate future use of the road with the objective of restoring hydrological function. Over 90% of these roads are already closed. The decommissioned roads would be bermed at the beginning of the road, the road surface subsoiled where feasible, seeded and mulched, drainage provided for the road surface, and culverts will be removed from the decommission roads. Conifers will be planted on decommissioned road segments located in RHCAs where conditions will support establishment and growth. These roads will be removed from the Forest Road Transportation System.

Old Growth Adjustments

Alternative 2 would require a nonsignificant Forest Plan amendment to adjust three Dedicated Old Growth (DOG) areas and delineate 3 new Replacement Old Growth (ROG) areas within the Crawford Project Area. The DOG adjustment is needed to better delineate suitable wildlife habitat. Currently, no ROGs have been allocated to be managed as replacement areas for associated Dedicated Old Growth areas.

Alternative 3

Alternative 3 responds to the two key issues of 1) The proposed ground disturbing activities associated with road construction and commercial timber harvest could degrade water quality and impact soil productivity and 2) Thinning could degrade the satisfactory cover by decreasing the tree density which in turn reduces the average canopy closure needed to maintain this standard.

Alternative 3 minimizes temporary road construction to less than 0.1 miles (500 feet) for each road. The average skidding was increased in some of the harvest units in response to decreasing the length of the temporary roads. With this reduction in access, approximately 1/3 of the harvest areas in Alternative 2 were dropped due to high logging costs. Without longer temporary access roads, skidding distances made harvest not viable in these areas.

Alternative 3 excludes harvest in those areas identified as satisfactory cover to maintain the existing tree density needed to maintain this Forest Plan cover standard. Portions of six of the commercial thinning areas were dropped from harvest.

The following are Alternative 3 activity descriptions.

Commercial Harvest

The proposed harvest in this alternative has been reduced by approximately 30% from Alternative 2. The treatment units common to Alternative 2 have the same harvest prescriptions as previously described.

- Commercial thinning - 1,506 acres
- Shelterwood harvest – None

The commercial thinning prescriptions and objectives are the same as those described in Alternative 2.

Road Use during Harvest

The amount and type of road reconstruction and road maintenance is very similar to Alternative 2. The number of miles of temporary road construction was reduced by approximately 82% compared to Alternative 2. The location and description of the reconstruction, maintenance, and temporary road construction activities common to Alternative 2 is the same as previously described.

- Temporary road construction – 1.5 miles
- Road reconstruction - 10.9 miles
- Road maintenance – 31.9 miles

Precommercial thinning

- Precommercial thinning – 666 acres

The precommercial thinning treatments areas and activity descriptions are generally the same as described for Alternative 2. Those acres dropped from commercial harvest would be not precommercially thinned.

Activity Fuels Treatments

- Yard tops attached – 276 acres
- Hand piling – 140 acres
- Grapple piling – 631 acres

Again the activity fuels treatment is much the same as described for Alternative 2. Since harvest levels were reduced in Alternative 3, the amount of activity fuels treatments were reduced accordingly.

Prescribed Fire

The prescribed fire treatments are the same as described in Alternative 2.

Road Closures and Decommissioning

The road closures, road reopening, and road decommissioning are the same as Alternative 2.

Old Growth Adjustments

The delineation of 3 new ROGs and adjustment of 3 DOGs are the same as described in Alternative 2.

Alternative 4

Alternative 4 was developed in response to the Key Issue #1: There is a concern that the proposed ground disturbing activities associated with road construction and commercial timber harvest could degrade water quality and impact soil productivity.

Alternative 4 does not include any timber harvest activities. The alternative does include precommercial thinning to reduce stand density of smaller trees, and prescribed burning.

The following are Alternative 4 activity descriptions.

Commercial Harvest/ Road Use

There is no commercial harvest, temporary road construction, road maintenance, or reconstruction activities proposed in this alternative.

Precommercial Thinning

- Precommercial thinning – 795 acres

The precommercial thinning treatments are the same as described in Alternative 2.

Activity Fuels Treatments

- Hand piling – 146 acres
- Grapple piling – 649 acres

Again the activity fuels treatment is much the same as described for Alternative 2 except there is no commercial harvest associated with fuels treatment. The description of each of following fuels treatment can be found in the narrative for Alternative 2.

Prescribed Fire

The prescribed fire treatments are the same as described in Alternative 2.

Road Closures and Decommissioning

The road closures, road reopening, and road decommissioning are the same as Alternative 2.

Old Growth Adjustments

The delineation of 3 new ROGs and adjustment of 3 DOGs are the same as described in Alternative 2.

Forest Plan Amendments

Alternatives 2, 3 and 4 were designed, in part, to adjust 3 Dedicated Old Growth Areas and create 3 new Replacement Old Growth Areas. Selecting *Alternative 2, 3 or 4* would include a *site-specific, nonsignificant amendment* (Management Area designations) to the Malheur Plan. The management allocations would increase MA 13 (Old Growth) by 554 acres and decrease MA 1&2 (General Forest and Rangeland) by 264 acres and decrease MA 14 (Visual Corridors) by 290 acres. Visual corridor standards would still apply in seen areas (Visual Corridors) along Highway 7 and 26.

Another nonsignificant amendment would be needed to select Alternative 2 to allow commercial thinning in 70 acres identified as satisfactory big game cover.

Comparison of Alternatives

TREATMENTS	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
Vegetation Treatments				
Commercial Thinning (acres)	0	2073	1506	0
Shelterwood Harvest (acres)	0	119	0	0
Precommercial Thinning (acres)	0	935	666	795
Planting Conifers (acres)	0	119	0	0
Fire and Fuels Treatments				
Prescribed burning (acres)	0	5,300	5,300	5,300
Activity Fuel Treatments from Timber Harvest				
Grapple Piling (acres)	0	877	631	649
Yard Tops Attached (acres)	0	507	276	0
Hand Piling (acres)	0	174	140	146
Yarding Systems				
Tractor (acres)r	0	2192	1506	0
Volume Harvested (MBF)	0	6,800	4,300	0
Road Activities Associated w/Logging				
Temporary Rd. Construction (miles)	0	8.6	1.5	0
Road Reconstruction (miles)	0	10.9	10.9	0
Road Maintenance (miles)	0	35.2	31.9	0
Road Access Activities (Includes only Mill Cr. Subwatershed; additional activities occur outside the subwatershed – see Appendix A and C)				
Closures (Gate or Sign) (miles)	0	0.7	0.7	0.7
Closures (Berm or Sign) (miles)	0	0.2	0.2	0.2
Decommissioning (miles)	0	17.8	17.8	17.8
Open Closed Road (miles)	0	1.7	1.7	1.7
Additional ROGs designated	0	3 new	3 new	3 new
Adjustment of DOGs	0	3	3	3

Road Density Summary: Existing and Proposed (Mill Cr Subwatershed ONLY)

Status	Existing	Proposed
Open (Miles)	50.7	51.1
Closed to Motorized Vehicles (Miles)	62.8	44.6
New Decommissioning (Taken off road system)		17.8*
Open Road Density (Miles per sq. Mile)	1.8	1.8

* Majority of roads proposed for decommissioning are already closed
(Road density: Mill Cr Sws – 17, 846 ac or 17,835/640 = 27.87 sq mi
Existing: 50.7/27.87 = 1.82 and Proposed: 51.1/27.87 = 1.83)

Comparison of Alternatives by Issue

Key Issue	Unit of Measure	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Temporary Road Construction	Miles	0	8.6	1.5	0
Log Haul and Rd Maintenance within RHCAs	Miles	0	5.6	5.5	0
All Roads (Open and Closed)	Miles	113.5	95.7	95.7	95.7
Roads within RHCAs (Open and Closed)	Miles	16.9	11.0	11.0	11.0
Equivalent Roaded Acres	Year - %	2006 – 7.6%	2006 – 9.3%	2006 – 8.9%	2006 – 7.6%
		2011 – 6.5%	2011 – 8.0%	2011 – 7.6%	2011 – 6.5%
Timber Harvest	Acres	0	2,192	1,506	0
Big Game Cover within Mill Creek SWS	%	Forage – 50.2 %	Forage – 55.7%	Forage – 54.2%	Forage – 51.7 %
		Marginal – 47.1%	Marginal – 42 %	Marginal – 43.1%	Marginal – 45.6 %
		Satisfactory – 2.7%	Satisfactory – 2.3%	Satisfactory – 2.7 %	Satisfactory – 2.7%

Affected Environment

The Crawford Project area lies within the Mill Creek subwatershed, which makes up a portion of the Middle Fork John Day River watershed that is part of the John Day River system. The project area is largely forested. The lower elevations and south facing slopes are generally ponderosa pine. Other tree species include western larch, Douglas-fir, lodgepole pine and grand fir in the upper elevations and northerly slopes. These stands are generally young and even-aged, densely stocked stands due to the nature of past harvests. There is low structural diversity and a lack of larger diameter trees and snags. Approximately 72% of these forested stands are located in either hot-dry or warm-dry upland biophysical environments. Existing detrimental soil impacts due to past ground based harvest average 6%. The Forest Plan standard for detrimental impacts is 20% or less. The watershed is important to rebuilding and sustaining populations of bull trout and steelhead, both listed as threatened under Critical steelhead habitat is present in the project area.

Environmental Consequences

Alternative 1 (No Action)

Since there would be no treatment with Alternative 1 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.

Alternative 1 proposes no new activities, resulting in no activity related long term benefits or impacts to aquatic species and their habitat. However, the lack of road treatments and no culvert removal would allow sediment sources to continue from roads.

There would be no increase in detrimental soil conditions.

The number of acres of satisfactory and marginal big game would remain the same.

Alternative 2

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.

Proposed activities (logging, road use, road maintenance, road reconstruction, road watering, road decommissioning, road re-opening, prescribed fire, precommercial thinning, activity fuels treatment) are unlikely to result in changes in water temperatures, pool frequencies, width/depth ratios, Large Woody Debris, or bank stability.

Detremental soil conditions would increase on an average of 10% following post treatment activities. This increase is due to ground disturbing activities including tractor harvest and construction of temporary roads. The Forest Plan standard of 20% detrimental soil conditions would not be exceeded.

Commercial thinning would decrease satisfactory big game cover by 70 acres. This would likely change big game distribution but not affect populations.

Alternative 3

The effects of this alternative on stand composition and density correspond to about 67% of the effects of Alternative 2.

The effects on water temperatures, pool frequencies, width/depth ratios, Large Woody Debris, or bank stability are similar to Alternative 2.

The increase in detrimental soil conditions would be similar to Alternative 2.

As in Alternative 1, there would be no change in the amount of big game satisfactory or marginal cover.

Alternative 4

The precommercially thinned stands are only expected to marginally respond to the thinning as the stands would still be in an overstocked condition with the stand basal area only slightly reduced. Precommercial thinning would reduce ladder fuels to some extent but would not open up the canopy distance between crowns to meet desired condition class objectives.

Due to lack of ground disturbing activities, detrimental soil impacts would not increase and are similar to those expected under Alternative 1 (No Action).

As in Alternative 1, there would be no change in the amount of big game satisfactory or marginal cover.

Common to Alternatives 2, 3, and 4

The proposed road decommissioning activities will result in a long-term decrease in fine sediment levels in the analysis area. Because road decommissioning activities are the same for all action alternatives it is unlikely that there will be measurable differences among action alternatives.

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DOCUMENT STRUCTURE

The Forest Service has prepared this Environmental Impact Statement in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This Environmental Impact Statement discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into six chapters:

- *Chapter 1. Purpose of and Need for Action:* This chapter includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.
- *Chapter 2. Alternatives, including the Proposed Action:* This chapter provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes management requirements and constraints to be used as part of the action alternatives. Finally, this section provides a summary table of the environmental consequences associated with each alternative.
- *Chapter 3. Affected Environment and Environmental Consequences:* This chapter describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource area.
- *Chapter 4. Consultation and Coordination:* This chapter provides a list of preparers and agencies consulted during the development of the environmental impact statement.
- *References:* This lists literature cited during the development of the environmental impact statement.
- *Glossary:* This is a glossary of terms used in this environmental impact statement.
- *Appendices:* The appendices provide more detailed information to support the analyses presented in the Environmental Impact Statement.
- *Index:* The index provides page numbers by document topic.

CHAPTER 1. PURPOSE OF AND NEED FOR ACTION

Introduction

The Malheur National Forest, Blue Mountain Ranger District is proposing the Crawford Project that would treat forested stands, using timber harvest methods to decrease tree density, increase representation of fire-adapted tree species, as well as decrease existing and activity fuel levels. The connected actions of log hauling associated with timber harvest will require constructing temporary roads, and maintaining and reconstructing existing roads. This proposed action would implement a Road Access Travel Management Plan that would close and decommission roads.

Past timber harvest and lack of fire have left many of the forested stands overstocked with a composition of species that cannot be sustained in the long-term. Many of the roads constructed during past harvest activities are contributing sedimentation into nearby streams. The activities proposed to remedy these problems include commercial thinning and shelterwood timber harvest, precommercial thinning, prescribed burning, and closing or decommissioning roads. These activities would occur over the next 5 years.

The Crawford Project proposes to adjust areas to be managed for Dedicated Old Growth (DOG) as designated in the Malheur Forest Plan (Forest Plan) Management Area (MA) 13. These adjustments would more fully meet the criteria for old growth habitat as prescribed by the Forest Plan. A nonsignificant Forest Plan amendment would be necessary to implement this change.

The Crawford Project area refers to the portion of the Mill Creek subwatershed within the Malheur National Forest, Blue Mountain Ranger District that is north of U. S. Highway 26. This area is approximately 14,950 acres (See Figure 1.1) which is 83% of the subwatershed. Highway 26 is the administrative boundary between the Blue Mountain and Prairie City Ranger Districts. The three major drainages in the project area are Middle Fork John Day River, Crawford Creek, and Mill Creek.

The legal description of the project area is: T.10S., R.35E., Sections 34 – 36; T.10S., R.35 ½ E., Sections 33 – 36; T.11S., R.35E., Sections 1 – 4, 9 – 16, 21 – 28, & 35; and T.11S., R.35 ½ E., Sections 1 – 4, 9 – 11, 14 – 16, 21, & 28.

The alternatives being considered were proposed in the original Crawford Vegetative Management Environmental Assessment (EA). The Decision Notice which selected Alternative 3 was signed on April 26, 2002, was appealed and then remanded back to the Malheur Forest from the Regional Forester for further analysis work. The Regional Forester did not feel the EA adequately analyzed cumulative effects.

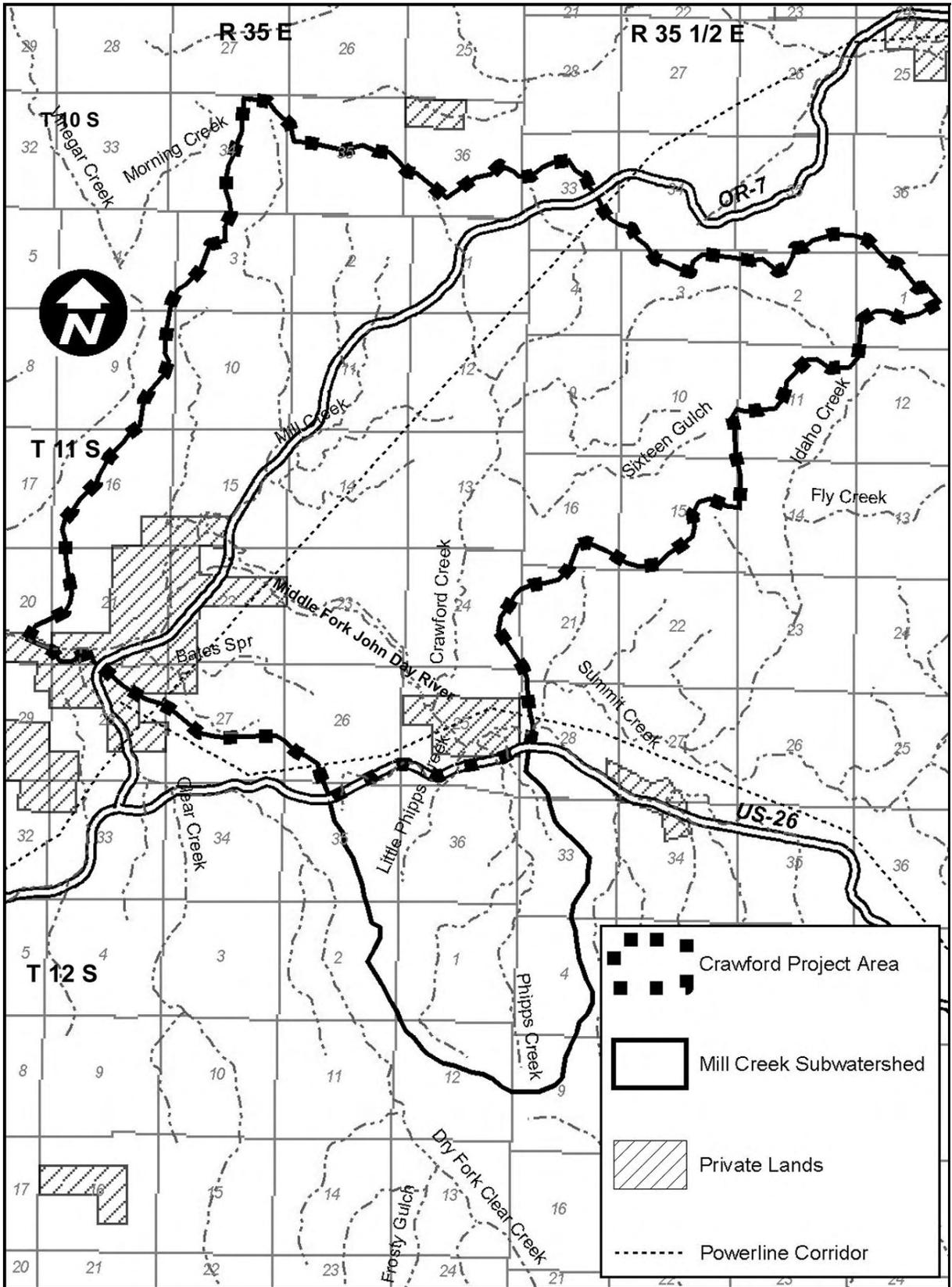
A Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS) was published in the Federal Register on October 9, 2003 for the Crawford Timber Sale. The Crawford Project and the Crawford Timber Sale are the same analysis. The original Crawford Vegetative Management EA and this EIS are intended to address many of the same needs. Some of the activities in the original

EA have been removed from the proposed actions in this EIS, including precommercial thinning that is outside of harvest units, planting hardwoods, conifer removal from hardwood areas and meadows, cutting hardwoods to stimulate reproduction, caging shrubs, fencing to protect hardwoods, and slashing junipers to create barriers to hardwoods. These activities are not connected to the proposed harvest and road activities in this analysis and can be addressed in future environmental analysis.

To address the public issue regarding new road construction, construction of new system roads was removed from proposed actions in the EIS. Various amounts of temporary road construction are proposed in alternatives considered. All temporary roads would be decommissioned after use.

Forest watershed and subwatershed boundaries have been adjusted since the original Crawford analysis was started. The original EA analysis boundary overlaps portions of five subwatersheds: Mill Creek, Idaho Creek/Summit Creek, Dry Fork, Clear Creek, and Bridge Creek. The EIS project area was refined to include only the Mill Creek subwatershed. The newly mapped Mill Creek subwatershed boundary contains the majority of the proposed activities from the original EA.

Figure 1.1 Map of Project Area



Purpose of and Need for Action

The Crawford Project area is characterized by dense forested stands dominated by ponderosa pine in the dryer warmer, lower elevation areas, or stands of mixed conifer species in the wetter, cooler higher elevations that include ponderosa pine/grand fir/western larch/lodgepole. These dense stands are dominated by younger small diameter trees. This is a result of intensive railroad logging of the large ponderosa pine that began in the early 1900's. Since this initial timber harvest, there have been several timber sales to thin selected areas or to regenerate isolated timber stands. Extensive precommercial thinning also occurred in the re-grown ponderosa pine stands. The area has a fairly high road density due to these past logging activities, however many of the roads were closed to motor vehicles with barriers in the early 1990's.

Other major physical features of the project area include two utility line corridors and two major highways.

This action is needed in order to comply with the goals and objectives outlined in the 1990 Malheur National Forest Land and Resource Management Plan (Forest Plan) as amended, which guides natural resource management activities and establishes management standards for lands administered by the Malheur National Forest. This EA tiers to and relies upon the analysis found in the 1990 Final Environmental Impact Statement for the Malheur National Forest Land and Resource Management Plan. This EIS is also tiered to a broader scale analysis (the Pacific Northwest Region Final Environmental Impact Statement for the Invasive Plant Program, 2005, hereby referred to as the R6 2005 FEIS. The R6 2005 FEIS culminated in a Record of Decision (R6 2005 ROD) that amended the Malheur National Forest Plan by adding management direction relative to invasive plants.

The project area is primarily allocated to Management Area (MA) 1 - General Forest and MA14 - Visual Corridors in the Forest Plan (see later section in Chapter 1 for additional information). The Regional Forester's Eastside Forest Plan Amendment #2 modified the objectives for these Management Areas especially MA 1. While MA 1 is still to be managed for the commercial production of sawtimber and forage for domestic livestock (within Forest-Wide Standards and Guidelines for all resources), the Regional Forester's amendment shifted the focus toward promoting and maintaining Late/Old Structural (LOS) or old forest (OF) characteristics that include large diameter, open-canopy structure. MA 1 areas are to be managed with an objective of creating a healthy forest condition through control of stocking levels, species mix, and protection from insects, disease, and other damage while moving forest stands toward structural conditions that are within the Historic Range of Variability (HRV). HRV refers to structural forest conditions that are based on pre-settlement conditions. Moving forest stands toward the HRV is desirable because such conditions provide the most sustainability over the long term. Sustainability refers to the ability of forested systems to withstand or resist rapid and widespread structural change due to fire, insects, and disease.

The Blue Mountain Ranger District, Malheur National Forest, has developed project proposals, analyzed in this EIS, to support the purposes of this project and meet Forest Plan goals and objectives. This project proposal also follows recommendations made in the Upper Middle Fork John Day River Watershed Assessment (1998) and the Malheur Forest Roads Analysis (2004). It is expected that the projects analyzed in this EIS would be implemented between 2006 and 2011. The **purposes** of this project are to:

- Promote a change in tree species composition, stand densities, and structure to develop a trend toward more resilient historical vegetation conditions in upland forested stands. To accomplish this objective a nonsignificant Forest Plan Amendment to reduce big game cover is proposed. The rationale for the amendment is further discussed in the description of the Proposed Action.
- Implement a road system that meets public and management access needs, while reducing the risk of sediment reaching streams, and road related impacts to aquatic species and wildlife habitat.
- Adjust Dedicated Old Growth (DOG) areas, identify Replacement Old Growth (ROG) areas, and identify pileated woodpecker feeding (PWFA) areas as required by the Forest Plan. A nonsignificant Forest Plan Amendment will be required to adjust Forest Plan management area allocations.
- Capture the economic value of trees to provide wood products and jobs.
- Develop future late and old structural single stratum wildlife habitats (LOS).
- Reduce the fire fuels by primarily reducing density of standing vegetation, surface fuels, and fuel ladders.
- Implement the Highway 26 and Highway 7 Viewshed Corridor Plans

The needs for the proposed action are derived from the differences between current conditions and desired conditions. Desired conditions are based on Forest Plan direction and management objectives. The proposed action is designed to move resource conditions closer to the desired conditions and address the management direction provided by the Forest Plan.

Specific “NEED” statements have been developed for each of the seven purposes stated above. Each statement briefly compares the existing condition and desired conditions to show why the project is being proposed. Within each “Need” statement a link between the desired condition and management direction in the Malheur Forest Plan is provided.

Forest Composition and Density Reduction Need

The desired condition is to move forest vegetation conditions towards the Historic Range of Variability (HRV). A large portion of project area is composed of warm and hot-dry upland forest biophysical environments. These forest types have been affected by factors such as past harvest, insects, and exclusion of fire. The composition of these stands has changed from a forest dominated by ponderosa pine to denser mixed species stands composed of higher components of fir species. Changes in composition and structure have increased the risk of greater fire severity and insect damage. As identified in the Forest Plan, these risks can be minimized by maintaining stand vigor through the use of integrated pest management such as stocking level control (Forest Plan, Standard #98, pg IV-37).

Vegetation structure in the area has changed due to past management activities including timber harvest and years of successful fire suppression. Structural stages within the hot-dry and warm-dry biophysical environments comprise 72% of the biophysical environments in the analysis area (Table 1.1), and are outside of the HRV ¹(Table 1.2). In the past, ecosystem interactions

¹"Historic Range of Variability" (HRV) refers to the range of vegetative structural conditions that were likely to have occurred prior to European settlement times. Data for HRV was taken from the *Upper Middle Fork of the John*

included a natural disturbance regime that included frequent low intensity fire that supported a more resilient forest condition. These historic stands were more resilient to damage fire, insects, and disease and supported resistant trees species such as ponderosa pine growing in a more open condition.

Table 1.1: Existing Upland Forest (UF) Structural Stages

Biophysical Environment		Structural Stages (percent)						
		Stand Initiation (SI)	Stem Exclusion Open Canopy (SEOC)	Stem Exclusion Closed Canopy (SECC)	Understory Reinitiation (UR)	Young Forest Multi-Stratum (YFMS)	Old Forest Single Stratum (OFSS)	Old Forest Multi-Stratum (OFMS)
Hot-dry UF	Current Condition	(0%)	40%	0%	3%	40%	(0%)	17%
	Historical Range of Variation	5-15%	5-20%	0-5%	0-5%	5-10%	20-70%	5-15%
Warm-dry UF	Current Condition	(1%)	20%	36%	17%	19%	(3%)	(4%)
	Historical Range of Variation	5-15%	5-20%	1-10%	1-10%	5-25%	5-55%	5-20%
Cool Moist UF	Current Condition	(0%)	15%	(3%)	32%	(11%)	0%	39%
	Historical Range of Variation	1-10%	0-5%	5-25%	5-25%	40-60%	0-5%	10-30%
Cool Dry UF	Current Condition	(0%)	0%	(0%)	53%	(0%)	(0%)	47%
	Historical Range of Variation	5-30%	0-5%	5-35%	5-20%	5-20%	1-10%	1-20%
Cold-dry UF	Current Condition	1%	9%	14%	36%	(1%)	5%	34%
	Historical Range of Variation	1-20%	0-5%	5-20%	5-25%	10-40%	0-5%	10-40%

Note: Shaded boxes are outside the historic range of variability (HRV). Percents in brackets are below HRV.

When compared to historical conditions there is an excess of denser and younger stands of stem exclusion open canopy and young forest multi-stratum structural stages, and a lack of older more open grown stands of old forest single stratum, and old forest multi-stratum structural stages.

Fire intolerant fir species occur more commonly than they did historically. Tree density has increased. A greater number of multi-strata stands are present in more contiguous blocks within the hot-dry and warm-dry upland forest biophysical environments than were present historically. There are few large trees for wildlife habitat, particularly in ponderosa pine forested types. Vegetation is more vulnerable to insects and disease as a result of high tree densities.

The desired condition includes large trees that are well represented across the landscape in hot-dry, warm-dry and cool-moist upland forest biophysical environments. Fire tolerant ponderosa pine, western larch, and, to a lesser extent, Douglas-fir is the dominant conifer species in areas with flatter terrain and hot-dry growing conditions that represent approximately two-thirds of the analysis area. This portion of the project area is open and park-like, maintained by low intensity, frequent fire occurrence.

Day River Watershed Assessment (1998). Direction for doing an HRV evaluation by biophysical environment is included in "Interim Management Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales" (Appendix B of the Regional Forester's Forest Plan Amendment #2).

Multi-strata structural stage in hot-dry forests is present in a smaller proportion occurring only in areas that are left unburned through several fire cycles. Multi-strata structural stage in warm-dry forests would occur in moist areas such as north aspects.

A nonsignificant Forest Plan amendment is proposed to commercially thin 70 acres of satisfactory cover. Thinning activities would reduce satisfactory cover below Forest Plan Standards to meet the purpose and need of promoting a change in species composition and structure to develop a trend toward more resilient historical vegetation conditions in upland forested stands. Most of the treatments would occur in Dry Forest types. These stands are considered outside the HRV), i.e., overstocked and likely unsustainable given the increasing risk of uncharacteristically severe fire and insect epidemics. These areas would likely fall out of cover within the next 25 years if not treated. Hiding/security cover patches would be maintained in all proposed units to minimize effects. These treatments will reduce satisfactory cover to 2.3 % in the Mill Creek Subwatershed, which is below the Forest Plan standard of 12 %. In a 2003 letter to the Eastside Forests, the Regional Office provided direction encouraging Forests to use site specific Forest Plan amendments to move the landscape towards HRV (USDA FS June 11, 2003). For further discussion see Forest Vegetation and Terrestrial Wildlife sections in Chapter 3.

Road Reduction Need

There is the need to move the project area toward an efficient, properly located road system that provides adequate public and administrative access, while reducing the risk of sediment reaching streams. To meet this objective of reducing sediment, unneeded roads that cross streams or are adjacent to streams need to be decommissioned or closed.

The open road density within the entire sub-watershed (1.8 miles of road per square mile) is between the Forest Plan 1999 desired condition (3.2 miles per square mile) and 2039 desired condition (1.5 miles per square mile) for big game in summer range. However, within the framework of the existing road system, the road density and route location adjacent to streams may pose a risk to threatened fish species. Existing roads within the riparian areas are potential sediment producers.

The Forest Plan states that there is a need to minimize the density of open roads in riparian areas (Forest Plan, Standard #41, pg. IV-67). Interim Strategies for Managing Anadromous Fish Producing Watersheds (PACFISH) standards state that roads not needed for future management activities should be closed or decommissioned (PACFISH, Standard RF-3c).

The desired condition for the project area roads would be to provide safe and adequate roaded access for forest users while protecting aquatic resources. Roads impacting streams or not needed for future management activities would be closed or decommissioned. Roads which are not decommissioned would be improved to a more self-maintaining status so that less maintenance is needed and impacts from road sediment are decreased.

Old Growth Boundary Adjustment Need

The Forest Plan directs that Dedicated Old Growth (DOG) and Replacement Old Growth (ROG) areas are to be distributed across the landscape to provide for old-growth associated species on a Forest-wide basis. A portion of this old growth is designated as DOG or ROG and contributes to the Forest's old growth network (Forest Plan, Standards #4, 5, 6, 7, and 8, pgs IV-105 & 106). Old growth areas are to be inventoried and validated, with designations not meeting management requirement to be corrected utilizing an interdisciplinary process to develop recommendations for boundary adjustments and unit relocation.

The old growth network on the Malheur National Forest was first established in the early 1980's. Since then, new field validation and inventory methods have provided better information on habitat conditions and stand delineations.

Within the project area there are three DOG habitats identified. These habitats do not currently meet Forest Plan standards for size. No ROG areas have been identified nor have Pileated Woodpecker Feeding (PWFAs) areas been designated for DOGs 335 and 134. DOG 335 does not meet Forest Plan standards for minimum size. In addition, with recent updates to the Forest Geographic Information System (GIS) layers, inaccurate depictions within the Forest Service database about habitat on the ground need to be corrected to match stand boundaries. These boundary adjustments better meet habitat requirements for old growth dependent species.

ROG areas may not currently have all the characteristics of old growth. They are managed to achieve those characteristics so that when a DOG area no longer meets the needed habitat requirements, the ROG area can take its place.

DOG unit boundary adjustments and ROG designations will require a nonsignificant Forest Plan amendment. The proposed action description in Chapter 1 provides more detailed information regarding the proposed amendment and a map (Figure 1.3).

Timber Production Need

Timber harvesting plays an important role in the local area by providing employment and revenues. There is a need to make wood products available for local, regional, and national needs to provide jobs in the most cost-effective manner, while being sensitive to resource conditions such as the level of soil disturbance.

The Forest Plan includes direction to provide a sustainable flow of timber and associated wood products at a level that will contribute to economic stability and provide an economic return to the public. Wood material in the form of sawlogs and fiber will be utilized in a cost-effective manner, consistent with the various resource objectives and environment (Forest Plan goals 24 - 26, IV-2).

Wildlife Habitat Development Need

The amount, patch size, and distribution of old forest (OF) habitat in the Mill Creek subwatershed (project area) has declined from historic levels especially in the warm-dry and hot-dry upland forest biophysical environments (Table 1.1). Past harvest of large ponderosa pine and fire exclusion has resulted in a loss of the old forest single-stratum (OFSS) forest structure.

Species such white-headed woodpecker depend on large open grown ponderosa pine stands associated with OFSS structure. There is a need to develop historic levels OFSS forest habitat for these species (Upper Middle Fork Watershed Assessment, pg 5-28).

Existing dense, low vigor stands are slowly developing large ponderosa pine stand structures. Stand densities are so high that competition for water, light, and nutrients is slowing and inhibiting growth to the larger tree size. Currently, approximately 3% of stands in the warm-dry biophysical environment are classified as OFSS. Historically 15 to 55% of this structure was estimated to exist. The hot-dry biophysical environment is totally lacking OFSS structure. Approximately 20-70% was estimated to exist historically (Table 1.1).

The desired condition is to provide sustainable habitat for those wildlife species that prefer OFSS forest structures at historic levels. There is the need to maintain and develop open, park-like stand conditions where this condition occurred historically and manipulate vegetation in a manner to encourage the development and maintenance of large diameter trees with open canopy structure (Regional Foresters Amendment #2, pg 8).

Fuels Hazard Reduction Need

The historic high frequency/low severity fire regime has changed in the warm and hot-dry upland forest biophysical environments. This fire regime controlled regeneration of fire intolerant species, maintained more open stand structures, maintained lower surface fuel loadings, and maintained low level impacts from insects and disease. Fire suppression and other forest management practices have altered these forest types resulting in a higher composition of fire intolerant species, more vertical and horizontal tree crown and canopy continuity, and higher levels of surface fuels. Reducing horizontal and vertical forested stand continuity and surface fuel loadings will reduce potential wildfire intensity and severity. There is a need for prescribed burning to reduce excess levels of fuels and promote fire tolerant species (Upper Middle Fork John Day Watershed Assessment, pgs. 5-19).

Both the tree density and the proportion of fire intolerant fir species have increased from historical conditions. Due to a lack of periodic fire and insect and disease mortality, surface fuels have increased and are more continuous at these increased loadings across the landscape than historical conditions. High surface fuel loadings increases the potential flame length of a fire thereby increasing the chance of a surface fire moving into the crowns.

The past harvest of large ponderosa pine trees and the absence of periodic fire have resulted in dense, younger, often multi-layered stands composed of more fir trees and less pines and larches than historically occurred. Smaller understory trees and the lower branches of larger fir trees provide "ladder fuels" enable wildfire to move into the tree crowns and increasing the probability for an active crown fire.

The denser stands of trees provide a continuous path for crown fire to spread across long distances. Fire behavior and severity are dependent on the properties of the surface, ladder and canopy fuel quantities and continuity both horizontally and vertically.

The desired condition would be multi-strata and single-strata structural stage with ladder fuels in dry upland forest types to occur in smaller proportion where several fire cycles have been missed. Fire tolerant ponderosa pine, western larch, and to a lesser extent, Douglas-fir are the

dominant conifer species in the dry upland forest with large trees well represented. Surface fuel loadings are reduced and not continuous and this part of the project area is maintained by low intensity, frequent fire. These conditions reduce the probability of crown fire that is not characteristic of the project area, improve conditions for successful fire suppression when needed, and improve the ability of forest stands to survive wildfire.

Viewshed Corridor Plan Implementation Need

The Crawford Project area is part of the Highway 26 and Highway 7 visual corridors that crosses the Malheur National Forest. In management of these areas, the Forest Plan recommends a Corridor Viewshed Plan be completed outlining the existing and desired scenic conditions, as well as possible management opportunities. Viewshed corridor plans have been completed for both the Highway 26 (2000) and Highway 7 (1995) visual corridors. There is a need to implement the recommendations in these plans and move towards the desired condition identified in the Forest Plan. Specific recommendations in the Highway 7 plan include the use of thinning to improve stand health and tree vigor, and the reduction of tree stocking to promote the growth of large diameter trees. The Highway 26 viewshed plan recommends the use of thinning and prescribed fire to create more diverse distribution of trees in all diameters, and opening stands to accelerate growth of small and medium diameter pine trees.

Management Areas and Objectives

Relationship to the Forest Plan

This environmental impact statement (EIS) tiers to and relies upon the analyses from the Malheur National Forest Land and Resource Management Plan Final Environmental Impact Statement (FEIS). Amendments to the Forest Plan include but are not limited to the Regional Forester's Eastside Forest Plan Amendment #2 and the Interim Strategies for Managing Anadromous Fish Producing Watersheds (PACFISH). Those analyses are documented in the Final Environmental Impact Statement and Record of Decision for the Forest Plan (1990), and the environmental assessments for PACFISH and Wildlife Standards for Timber Sales (Eastside Forest Plan Amendment #2), and other related documents. The analysis also tiers to the analysis in the environmental assessments for PACFISH and Forest Plan Amendment #2. The Forest Plan, as amended, contains both Forest-Wide Standards and Guidelines as well as Standards and Guidelines for specific management areas (such as MA-1 General Forest).

Regional Forester's Forest Plan Amendments

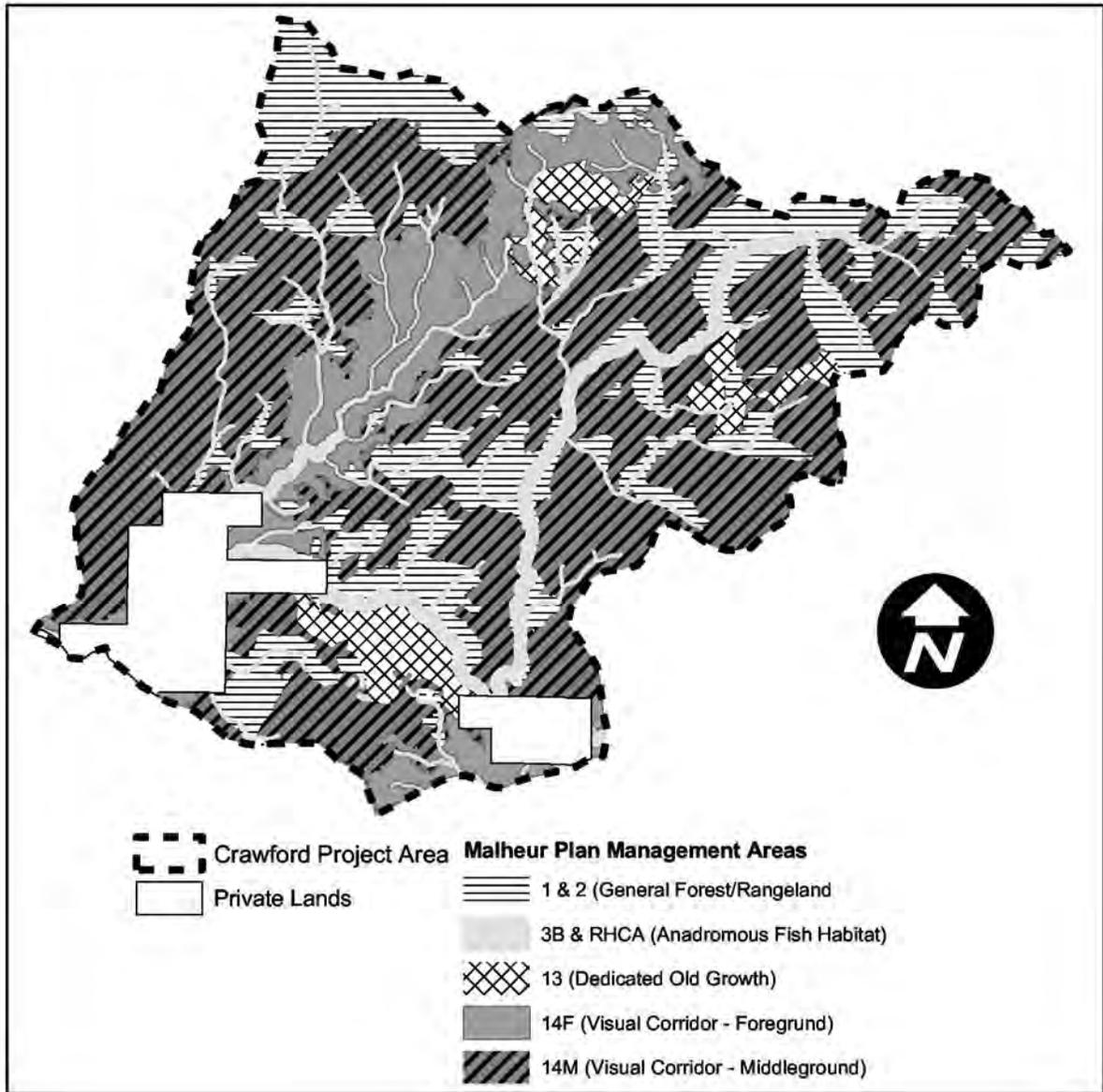
Regional Forester's Eastside Forest Plan Amendment #2 (1995) provides Forest-Wide Standards and Guidelines that contain direction for the development of timber sales. Amendment #2 changed standards for vegetation management (ecosystems), maintaining and enhancing late and old structure (LOS) for wildlife habitat, snag and down logs, goshawk habitat, connectivity of old forest, and riparian habitat.

Management Areas

The Crawford Project Area includes approximately 14,950 acres of National Forest lands that are allocated by the Forest Plan, as amended; to management areas (see Figure 1.2). Management area designations overlap; when a specific segment of land falls under the goals or standards of

two or more management areas, acres are assigned to the higher priority management area. The following is a description of management areas in the Crawford project area:

Figure 1.2. Malheur Forest Plan Management Areas within the Crawford Project Area.



Land Allocations and Forest Plan Goals

Goals for this area are identified within the Forest Plan. Goals for these management areas have been amended since the Record of Decision was signed in 1990.

General Forest—MA 1 - 2,950 acres (19%) Emphasize timber production on a sustained yield basis while providing for other resources and values. Develop equal distribution of age classes to optimize sustained timber production. Manage at levels and intensities consistent with the schedules described in this Plan to provide for other multiple uses and resources.

Rangeland—MA 2 (the acreage is combined with MA 1) - Emphasize forage production on non-Forest areas on a sustained yield basis while providing for other resources and values.

Anadromous Riparian Areas—MA 3B/RHCA – 1,621 acres (11%) Manage riparian areas to protect and enhance their value for wildlife, anadromous fish habitat, and water quality. Manage timber, grazing, and recreation to give preferential consideration to anadromous fish on that portion of the management area suitable for timber management, grazing, or recreation. Design and conduct management in all riparian areas to maintain or improve water availability and beneficial uses.

PACFISH introduced Riparian Habitat Conservation Areas (RHCAs) as an interim management area that overlays and supercedes the Forest Plan direction for managing anadromous riparian areas. RHCAs are portions of watersheds where riparian dependent resources receive primary emphasis, and management activities are subject to specific standards and guidelines. RHCAs include established riparian corridors, wetlands, intermittent streams, and perennial streams that help maintain the integrity of aquatic ecosystems by:

- Influencing the delivery of coarse sediment, organic mater, and woody debris into streams.
- Providing root strength for channel stability.
- Shading the stream; and protecting water quality.

Old Growth Habitat—MA 13 – 721 acres (5%) Provide suitable habitat for old growth dependent wildlife species, ecosystem diversity, and preservation of aesthetic qualities. Dedicated old growth (DOG) is the term used when referring to areas chosen to manage for old growth characteristics for old growth dependent species. Replacement old growth (ROG) areas are chosen to provide future old growth habitat if current designated stands no longer meet old growth characteristics. Old growth *management indicator species*² are pileated woodpecker and pine marten.

Visual Corridor—MA 14 - 8, 463 acres (57%) Manage corridor viewsheds with primary consideration given to their scenic quality and the growth of large diameter trees. Visual quality objectives of retention, partial retention, and modification will be applied for other uses and resources. Visual Corridor plans have been developed for Highway 7 and Highway 26 as required by the Forest Plan.

Minimum Level Management—MA 16 – Non-forest and low productivity forest lands; provide the minimum management necessary to provide for resource protection and management of adjacent lands.

Other Ownership - Approximately 1,195 acres (8%) within the project area is in private ownership (see Figure 1.1). No activities are proposed on private lands, but conditions and actions on private lands are considered for cumulative effects.

² Species identified in the Malheur National Forest Land and Resource Management Plan (Forest Plan) that are used to monitor the effects of planned management activities on viable populations of wildlife and fish, including those that are socially or economically important.

Proposed Action

The Proposed Action is an alternative developed early in the NEPA planning process to accomplish stated purposes, needs, and goals based on the best information available at the time. It is the first alternative offered and is used to identify issues and develop other alternatives for further study. Alternative 2 described below and in Chapter 2, is a portion of the activities included in the proposed action that was mailed to interested parties during public scoping in 1999.

Modifications to the original Proposed Action in this analysis have been made since the public scoping 1999. This analysis now focuses only on the commercial harvest, precommercial thinning, prescribed burning, and road closure related activities identified in the original project in the Mill Creek subwatershed (formerly identified as the Crawford and Mill subwatersheds in 1999). Originally a small amount of harvest activities were proposed within four other adjacent subwatersheds in the Upper Middle Fork John Day Watershed. These changes were made to focus the analysis process. The changes have not significantly changed the original proposal.

Why was this Proposal Developed?

The Interdisciplinary Team (IDT) developed this proposal following guidelines given by the Blue Mountain District Ranger. The goal of this project is to move vegetation towards a status closely resembling historical conditions while protecting or enhancing soil productivity and water quality. Road closure/decommissioning activities were proposed in order to protect water quality to decrease movement of sediment into streams. Road reconstruction and additional road maintenance was proposed to facilitate harvest activities while protecting other resources.

The Crawford IDT was also directed to consider recommendations described in the *Upper Middle Fork Watershed Analysis Report*, *Crawford Roads Analysis*, and the *Malheur Forest Roads Analysis* to implement restorative watershed activities, and to include a sub-forest scale roads analysis (per direction given in Forest Service Manual 7700).

Proposed Activities

The action proposal includes commercial thinning, shelterwood harvest, reforestation, small tree thinning (precommercial thinning), prescribed fire treatments, road closure and decommissioning projects. Nonsignificant Forest Plan Amendments to reduce satisfactory cover below Forest Plan Standards, and to allocate and adjust old growth management areas are proposed. Connected actions include transportation system improvements and use, temporary road construction, and fuels treatments associated with commercial thinning (slash disposal). On-going actions authorized by previous or concurrent decisions in and near the project area include: fire suppression rehabilitation, road management, noxious weed prevention, noxious weed control, and grazing management.

Specifically the **Proposed Action** includes:

Commercial Harvest – 2,073 acres commercial thinning; 119 acres of shelterwood harvest; harvest volume of 6,800 thousand board feet (MBF); the harvest method would be ground based skidding systems. Existing roads used for log haul would be maintained (35.2 miles) or reconstructed (10.9 miles). No new specified road construction is proposed in association with any of the management activities included in this alternative. Approximately 8.6 miles of temporary road would be constructed for access. Temporary roads would be constructed in several short segments ranging from a few hundred feet to approximately a mile in length. Temporary roads will be closed and subsoiled following logging.

Reforestation Planting – 119 acres; remove undesirable trees that are less than commercial size, treat activity fuels, and plant understocked areas that are larger than ½ acres with early serial tree species.

Precommercial Thinning - 935 acres of high density, multi-storied mixed conifer stands would be thinned.

Road Activities – Within the Mill Creek subwatershed, 0.9 miles of open road would be closed to motorized vehicles with gates, signs or dirt berms; 17.8 miles of currently closed roads would be decommissioned; and 0.4 miles of currently open road would be decommissioned.

Approximately 1.7 miles of road currently closed would be reopened. This consists of two roads that were closed in the early 1990's to reduce wildlife disturbance. Monitoring has identified some problems associated with the closures. One of the closed roads is located in a meadow area and the public has been consistently driving around the established closure causing rutting and meadow damage. The second road closure is located in an upland area has forced alternate use of a nearby road located in a riparian area. Use of the riparian road is causing resource damage and sediment concerns. The proposal is to close the riparian road causing resource damage, in turn re-opening the stable upland road for public access.

Old Growth Adjustment – 3 new ROGs designated and adjustment of the three DOGs; a nonsignificant Forest Plan amendment would be required to designate and adjust these areas.

Activity Fuels Reduction – 507 acres of yarding tops attached, 174 acres of hand piling, and 877 acres of grapple piling that would follow the completion of the commercial harvest or precommercial thinning activities.

Prescribed Burning – 5,300 acres of low intensity prescribed burning. This includes 1,235 acres of underburning in mechanically treated units, and 4,765 acres outside of mechanically treated units.

Further details of the Proposed Action (analyzed in this document as “Alternative 2”) are presented in Chapter 2, along with descriptions of all alternatives considered or analyzed.

The proposed action helps move the project area towards desired conditions described in the Forest Plan. The proposals include design features or mitigations to make them consistent with the Forest-wide Standards and Guidelines of the Forest Plan. This EIS documents the site-specific implementation of the Forest Plan.

Activity Description and Objectives

Commercial Thinning and Precommercial Thinning Treatments

The proposal would decrease tree density by cutting predominantly fire intolerant species such as grand fir. Reducing selected tree densities would reduce the chance of extensive wildfire, change the species mix, and encourage growth of larger tree structure, moving the area toward a more resilient forest condition. Trees less than commercial size (generally 9 inches in diameter or less) would be cut as a post-harvest treatment to remove the suppressed understory and reduce the stocking level. Thinning treatments would include some existing wildlife connectivity corridors linking late and old structural habitat (LOS). More trees would be retained in connectivity corridors to maintain a denser stand structure for wildlife movement between LOS habitats.

Dry Forest Pine, Douglas-Fir Sites

The Dry Forest Pine sites in the Crawford Project area are low in large trees (greater than 21 inch diameter) as compared to historic conditions. Stands are densely stocked and the growth of large diameter trees will be slow due to competition for moisture in the soil. There are also large numbers of small and mid size trees that presently occupy the understory of the site. These sites have a high basal area stocking which is made up of mostly small and mid diameter trees. The stand density (greater than 120 square feet basal area) exceeds historic stand densities, which averaged less than 50 square feet of basal area. These forested areas are at increased risk to insects, diseases and catastrophic fire.

The objective of the Crawford Project is to manage these sites to a condition more reflective of historic conditions, and to emphasize a shift to large diameter single strata trees of the appropriate species mix for the environment. In general, this would be achieved by removing the smaller diameter trees and retaining the larger diameter trees greater than 21" diameter at breast height (dbh). The basal area objectives are approximately 50 square feet per acre. Trees would be removed with a variable spacing to leave a range of patchy stand conditions with small openings to leave patches 2 to 5 acres in size. Table 2.1 in Chapter 2, Design Measures Section, shows the variable spacing that would be applied. The overall result would be a dry forest stand with larger average size trees, average basal area that reflects the historic condition, and stand structures that have a variability of spacing across the landscape. Trees greater than 21 inches would not be removed. Stand structures will provide habitat for species dependent on open, mature ponderosa pine such as the white-headed woodpecker. This would meet the purpose and need by addressing species composition and structure of the vegetation to develop a trend toward more resilient historical vegetative conditions, while addressing the old forest single-stratum structure (OFSS) need for wildlife habitat.

Dry Forest Mixed Conifer Sites

The Dry Forest Mixed Conifer sites in the Crawford Project area, are low in large trees (greater than 21 inch diameter), and have a high-level of late seral species (fir species), and dense understory, as compared to historic conditions. Some of the larger trees have achieved 21-inch diameter as a result of previous treatments. Stands are now densely stocked and growth of large diameter trees will continue to decline as competition for moisture in the soil increases. There are also large numbers of small and mid size trees that presently occupy the understory of the

site. In addition these sites have a high basal area, which is made up of mostly small and mid diameter trees. The stand density (greater than 120 square feet basal area) exceeds historic stand densities, which averaged less than 80 square feet of basal area. These forested areas are at risk of increasing susceptibility to insects, diseases and severe wildfire.

The objective of the Crawford Project is to manage these sites to a condition that meets historic conditions (historic range of variation), and to emphasize a shift to large diameter single strata trees. In general, this would be achieved by removing the smaller diameter trees with variable density thinning, emphasizing retaining early seral species of pine and larch, and retaining the larger diameter trees. The basal area objectives are 65 square feet per acre and trees would be removed to leave a range of stand conditions. Table 2.1 in Chapter 2, Design Measures Section, shows the variable spacing that would be applied in dry forest mixed conifer sites.

The overall result from the harvest would be Dry Forest Mixed Conifer sites with larger average size trees, average basal area that is in the historic range of variability, species composition that are earlier seral and less fire susceptible and trees that have variability of spacing across the landscape. Trees greater than 21 inches would not be removed. This would meet the purpose and need by addressing species composition and structure of vegetation to develop a trend toward more resilient historical vegetative conditions to reduce future fuel loadings. By decreasing density, remaining tree vigor and growth would be improved and trees would more likely retain full crowns. Treatments address the need to increase old forest single stratum structural stage by reducing the understory and increasing tree growth rates. Treatments would favor the retention of early seral, fire tolerant species by removing late seral species. This would increase early seral species representation across the landscape. This action addresses the need to change species composition and increase the representation of early seral species.

Shelterwood and Reforestation Treatments

The proposal includes shelterwood harvest on 119 acres. This prescription would remove undesirable trees from the middle and understory, thin desirable trees where they are over stocked, and reforest the resulting understocked areas. Undesirable trees are those that dependent on species or tree condition (insect, disease, damage) are not desirable for future management. Where suitable trees are available, a minimum of 20 trees per acre would be left to provide structural variety and future snag recruitment. Following the shelterwood harvest, there would be small Douglas-fir and grand fir trees remaining that are undesirable for future management. These small trees would be removed and non-stocked areas greater than ½ acre in size would be reforested with early seral species such as ponderosa pine and western larch tree seedlings. Planted areas would be monitored for growth and survival. Prior to planting, fuels created by the harvest and the cutting non commercial sized trees would be treated by grapple piling to reduce the fire hazard.

Fire and Fuel Treatments

All fire and fuel treatments address the need to reduce fuels and potential fire severity. There are several methods used to treat fuels. Those proposed with this project include commercial harvest, precommercial thinning, yarding tops attached, grapple piling, hand piling, burning piles, and prescribed fire. Yarding tops attached occurs during the harvest operations and brings material to the landing where it is piled and burned later if not utilized by some means. Grapple piling is done by a track excavator on slopes less than 35%. Piles are then burned when the

potential for fire spread is minimal. Hand piling is primarily used on slopes greater than 35% with moderate to high fuel loads. Piles are also burned when the potential for fire spread is minimal.

Prescribed burning (underburning) would occur within an approximate 5,300 acre area of the 14,950 acre project area over the next 5 years. Within the 5,300 acres, not all acres would be burned and there are different objectives for areas with resource concerns. Burning would be accomplished in the fall and spring times of year when weather and moisture conditions are appropriate and after much of the mechanical work is completed. These burn operations would be coordinated with the Grazing Permittee and the Rangeland Management Specialist administering the affected allotments. Where possible the burning would be fit to the grazing systems being used on the affected allotments to minimize impacts to the permittee's ranch operations.

Adjustments of Dedicated Old Growth and Additions to Replacement Old-Growth

A nonsignificant Forest Plan amendment would be required to adjust the Dedicated Old Growth (DOG) areas within the Crawford Project area to allow for re-delineation and incorporation of suitable late and old structure (LOS) habitats within these DOGs.

The designation of Replacement Old Growth areas (ROGs) would incorporate suitable LOS or older structure stands to provide suitable replacement areas for the associated DOGs. Pileated woodpecker feeding areas would also be delineated as appropriate to provide suitable foraging habitat for Pileated woodpeckers.

Figure 1.3. Map of Existing and Proposed DOGs and ROGs

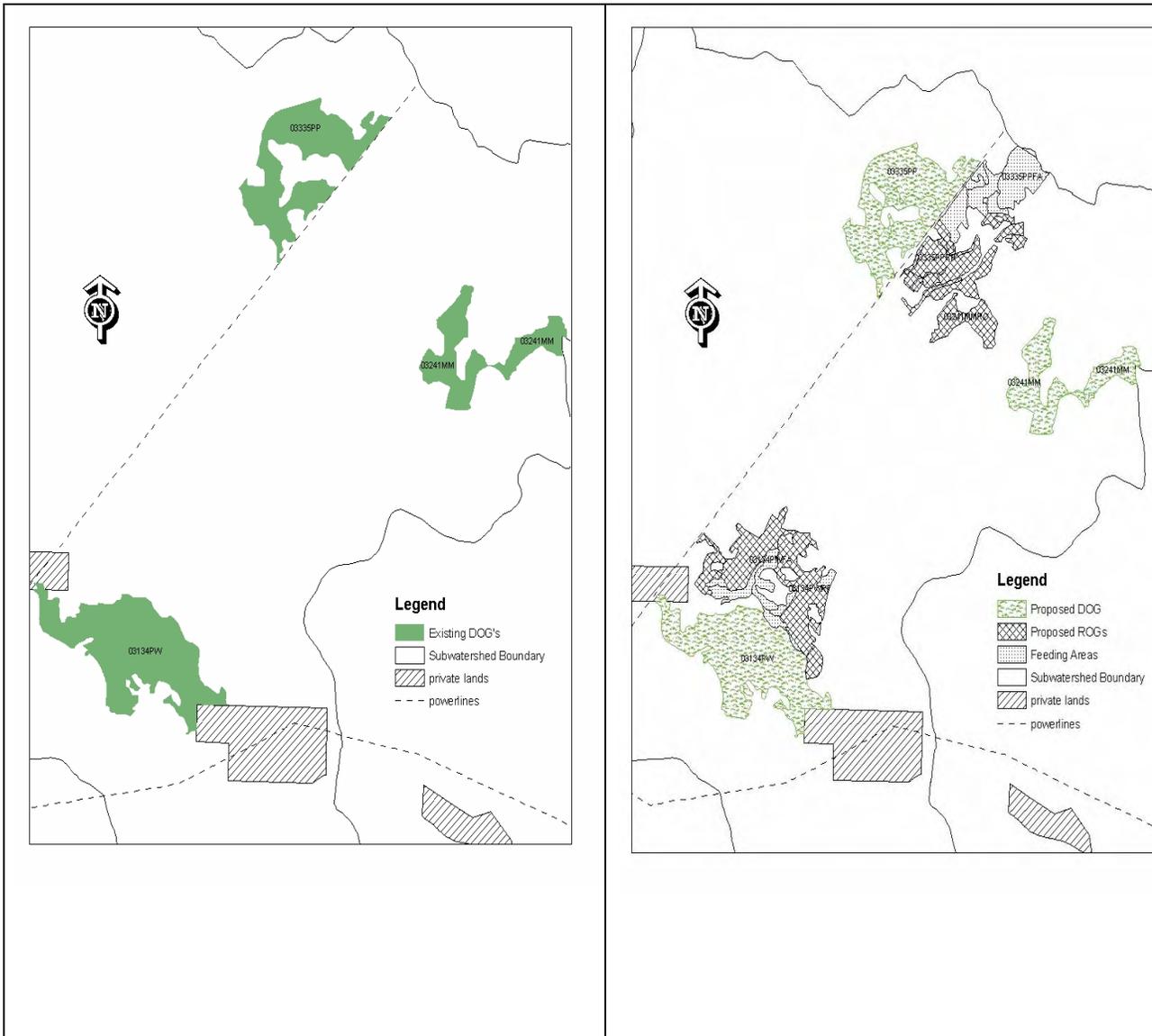


Table 1.3. DOG adjustments and new ROG delineation

DOG # ROG #	Label on Map (Above)	Exiting (Acres)	Proposed (Acres)	Species Designation
DOG 134 ROG 134 Pileated Feeding Area	03134PW 03134PWRF 03134PWFA	382 0 0	395 256 83	Pileated Woodpecker
DOG 241 ROG 241	03241MM 03241MMRO	169 0	169 62	Pine Marten
DOG 335 ROG 335 Pileated Feeding Area	03335PP 03335PPRF 0335PPFA	273 0 0	317 179 154	Pileated Woodpecker, Pine Marten

Road Activities

The overall objective is to reduce road related impacts to water quality and fish habitat. To meet this objective, a number of roads currently closed to motorized vehicles would be decommissioned. The decommissioned roads would be bermed at the beginning of the road, the road surface subsoiled where feasible, seeded and mulched, drainage provided for the road surface, and culverts will be removed and disposed of. Many of these roads are within sensitive areas such as riparian habitat conservation areas.

The desired condition 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. The desired condition is largely based on Forest Plan, Malheur Forest Road Analysis, and the Crawford Roads Analysis. The general Forest Plan direction for transportation system management states: "Roads will be planned, designed, constructed and maintained to the minimum level necessary to meet integrated land management objectives".

The Crawford Roads Analysis focused on recommendations for moving the areas transportation system towards desired conditions, as identified in the Upper Middle Fork John Day Watershed Analysis and in the Malheur Forest Roads Analysis (December 2004). Roads not identified in the Forest Roads analysis as needed for the Forest transportation system, that are located in RHCAs that contribute to environmental impacts are being considered for closure or decommissioning.

Many of the roads proposed for closures or decommissioning are potentially creating sediment that is being delivered into adjacent streams. About 5.8 miles of road would be decommissioned within RHCAs including about 1.6 miles adjacent to Crawford Creek. About 0.9 miles of road would be closed within RHCAs. There is a need to minimize the effects of runoff and precipitation intercepted by road surfaces. Many of the roads causing the sediment problems are lacking adequate drainage structures or are not being maintained to design specifications. Decommissioned roads will be hydrologically disconnected from the drainage network and removed from the transportation system. No funding has been available to improve the conditions of these roads for the last several years and funding is projected to decrease (2004 Malheur Forest Roads Analysis, pgs 29 & 30).

Approximately 1.7 miles of road currently closed would be reopened. This consists of two roads that were closed in the early 1990's to reduce wildlife disturbance. Monitoring has identified some problems associated with the closures. One of the closed roads is located in a meadow area and the public has been consistently driving around the established closure causing rutting and meadow damage. The second road closure is located in an upland area has forced alternate use of a nearby road located in a riparian area. Use of the riparian road is causing resource damage and sediment concerns. The proposal is to close the riparian road causing resource damage, in turn re-opening the stable upland road for public access.

Decision Framework

Through this analysis the Forest Supervisor must decide:

- Which actions best implement the recommendations of the Upper Middle Fork John Day Watershed Assessment?
- How quickly to move the forest toward a more resilient condition (within or trending toward the Historic Range of Variability), and by which methods?
- Which recommendations from the *Malheur and Crawford Roads Analysis* best reduce sediment risk while maintaining necessary access?
- What actions are most appropriate to reduce fire hazard, and crown fire potential?
- If the selected alternative is consistent with the Forest Plan and other applicable laws.
- If there is reasonable expectation that anticipated funding is adequate to complete any required monitoring evaluation of the project.

The proposed management activities are generally designed to be consistent with the Forest Plan (Malheur National Forest Land and Resource Management Plan, 1990); however, nonsignificant Forest Plan amendments would be needed to commercially thin approximately 70 acres of satisfactory big game cover habitat, and to adjust Dedicated Old Growth (DOGs) boundaries and Replacement Old Growth areas (ROGs).

Public Involvement

Public comments were received after four separate scoping requests. The original analysis began in the fall of 1993, and was called the Flat Analysis. Two scoping efforts were initiated during this season: during November, 1993 to alert hunters to the imminent project and in late October, 1993, to alert the general public. However, the analysis was delayed because of higher priority projects until April 1999, when it was renamed the Crawford Vegetation Management Project.

When the analysis resumed, the Upper Middle Fork John Day Watershed Report and its recommendations were included to define the purpose and need for the project. The formal scoping package was mailed to the public on May 21 and June 17, 1999.

These letters and correspondence are filed in the Crawford Project File.

Additional public comments on the Crawford project were received in 2000 and 2001 during comment period on two different versions of the Crawford Vegetation Management Project EA. The comment letters and Forest Service response to these comments are in the Crawford Project File.

A Decision Notice and FONSI were signed by Bonnie Wood, Malheur Forest Supervisor on April 26, 2002. This decision was appealed and then reviewed by the Appeal Deciding Officer, Richard Sowa. This review revealed that the analysis of cumulative effects was not sufficient to support the decision. The Forest Supervisor was directed to withdraw the decision.

Following the withdrawal of the decision, a Notice of Intent (NOI) was published in the Federal Register on October 9, 2003. The NOI asked for public comment on the scope of the analysis by

November 15, 2003. One comment was received from Doug Heiken, Oregon Natural Resources Council (ONRC). Additional comments were provided by ONRC on January 31, 2006.

The project has been listed in the Malheur National Forest Winter Schedules of Proposed Activities (SOPA) beginning in 2003 and subsequent quarterly SOPA's through the summer of 2006

The analysis work on the Crawford Project was resumed in 2005. This delay was because Forest Planning Teams needed to work on high priority fire recovery projects. A Project Initiation Letter (letter of direction) was issued from the Blue Mountain District Ranger to the Team Leader and IDT on June 21, 2005. The Ranger stated in this letter that there had already been substantial previous public comments received on past analysis projects in the Crawford area. He felt this public involvement was adequate to continue the analysis without additional scoping. He directed the IDT to review all previous public comments received to date on the Crawford Project and past projects. After this review he asked the IDT to recommend any proposed changes to the key issues for his approval. To meet this direction, the IDT met in December 2005 to review the following:

- Comments received during initial scoping efforts. These comments were used to develop significant key issues in November, 2001 Environmental Assessment (EA).
- Public comments received during 30 day comment periods (November, 2001 EA)
- Appeal points on the November, 2001 Crawford EA and April 26, 2002 Decision Notice
- Comments received on the October 9, 2003 Notice of Intent to Prepare an EIS

Recommended refinements and changes to key issues were then approved by the District Ranger at later meetings. Notes from these meetings are available in the Project Record. Further discussion of Key Issues can be found in the section below.

Coordination with Other Governments and Agencies

The Blue Mountain Ranger District staff contacted three tribes that have rights or interests in the Crawford Timber Sale Project: the Confederated Tribes of Warm Springs, the Confederated Tribes of the Umatilla Indian Reservation, and the Burns Paiute Tribe. Based on a government-to-government relationship, the purpose of the contact was to exchange information, answer questions, and to work closely and continuously with each other to integrate tribal rights and interests in the planning process.

The Confederated Tribes of the Warm Springs Reservation provided comments on the initial Flat Planning Area scoping on December 23, 1997. When the project was renamed the Crawford Vegetation Management Project, a pre-scoping letter was sent to Tribal agencies on April 26, 1999, before the general public, in accordance with management direction. Comments were received by letter from the Burns Paiute Tribe on December 10, 2001, and the Confederated Tribes of the Warm Springs Reservation of Oregon on October 13, 2000.

Tribal interests also provided comments on the November 28, 2001 Crawford Environmental Assessment. Both the Burns Paiute Tribe and the Confederated Tribes of Warm Springs provided comments. From 2000 through 2002 several communication letters and phone calls took place between interested Tribes and the Forest Service.

Concurrent with the Notice of Intent (NOI) to publish an Environmental Impact Statement (EIS) letters were mailed on October 1, 2003 to the Confederated Tribes of Warm Springs, the Confederated Tribes of the Umatilla, and the Burns Paiute Tribe. The letter informed the three Tribes that the Forest Service was starting to work on the project again and therefore would like to continue consultation. The letter summarized changes to the proposed action that would be made from the original EA and the proposed action in the EIS and provided a copy of the NOI.

Coordination has also occurred with federal, state, and local government officials (see also Chapter 4). The National Oceanic and Atmospheric Administration-Fisheries (NOAA), and U.S. Fish and Wildlife Service have been kept informed of proposed activities. Information has been provided to and exchanged with state agencies. Grant County Judge Dennis Reynolds has been provided with information on the proposal and was offered the opportunity to have the County be a cooperating agency.

Issues

Significant issues, otherwise known as key issues, for the Crawford Project came from the public, other agencies, organizations and businesses, and Forest Service resource specialists. Issues are defined as a point of discussion, debate, or dispute about environmental effects. Key issues are used to formulate alternatives, prescribe mitigation measures, and analyze environmental effects. Issues are “significant” because of the extent of their geographic distribution, the duration of their effects, or the intensity of interest or resource conflict (40 CFR 1508.27).

Key issues are normally considered the basis for alternative development. However, there are a variety of ways to address key issues within any specific alternative. Key issues may be addressed by simply avoiding environmental consequences by elimination of an action that would impact a given resource. For example, if impacts to a specific stream segment are a key issue, project alternatives that avoid all potential impacts to the stream segment address this issue.

In addition to key issues identified by the IDT, there are “other analysis” issues addressed in the effects analysis and often used to compare alternatives. For example, heritage resources will always be addressed in actions that have site specific ground disturbing actions. Although, alternatives may not be designed specifically to address heritage resources, the consequences of all the alternatives must be measured against compliance with direction to provide adequate protection for these resources (see Other Analysis Issues, this chapter).

The environmental consequences of the proposal are disclosed in Chapter 3 for each resource affected by the significant or key issues. The key issue has indicators to allow members of the public and the Responsible Official to determine how well issues are addressed by the alternatives. A summary the key issues and its indicators are identified below.

Key Issues

1) *Roads and Commercial Timber Harvest*

There is a concern that the proposed ground disturbing activities associated with road construction and commercial timber harvest could degrade water quality and impact soil productivity. These ground disturbing activities may also indirectly impact habitat for

aquatic species including listed and sensitive aquatic species. Aquatic species of concern present within the project include summer steelhead, Chinook salmon, and redband trout. There is also historic bull trout habitat. The proposed harvest activities combined with past impacts including, extensive past timber harvest and ongoing grazing may cumulatively affect water quality.

Measures or elements for evaluating the issue:

- Miles of temporary road.
- Miles of log haul and road maintenance in RHCAs.
- Total road miles in Mill Creek sub-watershed.
- Equivalent Roaded Area
- Acres of timber harvest
- Miles of RHCA road remaining

2) Big Game Cover

Commercial thinning is proposed on approximately 70 acres identified as satisfactory big game cover. Currently satisfactory cover is 2.7% of the Mill Creek subwatershed, below the Forest Plan standard of 12%. These forested areas provide some of the highest quality cover habitat available for big game species (elk) in the project area. Thinning these acres would degrade the satisfactory cover by decreasing the tree density which in turn reduces the average canopy closure needed to maintain this standard. This thinning reduces the cover percentage further below Forest Plan standards to approximately 2.3%.

Measures or elements for evaluating the issue:

- Quantitative assessment on big game cover %

Other Analysis Issues

Other analysis issues are addressed in the effects analysis and used to compare alternatives. The following analysis issues and concerns raised by the public and Forest Service Resource specialists are important and were considered as this project was developed and analyzed. These issues did not drive alternatives, but they were addressed or used in this analysis. Other analysis issues are listed here and analyzed in Chapter 3. Some issues are already addressed through other processes or in the Forest Plan, some led to design measures specific to each alternative (see Management Requirements and Constraints in Chapter 2), and some are analyzed in Chapter 3.

Some issues fit into the following categories: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality (CEQ) NEPA regulations require this delineation in Sec. 1501.7: “identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3).”

The following is a list of other issues and reasons regarding their categorization as, or a reference to a location in this EIS where that issue is addressed. A brief response follows the concern in italics.

Forest Vegetation/Structure

There is an issue to exclude toxic poisoning of gophers and chemical herbicides.

The proposed action no longer includes poisoning gophers or using chemical herbicides for reforestation activities.

There is a recommendation to use nontraditional techniques (without commercial harvest) to accomplish vegetation management objectives.

This recommendation led to the development of Alternative 4 which is studied in detail.

Wildlife Habitat

There is a concern that underburning would impact nesting birds, and elk calving and deer fawning areas.

A number of design measures to protect wildlife and habitat have been developed (Chapter 2). These impacts are discussed in Chapter 3, in the Terrestrial Wildlife effects section and in the Biological Evaluation.

There is the issue that commercial thinning young trees in connectivity corridors will degrade this habitat.

The harvest prescriptions were modified in this connectivity habitat to provide a denser forested stand following harvest. See Chapter 2, Table 2.1. Impacts of activities on connectivity corridors are discussed in Chapter 3, Environmental Consequences in the Wildlife Section.

Many populations of neotropical migratory bird species are considered in decline (Saab and Rich 1998, Altman 2000, Sharp 1996). Habitat loss is considered the primary factor for population declines. There is an issue that commercial thinning and prescribed burning activities could contribute to further population decline. *These impacts are discussed in Chapter 3, Environmental Consequences in the Wildlife section.*

There is an issue that commercial thinning would adversely affect the habitat of old growth dependent species including pine marten, California wolverine, Canada Lynx, Three-toed woodpecker, northern goshawk, and bald eagle. *Impacts on wildlife management indicator species (MIS) and threatened and endangered species are discussed in Chapter 3, Environmental Consequences in the Wildlife section.*

There is the issue that timber harvest would impact old growth ponderosa pine forests which is white headed woodpecker habitat.

These impacts are discussed in Chapter 3, Environmental Consequences in the Wildlife section.

There is the concern that logging would impact primary cavity excavator species.

These impacts are discussed in Chapter 3, Environmental Consequences in the Wildlife section.

There is the issue that the proposed harvest and burning activities would treat areas providing late and old structural habitats. Alterations in habitat components (canopy cover, understory density, and structure) in these areas have the potential to alter the value for multi-strata associated species such as pileated woodpecker, pine marten, and northern goshawk.

Impacts on multi-stratum dependent species including pileated woodpecker, pine marten and northern goshawk are discussed in Chapter 3, Environmental Consequences in the Wildlife section.

Water Quality and Fisheries

Concerns were raised that existing roads will continue to impact water quality, aquatic species, and wildlife. Several native surface roads are located in riparian areas containing listed fish species.

Reducing existing road impacts to water quality and aquatic species is part of the stated purpose and need. Road closure, road decommissioning, and road reconstruction activities are proposed to address this purpose and need. Impacts of roads are discussed in Chapter 3, in the water quality, fish, and wildlife sections.

There is the issue that commercial logging will create further harm to the watershed. These impacts could include cumulative effects to watershed health and impacts to 303(d) listed streams.

See Key Issue #1, which led to development of Alternative 3 and 4. Design measures to minimize watershed impacts have been developed (Chapter 2) to address this issue. Impacts to water quality are discussed in Chapter 3, in the watershed/aquatic Section.

There is the issue that there would be adverse impacts from prescribed burning to aquatic species.

Design measures to minimize aquatic impacts have been developed (See Chapter 2). These impacts are discussed in Chapter 3, in the water quality/aquatics section.

Soils

Concerns have been raised that timber harvest, road construction, prescribed burning, and sub-soiling adversely impacts soils. The adverse impacts include potential detrimental soil compaction, soil displacement, sediment increases, impacts to soil organisms, mycorrhizae fungi, and soil nutrient losses.

See Key Issue #1, which led to development of Alternatives 3 and 4. Design measures to minimize soil impacts have been developed (Chapter 2). Soil impacts are discussed in Chapter 3, in the Soil Sections.

Fuels

There is the issue that smoke from prescribed burning would impact the local communities of Austin and Unity.

These impacts are discussed in Chapter 3, in the Fire/Fuels effects section.

There is the issue that large tree mortality is induced from underburning.

Design measures to lessen tree mortality have been developed (Chapter 2). These impacts are discussed in Chapter 3, in the visual effects and wildlife sections.

There is the issue that prescribed burning reduces the amount of large wood needed for wildlife habitat and soil nutrients.

Design measures to retain down wood have been developed (Chapter 2). These impacts are discussed in Chapter 3, in the soils and wildlife sections.

Roads/Access

The existing road system is currently being utilized by recreationists, hunters, firewood cutters, and range permittees. There is a concern that road closures would impact these uses. Roads provide access for those with disabilities.

These impacts are discussed in Chapter 3, in the Roads/Access and Recreation effects section.

Scenery

There is an issue that proposed harvest, temporary road construction, and burning activities would impact visual quality along Hwy. 7 and 26.

Design measures to lessen the visual effects along the highways have been developed (Chapter 2). These impacts are discussed in Chapter 3, in the Visual effects section.

Rangeland

There is an issue that the grazing permittee operations would be adversely impacted (including rest needs after burning).

Design measures to lessen the effect to the grazing permittee have been developed (Chapter 2). These impacts are discussed in Chapter 3, in the Range Management effects section.

Invasive Plants

There is an issue that the proposed activities will increase the magnitude and distribution of invasive plants. Commercial thinning including the construction of temporary roads could increase the risk of invasive plants due ground disturbing activities. Prescribed burning has the potential also to increase distribution of invasive plants in areas where the ground vegetation is burned off.

A number of design measures to limit invasive plant establishment have been developed (Chapter 2). These impacts are discussed in Chapter 3, in the Invasive Plants effects section.

Recreation

There is an issue that fall recreation (primarily hunting) being impacted from burning activities. These impacts include dense smelly smoke near dispersed camping areas and active burning that will displace hunters and other recreationists from the affected dispersed campsites.

These impacts are discussed in Environmental Consequences for the alternatives in the Recreation section in Chapter 3.

Roadless/Unroaded

There is an issue that the Crawford Project may affect roadless, contiguous roadless areas, or non-inventoried roadless areas greater than 1,000 acres. *The proposed treatments are consistent with management direction in the Malheur Forest Plan (1990) and current Forest Service roadless direction. There are no 1,000 acre contiguous unroaded areas or inventoried roadless areas in the project area (project record, GIS analysis). These inventoried roadless areas are identified in the Forest Service Roadless Area Conservation FEIS, Vol. 2 (USDA Forest Service 2000). No road construction, road reconstruction, or timber harvest would occur in any of the*

alternatives in the inventoried roadless areas. This meets the requirements of the Roadless Area Conservation Final Rule, 36 CFR 294. The project also meets low density recommendations identified by the Road Density Analysis Task Team Final Report (01/30/2002).

Social/Economics

There is an issue that the National Forest System lands need to support local community economics. This includes family income, business stability, and well being of the community. The commercial thinning should provide green timber to support the local economy. *These impacts are discussed in Chapter 3, in the Social/Economic effects section.*

Laws and Regulations

This EIS adheres to the following legal requirements and coordination, and regulations:

Magnuson-Stevens, Fishery Conservation and Management Act, Public Law 94-265 as amended through October 11, 1996

This Act governs the conservation and management of ocean fishing. It establishes exclusive U.S. management authority over all fishing within the exclusive economic zone, all anadromous fish throughout their migratory range except when in a foreign nation's waters and all fish on the Continental Shelf. Foreign fishing within these areas is prohibited unless conducted pursuant to a governing international fishery agreement and permit, and only if the foreign nation extends reciprocity to U.S. fishing vessels. The Act also establishes eight Regional Fishery Management Councils responsible for the preparation of fishery management plans to achieve the optimum yield from U.S. fisheries in their regions

The Preservation of American Antiquities Act of 1906:

This Act makes it illegal to “appropriate, excavate, injure, or destroy any historic or prehistoric ruin or monument, or any object of antiquity, situated on lands owned by the Government of the United States, without the permission of the Secretary of the Department of the Government having jurisdiction over the lands on which said antiquities are situated.”

The National Historic Preservation Act of 1966, as amended:

This Act requires Federal agencies to consult with State and local groups before nonrenewable cultural resources, such as archaeological sites and historic structures, are damaged or destroyed. Section 106 of this Act requires Federal agencies to review the effects project proposals may have on the cultural resources in the Project Area.

The Endangered Species Act of 1973, as amended:

The purposes of this Act are to “provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve the purposes of the treaties and conventions set forth in subsection (a) of this section.” The Act also states “It is further declared to be the policy of Congress that all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of this Act.”

The Migratory Bird Treaty Act of 1918:

The purposes of this Act are to establish an international framework for the protection and conservation of migratory birds. The Act makes it illegal, unless permitted by regulations, to “pursue, hunt, take, capture, purchase, deliver for shipment, ship, cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in this Convention . . . for the protection of migratory birds . . . or any part, nest, or egg of any such bird” (16 USC 703). The original 1918 statute implemented the 1916 Convention between the United States and Great Britain (for Canada). Later amendments implemented treaties between the United States and Mexico, Japan, and the Soviet Union (now Russia).

The National Environmental Policy Act (NEPA) of 1969, as amended:

The purposes of this Act are “To declare a national policy which will encourage productive and enjoyable harmony between man and his environment, to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality” (42 U.S.C. Sec. 4321). The law further states “it is the continuing policy of the Federal Government, in cooperation with State and local governments, and other concerned public and private organizations, to use all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans” [42 U.S.C. Sec. 4331(a)]. NEPA establishes the format and content requirements of environmental analysis and documentation, such as the Crawford Project.

The National Forest Management Act (NFMA) of 1976:

This Act guides development and revision of National Forest Land Management Plans and has several sections to it ranging from required reporting the Secretary must submit annually to Congress to preparation requirements for timber sale contracts. There are several important sections within the act, including Section 1 (purpose and principles, Section 19 (fish and wildlife resource), Section 23 (water and soil resource), and Section 27 (management requirements).

The Clean Water Act, as amended in 1977 and 1982:

The primary objective of this Act is to restore and maintain the integrity of the nation’s waters. This objective translates into two fundamental national goals: 1. Eliminate the discharge of pollutants into the nation’s waters; and 2. Achieve water quality levels that are fishable and swimmable. This Act establishes a non-degradation policy for all federally proposed projects.

The Clean Air Act, as amended in 1990:

The purposes of this Act are “to protect and enhance the quality of the Nation’s air resources so as to promote the public health and welfare and the productive capacity of its population; to initiate and accelerate a national research and development program to achieve the prevention and control of air pollution; to provide technical and financial assistance to State and local governments in connection with the development and execution of their air pollution prevention

and control programs; and to encourage and assist the development and operation of regional air pollution prevention and control programs.”

Multiple-Use Sustained-Yield Act of 1960

The Multiple Use - Sustained Yield Act of 1960 requires the Forest Service to manage National Forest System lands for multiple uses (including timber, recreation, fish and wildlife, range, and watershed). All renewable resources are to be managed in such a way that they are available for future generations. The harvesting and use of standing timber can be considered a short-term use of a renewable resource. As a renewable resource, trees can be re-established and grown in again if the productivity of the land is not impaired.

Treaty with the Walla Walla, Cayuse, and Umatilla Tribes, June 9, 1855, and Treaty with the Tribes of Middle Oregon, June 25, 1855:

These treaties established “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.” All actions to be taken must fully consider and comply with Native American treaty rights.

The project area falls within lands ceded by the Confederated Tribes of the Warm Springs Reservation and within lands that have an overlap of use with the Umatilla Tribes. These tribes have reserved rights to anadromous fish, and Federal court decisions have specifically established that the tribes have treaty rights to an equitable share of the Columbia Basin fishery resource (CRITFC 1995, Vol. I, pgs. 4-1 – 4-3).

Public law 92-488:

This law recognizes the Burns Paiute Tribe and their reservation. As a Federally recognized tribe, the Burns Paiute Tribe retains rights of inherent sovereignty. The project area is within the traditional and current use area of the Burns Paiute Tribe.

Migratory Bird E. O. 13186:

On January 10, 2001, President Clinton signed an Executive Order" (E.O. 13186) titled "Responsibilities of Federal Agencies to Protect Migratory Birds." This E.O. requires that *“environmental analysis of Federal actions, required by NEPA or other established environmental review processes, evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern.”*

Natural or Depletable Resource Requirements and Conservation Potential:

The Crawford Project has been designed to conform to applicable laws and regulations pertaining to natural or depletable resources, including minerals and energy resources. Regulations of mineral and energy activities on the National Forest, under the U.S. Mining Laws act of 1872 and the Mineral Leasing Act of 1920, are shared with the Bureau of Land Management. The demand for access to National Forest System lands for the purpose of mineral and energy exploration and development is expected to increase over time.

Environmental Justice:

On February 11, 1994, President Clinton signed Executive Order 12898. This order directs each Federal agency to make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. On the same day, the President also signed a memorandum emphasizing the need to consider these types of effects during NEPA analysis. On March 24, 1995, the Department of Agriculture completed an implementation strategy for the executive order. Where Forest Service proposals have the potential to disproportionately and adversely affect minority or low-income populations, these effects must be considered and disclosed (and mitigated to the degree possible) through the NEPA analysis and documentation (see Environmental Justice, Chapter 3).

Prime Farmland, Rangeland, and Forestland:

All alternatives are in accordance with the Secretary of Agriculture Memorandum 1827 for prime farmland, rangeland, and forestland. "Prime" forestland is a term used only for non-Federal land, which would not be affected by proposed alternatives. Regardless of the alternative selected, National Forest System lands would be managed with sensitivity to adjacent private and public lands.

Floodplains and Wetlands (E. O. 11988 and 11990)

The purpose of these 1977 orders are to "...avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development..." and similarly "...avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands..."

Wetlands that meet the Jurisdictional Definition (Corps of Engineers) are found in the Crawford Timber Sale Area. These areas will be mapped as described in the Mitigation and avoided during harvest and fuel treatments.

Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974 (as amended)

This act directed the Secretary of Agriculture to prepare a Renewable Resources Assessment and updates. These assessments include "an analysis of present and anticipated uses, demand for, and supply of the renewable resources, with consideration of the international resource situation, and an emphasis of pertinent supply, demand and price relationships trends." The USDA Forest Service Forest Inventory and Analysis unit provides updates for this assessment.

Executive Order 12962 (aquatic systems and recreational fisheries)

This 1995 order's purpose is to conserve, restore, and enhance aquatic systems to provide for increased recreational fishing opportunities nationwide. It requires federal agencies to evaluate the effects of federally funded actions on aquatic systems and document those effects relative to the purpose of this order.

Executive Order 13112 (invasive species)

This 1999 order requires Federal agency whose actions may affect the status of invasive species to identify those actions and within budgetary limits, "(i) prevent the introduction of invasive

species; (ii) detect and respond rapidly to and control populations of such species... (iii) monitor invasive species populations... (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded;... (vi) promote public education on invasive species...and (3) not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species...unless, pursuant to guidelines that it has pre-scribed, the agency has determined and made public...that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions.”

Executive Order 13287 (preserve America)

This 2003 order’s intent is to preserve America’s heritage through “actively advancing the protection, enhancement, and contemporary use of the historic properties owned by the Federal Government...The Federal Government shall recognize and manage the historic properties in its ownership as assets that can support department and agency missions while contributing to the vitality and economic well-being of the Nation's communities and fostering a broader appreciation for the development of the United States and its underlying values...”

Consumers, Civil Rights, Minorities, and Women:

All Forest Service actions have potential to produce some form of impacts, positive or negative, on the civil rights of individuals or groups, including minorities and women. An analysis of this potential impact is required by Forest Service Manual and Forest Service Handbook direction (see Socio-Economics, Chapter 3).

Project Record

This EIS hereby incorporates by reference the Project Record (40 CFR 1502.21). However, Chapter 3 provides a summary of the Specialist Reports in adequate detail to support the rationale for the decisions and the appendices provide supporting documentation. The Project Record contains Specialist Reports and other technical documentation used to support the analysis and conclusions in this EIS. These Specialist Reports are for Forest Vegetation, Fire and Fuels, Roads, Wildlife, Soil, Water, Fisheries, Scenery, Recreation, Range, Botany, Heritage, and Socio-Economics.

Incorporating these Specialist Reports and the Project Record helps implement the CEQ Regulations’ provision that agencies should reduce NEPA paperwork (40 CFR 1500.4), that EISs shall be “analytic rather than encyclopedic,” and that EISs “shall be kept concise and no longer than absolutely necessary” (40 CFR 1502.2). The objective is to furnish enough site-specific information to demonstrate a reasoned consideration of the environmental impacts of the alternatives and how these impacts can be mitigated, without repeating detailed analysis and background information available elsewhere. The Project Record is available for review at the Blue Mountain Ranger District Office, 431 Patterson Bridge Rd., John Day, Oregon.

CHAPTER 2. ALTERNATIVES

Introduction

Chapter 2 describes the proposed action and alternatives to the proposed action, including a no action alternative. This chapter also describes the measures necessary to mitigate environmental effects, identifies management requirements, develops monitoring plans, and shows a summary comparison of the alternatives as they relate to key issues and the purpose and need for action. Maps (labeled as figures) of alternatives considered in detail are included in a Map Section at the end of this DEIS. In the Map Section, figures that compare action alternatives were organized consecutively to make visual comparisons easy.

The Crawford Project DEIS incorporates information and relies on direction provided by the Malheur Forest Plan, as amended. All alternatives have been designed to adhere to State and Federal laws and regulations.

This chapter is divided into four major sections:

- Alternative Development Process
- Alternatives Considered but Eliminated from Detailed Study
- Alternatives Considered in Detail
- Comparison of Alternatives

The affected environment and environmental consequences of implementing alternatives for the Crawford Project Analysis Area can be found in Chapter 3. The Project Record is referenced throughout this document and contains additional documentation and analysis.

Alternative Development Process

This chapter of the DEIS describes in detail four alternative ways to manage land and resources in the Crawford Project Area. These alternatives were developed from public scoping comments and review by the project Forest Service interdisciplinary team (IDT). Public participation to review and comment on proposed activities began in April 1999 and continues with this DEIS. This initial 1999 project was identified as the Crawford Vegetation Management Project and latter renamed as the Crawford Project. The Proposed Action was revised in 2005 using the Forest Supervisor's specific direction detailed in the Project Initiation Letter.

Based on comments received from the public and other agencies, direction given by Forest leadership, and through incorporating Forest Plan amendments, existing State and Federal laws, and Forest Service interim direction, the range of options/differences between alternatives is limited. The alternatives were designed to stay within the framework of ecological stewardship and the Malheur Forest Plan.

All the action alternatives described in the DEIS were developed with some common themes. All action alternatives would:

- Change the species composition and structure of the vegetation to develop a trend toward more resilient historical vegetative conditions (HRV),

- Implement a roads system that meets public and management access needs, while reducing the risk of sediment reaching streams while providing safe and adequate roaded access in the project area,
- Adjust dedicated old growth and replacement old growth boundaries to meet Forest Plan standards
- Capture economic value of trees removed in meeting the purpose and need items above,
- Provide some level of employment to the local community.
- Reduce the effects of roads on wildlife and water quality,
- Apply water quality Best Management Practices (BMPs) in the design and implementation of the alternatives to protect water quality.
- Avoid effects on sensitive areas such as heritage sites and sensitive plant sites by not proposing harvest in those areas.
- Reduce future fuel hazards,
- Implement visual corridor plans for Highway 7 and Highway 26.

Each action alternative analyzed in detail discloses environmental effects associated with its implementation, thereby facilitating a comparison of alternatives. This comparison of effects along with projected environmental consequences detailed in Chapter 3 provides the Responsible Official with information needed to make an informed choice between alternatives.

Alternatives Considered but Eliminated from Detailed Study

Through the National Environmental Policy Act (NEPA) interdisciplinary process and public scoping, several alternatives may be investigated before settling upon those to be pursued through full analysis. Alternatives may be found to be beyond the scope of the project, impractical, or may require amendments that deciding officials do not wish to pursue with this action. The following are descriptions of alternatives considered but eliminated from detailed study and a rational why they were not analyzed.

Designate Larger ROGs

The interdisciplinary team (IDT) considered developing alternatives that included set asides of new, larger Replacement Old Growth (ROGs) areas. Current research indicates that acreage sizes for Old Growth in the Forest Plan may not be adequate for the species for which they are designated (pine marten and pileated woodpecker). The designation of these areas would have required an additional Forest Plan amendment. Rather than address changes indicated by current research on a project-by-project basis, this issue is better dealt with in a future Forest Plan revision since it affects the entire old growth network on the Forest.

Require Winter Logging

The interdisciplinary team considered restricting ground skidding to frozen soil or snow covered conditions. Skidding under these conditions could lessen soil and visual impacts. Acknowledging the potential benefits of winter logging, this alternative was eliminated for several reasons. This alternative would have been more costly and potentially would have made commercial thinning uneconomical. Winter logging would conflict with snowmobile use on those portions of haul roads identified as snowmobile routes. Field soil surveys identified that the existing detrimental soil conditions range from 0-14 percent, with an average of 6%. This is well

below the Forest Plan threshold of 20%. With proposed design measures in place (See Table 2.4) expected impacts of additional ground skidding would still maintain total soil disturbance below the Forest Plan threshold.

Prohibit Temporary Road Construction Adjacent Highway 7

The proposed construction of two temporary roads adjacent Highway 7 would be visible in the foreground area for the short-term along the highway. To eliminate the need for these roads, an alternative was considered to either use a skyline system to bring the logs to upslope roads or build new spurs down into these same areas. This alternative was considered early in the process but was dropped from further consideration. The option to skyline yard these areas would require rigging cables across the highway which is a major operational and safety constraint. Bringing the access roads from existing upslope roads would require many more miles of road that would pose even a greater effect on the visual corridor.

Eliminate RHCA Log Haul

Log haul on existing roads within RHCAs has the potential to temporally increase sediment delivery into streams. Constructing new haul roads outside of RHCAs was considered to avoid this impact. Constructing new haul roads would potentially have a greater impact on soil and water quality, than utilizing existing roads in RHCAs with required protection measures to reduce potential impacts such as watering of the road surface to reduce dust, and maintenance or reconstruction of log haul roads to decrease the risk of sedimentation.

Construct New System Roads rather than Temporary Roads

Logging road access is needed into many of the proposed harvest areas. Either new system roads (specified roads) or temporary roads could be built into these areas to permit economically efficient timber harvest. The alternative to include the construction of new system roads was dismissed since they are more expensive to construct and are not needed for management activities for a long period of time. Construction of temporary roads was considered a better options since they be decommissioned after use to reduce soil, water, and wildlife impacts.

Retain Current Motorized Vehicles Access

Approximately 0.9 miles of road currently open to public motorized vehicle access is proposed for closure. An additional 17.8 miles of road decommissioning is proposed. Public comments have requested that all current motorized vehicle access be maintained, stating the rationale that road closures limit public access to those individuals with physical limitations. An alternative to retain all existing drivable roads in an open status was considered but eliminated from detailed study. The few roads proposed for closure would have minimal impact on the primary access needs and uses in the area. These include hunting, grazing permittee access, winter recreation, firewood cutting, and power line maintenance. Over 90% of the roads proposed for decommissioning are already closed. The goal for these roads is to complete additional work to restore the hydrologic function including subsoiling the road surface, adding drainage, seedling and mulching, and removing culverts where needed. Approximately 0.9 miles of road closure is being proposed, however the proposed action also proposes to reopen 1.7 miles of existing closed road. These miles consist of two roads that were closed in the early 1990's to reduce wildlife disturbance. Since establishment of the closures the roads have been monitored. One of the roads is located in a meadow area and the public has been consistently driving around the

established closure causing rutting and meadow damage. Closure of the other road has focused public use on a nearby road located in a riparian area. Heavier use of the riparian road is causing resource damage and sediment concerns. In this case the proposal to close the riparian road and re-open the upland road which is more stable.

Relocate FS 2620 Road to Reduce Impacts to Fish Habitat (Main Crawford Creek Rd)

An alternative was considered to relocate FS Road 2620 outside of the RHCA to reduce impacts to fish habitat. This alternative was eliminated from detailed study for two primary reasons. The Malheur Roads Analysis (Appendix A) identified FS Road 2620 as a part of the minimum primary road system for the Malheur Forest. Minimum primary roads have high recreation or other resource values. Relocation of the road would require a very complex and costly analysis. Line officer direction was given to the interdisciplinary team to not consider closure of the road at this time. FS Road 2620 would be maintained during log haul to minimize impacts from use.

Increase Timber Harvest

Additional densely forested areas could be included for commercial thinning. These areas were identified in the 2001 Crawford Proposed Action. These include stands on steeper slopes exceeding 35% (approximately 150 acres) and areas where road access is very limited (approximately 600 acres). In both areas, average forest stand diameters are very small, 7" to 9" dbh. These areas were dropped for harvest consideration primarily due to logging economics. The cost of skyline yarding the steeper slopes and construction of long temporary or specified roads made commercial thinning economically unfeasible at this time. These areas also provide valuable security habitat for big game species, and potential connectivity habitat for wide ranging carnivores.

Alternatives Considered in Detail

The alternatives were developed based on varying responses to the key issue discussed in Chapter 1, with actions that respond to meeting purpose and need and design features and mitigation requirements related to the issues and public concerns. Four alternatives were considered, fully developed, and analyzed. These are:

- Alternative 1 – No Action.
- Alternative 2 – Proposed Action
- Alternative 3 – Alternative to the Proposed Action, Alternative 2. In this alternative, temporary road construction lengths would not exceed 1/10 of a mile or approximately 500 feet. The average skidding distances would be increased to reduce the amount of temporary road needed. Alternative 3 addresses public concerns relating to water quality and soil, and impacts from new road construction (including temporary roads). By restricting the length of temporary roads allowed for harvest access, it was necessary to delete some harvest units requiring very long and uneconomical skidding distances. Alternative 3 excludes harvest in areas designated as satisfactory big game cover. Portions of six commercial harvest units included in Alternative 2 are located in satisfactory cover and were deleted from Alternative 3. Actions proposed in Alternative 2 for road closures, road decommissioning,

prescribed burning, and dedicated old growth adjustment activities are the same in this alternative.

- Alternative 4 – Alternative to the Proposed Action, Alternative 2. In this alternative no commercial thinning would occur, instead only the small trees would be precommercially thinned in those units identified in Alternative 2 for commercial thinning. This is in response to public comments regarding water quality and soils. Public comments expressed concerns that logging activities would further degrade water quality. Proposed road closure/decommissioning, prescribed burning, and old growth re-adjustment activities identified in the proposed action are the same.

The following major features are described, particularly as they differentiate the alternatives. The management requirements, constraints, and mitigation and monitoring are combined for the three action alternatives at the end of chapter.

- Commercial Harvest
- Road Use during Harvest
- Precommercial thinning
- Activity Fuels Treatments
- Prescribed Burning
- Road Closures and Decommissioning
- Old Growth Adjustment
- Management Requirements, Constraints, and Mitigation Measures
- Monitoring

Alternative 1 - No Action Alternative

Purpose and Design:

The purpose of this alternative is to allow current processes to continue, along with associated risks and benefits, in the Crawford Project Area.

The No Action alternative is required by NEPA. In this document the no action alternative means the proposed project (which includes all activities identified in the proposed action) would not take place at this time. Alternative 1 is designed to represent the existing condition. It serves as a baseline to compare and describe the differences and effects between taking no action and implementing action alternatives.

Ongoing management practices and activities such as motorized access travel management, road maintenance, dispersed recreation, invasive plant management, fire protection, and livestock grazing would be allowed to continue in the project area.

Description of Specific Features:

Commercial Harvest/Road Use

- None

Precommercial thinning

- None

Activity Fuels Treatment

- None

Prescribed Fire

- None

Road Closures and Decommissioning

- No Change from existing situation of open and closed roads

Old Growth Adjustments

- No change from the existing allocations.

Alternative 2 – Proposed Action

Purpose and Design

This alternative was designed to meet the purpose and need for action and was developed from the recommendations in the Upper Middle Fork John Day Watershed Assessment and management direction in the Malheur Forest Plan. The rationale for development is included in Chapter 1.

The following are Alternative 2 activities descriptions. Specific design measures and monitoring requirements are listed at the end of Chapter 2. A map of the harvest units and road closure/decommissioning can be found in Appendix A and a listing of each harvest unit in Appendix B.

Activity Descriptions

Commercial Harvest

- Commercial Thinning – 2,073 acres
- Shelterwood Harvest – 119 acres

There are two different harvest prescriptions that would be implemented with the alternative, commercial thinning and shelterwood harvest. Both harvest prescriptions would be completed using ground based harvest systems. The commercial thinning prescription promotes ecologically appropriate compositional and structural conditions in order to increase resiliency and promote development of structural and wildlife habitat conditions currently lacking across the area and watershed as a whole. Commercial thinning would harvest merchantable tree in immature forest stands by thinning from below to reduce stocking levels to enhance tree growth and to allow for the reintroduction of fire. This treatment would thin small/medium size trees (7 to 20.9" dbh). An additional 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, nutrients resulting in more vigorous, healthier forest stands. Trees would be left at a varied spacing, with the density varying as much as 50% across the stands. Table 2.1 in Chapter 2, Design Measures Section, shows the variable spacing that would be applied in dry forest types and dry forest mixed conifer sites. In addition, 5 to 15% of the understory will be left in unthinned patches from 2 to 5 acres in size for wildlife cover.

A portion of the commercial thinning areas are located within wildlife connectivity corridors. The objective is to reduce stocking in these stands while retaining sufficient trees per acre to provide denser forest stands than the surrounding area for security. To meet Forest Plan wildlife connectivity standards, fewer trees would be thinned to retain a higher density and clumps of trees would also be designated. Specifically, the canopy cover is to be left in the upper 1/3 of the site potential.

Commercial thinning would also occur in approximately 88 acres of Replacement Old Growth. The objective of thinning is to reduce stocking to increase resiliency of the area for the long term and accelerate growth and the development of large trees. Instead of rigidly thinning from below, the objective will be to thin trees from each size class to encourage the development of a multi-storied stand. All trees that are over 21" DBH will be retained to provide structural diversity, regardless of their condition.

A nonsignificant Forest Plan amendment is proposed to commercially thin 70 acres of satisfactory cover. Thinning activities would reduce satisfactory cover below Forest Plan Standards to meet the purpose and need of promoting a change in species composition and structure to develop a trend toward more resilient historical vegetation conditions in upland forested stands. Most of the treatments would occur in Dry Forest types. These stands are considered outside the historic range of variation (HRV), i.e., overstocked and likely unsustainable given the increasing risk of uncharacteristically severe fire and insect epidemics. These areas would likely fall out of cover within the next 25 years if not treated. Hiding/security cover patches would be maintained in all proposed units to minimize effects.

The shelterwood harvest would remove less desirable trees from the middle and understory, thin desirable trees where they are over stocked, and reforest the resulting understocked areas.

Both the commercial thinning and shelterwood treatments would include the following design features:

- All trees 21 inches and larger in diameter will be retained, except where they present a safety hazard or operational constraint such as in the construction of temporary roads during logging.
- There will be no net loss of old forest structures (OF) only a change in the types of OF structure. This includes converting OFMS to OFSS where ecologically appropriate.
- Existing snags 12+ inches in dbh will be retained except where they present a safety hazard.
- No harvest activities will occur within RHCAs.

Road Use during Harvest

- Temporary road construction – 8.6 miles. Temporary roads would be constructed in several short segments ranging from a few hundred feet to approximately a mile in length.
- Road reconstruction - 10.9 miles
- Road maintenance – 35.2 miles

In order to accomplish timber harvest activities, road reconstruction, temporary road construction, and road maintenance would occur to provide adequate access for harvest and upgrade the road system to meet safety and resource protection needs. Appendix C identifies each road proposed for log haul under Alternative 2.

Most of the National Forest System land in the project area is roaded with the majority of the roads being Maintenance Level 1 and 2 (native surface or gravel). All of the roads will need some work done on them to meet maintenance standards. This work will range from simple maintenance to reconstruction.

On most roads, the roadway surface is either rutted or has rill erosion, or both, which is caused by water running down the roadway or rutting made by the passage of a vehicle. This allows sedimentation to filter into adjacent streams.

Road surface maintenance needs include blading to reshape the surface. Most roads in the project area will need this work done. Other maintenance items needed, includes brushing areas where there is vegetation encroaching on the road and seeding those areas where the soil has been disturbed by maintenance activities.

The following examples work can be performed as maintenance in any contracts:

- Blading and shaping the road surface including existing drainage dips, grade sags, and waterbars.
- Repair of damaged culverts
- Placing rock in some existing drainage dips and grade sags
- Placing rock in wet areas of road
- Brushing of small trees and shrubs along the edge of the road
- Removal of hazard trees
- Watering of roads to reduce dust during log haul (dust abatement)

The following work is classified as maintenance under the definition listed in the Federal Register and is examples of the work that will be listed as reconstruction in any contracts that are issued.

- Constructing new drainage dips.
- Constructing new waterbars.
- Constructing new outlet ditches.
- Placing geotextile on existing road surface.
- Placing fill material in ruts in road.
- Repair or replacing existing cattleguards.
- Removing small trees and stumps

Temporary roads would also be needed to support timber harvest. All temporary roads would be decommissioned after use. Decommissioning would eliminate future use of the road with the objective of restoring hydrological function. This will include subsoiling and seeding as necessary.

Precommercial Thinning

- Precommercial thinning – 935 acres

Following timber harvest, areas with remaining high density would be thinned by further removal of small diameter trees (generally less than 9 inches in diameter) to achieve desired

stand conditions. The precommercial thinning prescription is recommended where the small trees to be cut are not merchantable saw log sized material. The objective is to reduce ladder fuels by reducing the amount of live or dead fuels, and increasing tree growth.

Reforestation

- Conifer Planting – 119 acres

Following the shelterwood harvest, areas that are understocked and greater than ½ acre in size would be planted with early seral (ponderosa pine and western larch) conifer tree seedlings.

Activity Fuels Treatments

- Yard tops attached – 507 acres
- Hand pile – 174 acres
- Grapple pile – 877 acres

The activity fuels treatments in Alternative 2 include yarding tops attached, hand piling, and grapple piling. There are several methods proposed to treat fuels generated by logging and precommercial thinning, including yarding with tops attached, whole tree yarding, machine pile, hand pile and prescribed underburning. Yarding tops attached and whole tree yarding are done during the logging operations. Both methods bring tree tops and limbs to a landing, where it is piled and burned or allowed to be used commercially as chips or firewood. Machine piling is done with a grapple on a low ground pressure (<8 pounds per square inch (psi)) track excavator on slopes less than 35%. Grapple piling is used in areas with moderate to high fuel loads. Piles are then burned during the late fall after sufficient fuel moisture is achieved to minimize fire spread. Grapple machines minimize ground disturbance and compaction. Hand piling is primarily used on slopes greater than 35% with moderate to high fuel loads. Piles are burned in the late fall when there is sufficient moisture to minimize fire spread.

Prescribed Fire

- Prescribed burning – 5,300 acres

Prescribed burning (underburning) would occur within an approximate 5,300 acre area of the 14,950 acre project area over the next 5 years. Within the 5,300 acres, not all acres would be burned and there are different objectives for areas with resource concerns. Burning would be accomplished in the fall and spring times of year when weather and moisture conditions are appropriate and after much of the mechanical work is completed. Multiple prescribed burning entries may be needed to reduce the ladder and surface fuels to reach the desired fuel composition, which has increased beyond historical conditions and allow for future management of natural ignitions. Ignition would be by hand or would be by ATVs. The prescribed fire perimeter is comprised of roads and all other interior control lines would be primarily roads. An estimated 1.5 miles of hand line may be used as a control line around and adjacent to private lands and to tie road to road. Hand line in addition to that described may be needed to exclude fire from aspen, Dedicated Old Growth, or the research plots, if use of roads is not used.

Within the 5,300 acre burn boundary, approximately 67% is within the warm-dry plant association group and approximately 9% is within the hot-dry biophysical plant association

group. All of this is a fire regime 1, historically with low intensity, frequent fire. Under this alternative approximately 1,200 acres will be thinned prior to burning.

The objectives of utilizing prescribed fire are to reduce surface fuels, reduce litter depth, and increase canopy base height. Prescribed fire is not being utilized to change the structural stage of any the stands. Some tree mortality is expected and acceptable in forested stands. Acceptable mortality ranges are as follows:

- Trees 0-5" dbh, tree mortality is expected to range from 5 to 15%.
- Trees 5-10" dbh, tree mortality is expected to range from 5 to 10%.
- Trees 10-20"+ dbh, tree mortality is expected to range from 1 to 5%.

These mortality levels are based on averages over the whole burning area and recognize the fact that fire is a relatively inexact tool and that there would be some localized areas where mortality reaches 100%. Mortality patches should be kept to less than 2 acres wherever possible and preferably to the ¼ to ½ acre size that was thought to exist under historic conditions (Agee, 1993).

No more than 3,000 acres would be burned using prescribed fire during any one year. Also burning would be limited during any one year to one grazing pasture. The recovery of vegetation, including forage production and species diversity, would be monitored after prescribed burning to ensure the areas are ready to support livestock grazing on a sustainable level. These burn operations would be coordinated with the Grazing Permittee and the Rangeland Management Specialist administering the affected allotments. Where possible the burning would be fitted to the grazing systems being used on the affected allotments to minimize impacts to the permittee's ranch operations. It is anticipated that after an area is burned livestock grazing will resume after a rest period of one full growing season in accordance with the Forest's Post Fire Interim Grazing Guidelines (2003). Following this rest a District interdisciplinary team will determine if forage recovery and species diversity is sufficient to resume grazing.

Within the 5,300 acres, fire would be excluded from the following areas; approximately 450 acres of Designated old-growth (including 03134PW and a portion of 03335PP), 14 aspen sites of approximately 27 acres, and 11 research plots with at least a 50 foot buffer. Fire would be excluded from these areas by methods including but not limited to the use of roads as control lines or fire line construction.

Also within the 5,300 acres, lightning would not occur but fire would be allowed to back into approximately 500 acres of non-forested stands and into RHCAs. The non-forested acres typically have minimal fuel loads which are discontinuous and therefore rarely burn. Ignition would not occur within the RHCAs. Past district experience has shown that when fire is allowed to back into RHCAs the effects are dependent on the existing vegetation. As soon as vegetative species and moisture regimes within the RHCA change and become more shaded with more moisture and higher humidity, the fire would not burn, so riparian vegetation is rarely affected. Shrubs and conifers providing streamside shade and riparian vegetation are rarely affected because they do not burn with enough intensity to cause mortality.

Approximately 425 acres of late and old structure are within the 5,300 acres and not within the DOG. Underburning in these areas would be low intensity with the objective of reducing surface

fuels while minimizing tree mortality, especially in the larger trees. Methods to protect large trees can include raking the litter and bark accumulation away from the base of the tree, not burning areas where concentrations of large trees exist, burning when duff moistures under the larger trees is 120% or greater which has been determined to not cause damage to the base of the tree (Scott, 2002).

Approximately 340 acres of ROG are within the 5,300 acres. Prescribed fire in this area would minimize mortality in the larger trees as described above and minimize loss of snags and large down wood.

Approximately 178 acres providing satisfactory cover are within the 5,300 acres. Much of the identified satisfactory cover is also late and old structure. Underburning in these areas would retain multi-storied stand characteristics and high canopy closures. After implementation, these areas would still meet the requirements of satisfactory cover. Objectives of underburning would be to reduce surface fuels, while minimizing overall tree mortality. Emphasis would be placed on minimizing understory tree mortality (less than 5 percent) currently providing big game security cover. Excluding fire from these stands is also acceptable.

During project implementation, underburning will adhere to the Oregon Smoke Management Plan and the State implementation Plan of the Clean Air Act.

Road Closures and Decommissioning

- Gated or signed closures – 0.7 miles
- Bermed or signed closures – 0.2 miles
- Decommissioning – 17.8 miles
- Opening of closed roads – 1.7 miles

(Note: These mileages include only activity within the Mill Creek subwatershed; minor additional activities occur outside this subwatershed.)

The new road closures would be gated or bermed and restrict yearlong use to motorized vehicles. Decommissioning would eliminate future use of the road with the objective of restoring hydrological function. Over 90% of these roads are already closed. The decommissioned roads would be bermed at the beginning of the road, the road surface subsoiled where feasible, seeded and mulched, drainage provided for the road surface, and culverts will be removed from the decommission roads. Conifers will be planted on decommissioned road segments located in RHCA's where conditions will support establishment and growth. These roads will be removed from the Forest Road Transportation System.

Proposed decommissioning activities will also include removal of one culvert on Forest Service Road (FSR) 2620156, ripping/subsoiling and seeding herbaceous vegetation, spreading woody debris and slash over the former roadbed, and installing drainage structures to discourage unauthorized motorized vehicle use and ensure proper drainage occurs over time.

In the Mill Creek subwatershed, approximately 1.7 miles that are currently closed to motorized vehicles would be re-opened. These miles consist of two roads that were closed in the early 1990's to reduce wildlife disturbance. Since establishment of the closures the roads have been monitored. One of the roads is located in a meadow area and the public has been consistently

driving around the established closure causing rutting and meadow damage. Closure of the other road has focused public use on a nearby road located in a riparian area. Heavier use of the riparian road is causing resource damage and sediment concerns. In this case the proposal to close the riparian road and re-open the upland road which is more stable.

Table 2.23 displays the miles of road proposed for closure in the Mill Creek subwatershed. Additional maps and summary information regarding road closures and decommissioning can be found in Appendix B and Appendix C.

Old Growth Adjustments

Alternative 2 would require a nonsignificant Forest Plan amendment to adjust three Dedicated Old Growth (DOG) areas and delineate 3 new Replacement Old Growth (ROG) areas within the Crawford Project Area (see Figure 1.3). The DOG adjustment is needed to better delineate suitable wildlife habitat (see Table 1.3 and Table 2.23). Currently, no ROGs have been allocated to be managed as replacement areas for associated Dedicated Old Growth (DOG) areas (see Table 1.3 and Table 2.23).

Alternative 3

Purpose and Design:

Alternative 3 responds to the two key issues.

Key Issue #1: There is a concern that the proposed ground disturbing activities associated with road construction and commercial timber harvest could degrade water quality and impact soil productivity.

Key Issue #2: Commercial thinning of about 70 acres is proposed in forested areas identified as satisfactory big game cover. Currently satisfactory cover is 2.7% of the Mill Creek subwatershed, below the Forest Plan standard of 12%. These forested areas provide some of the highest quality cover habitat available for big game species (elk) in the project area. This thinning would degrade the satisfactory cover by decreasing the tree density which in turn reduces the average canopy closure needed to maintain this standard.

Alternative 3 minimizes temporary road construction to less than 0.1 miles (500 feet) for each road. The average skidding was increased in some of the harvest units in response to decreasing the length of the temporary roads. With this reduction in access, approximately 1/3 of the harvest areas in Alternative 2 were dropped due to high logging costs. Without longer temporary or specified access roads, skidding distances made harvest not viable in these areas.

Alternative 3 excludes harvest in those areas identified as satisfactory cover to maintain the existing tree density needed to maintain this Forest Plan cover standard. Portions of six of the commercial thinning areas were dropped from harvest.

A map of the harvest activities and listing of harvest units is in Appendix A.

The following are Alternative 3 activities descriptions. Specific design measure requirements are listed at the end of Chapter 2.

Activity Descriptions

Commercial Harvest

The proposed harvest in this alternative has been reduced by approximately 30% from Alternative 2. The treatment units common to Alternative 2 have the same harvest prescriptions as previously described.

- Commercial thinning - 1,506 acres
- Shelterwood harvest – None

The commercial thinning prescriptions and objectives are the same as those described in Alternative 2.

A portion of the commercial thinning areas are located within wildlife connectivity corridors. The objectives are the same as Alternative 2.

Commercial thinning would also occur in approximately 50 acres of ROG. Objectives are the same as alternative 2.

Road Use during Harvest

The amount and type of road reconstruction and road maintenance is very similar to Alternative 2. The number of miles of temporary road construction was reduced by approximately 82% compared to Alternative 2. The location and description of the reconstruction, maintenance, and temporary road construction activities common to Alternative 2 is the same as previously described.

- Temporary road construction – 1.5 miles
- Road reconstruction - 10.9 miles
- Road maintenance – 31.9 miles

Precommercial thinning

- Precommercial thinning – 666 acres

The precommercial thinning treatments areas and activity descriptions are generally the same as described for Alternative 2. Those acres dropped from commercial harvest would be not precommercially thinned.

Activity Fuels Treatments

- Yard tops attached – 276 acres
- Hand piling – 140 acres
- Grapple piling – 631 acres

Again the activity fuels treatment is much the same as described for Alternative 2. Since harvest levels were reduced in Alternative 3, the amount of activity fuels treatments were reduced accordingly. The description of each of following fuels treatment can be found in the narrative for Alternative 2.

Prescribed Fire

The prescribed fire treatments are the same as described in Alternative 2.

Road Closures and Decommissioning

The road closures, road reopening, and road decommissioning are the same as Alternative 2.

Old Growth Adjustments

The delineation of 3 new ROGs and adjustment of 3 DOGs are the same as described in Alternative 2.

Alternative 4

Purpose and Design

Alternative 4 was developed in response to the Key Issue #1: *There is a concern that the proposed ground disturbing activities associated with road construction and commercial timber harvest could degrade water quality and impact soil productivity.*

Alternative 4 does not include any timber harvest activities. The alternative does include precommercial thinning to reduce stand density of smaller trees, and prescribed burning.

Activity Descriptions

Commercial Harvest/ /Road Use

There is no commercial harvest, temporary road construction, road maintenance, or reconstruction activities proposed in this alternative.

Precommercial Thinning

- Precommercial thinning – 795 acres

The precommercial thinning treatments are the same as described in Alternative 2.

Activity Fuels Treatments

- Hand piling – 146 acres
- Grapple piling – 649 acres

Again the activity fuels treatment is much the same as described for Alternative 2 except there is no commercial harvest associated with fuels treatment. The description of each of following fuels treatment can be found in the narrative for Alternative 2.

Prescribe Fire

The prescribed fire treatments are the same as described in Alternative 2.

Road Closures and Decommissioning

The road closures, road reopening, and road decommissioning are the same as Alternative 2.

Old Growth Adjustments

The delineation of 3 new ROGs and adjustment of 3 DOGs are the same as described in Alternative 2.

Implementation Schedule – Alternatives 2, 3, & 4

Commercial Harvest/Road Use

Alternatives 2 and 3 - Activities would occur for one or two year period

Alternative 4 – No activities

Precommercial Thinning

Alternative 2 and 3 - Activities would follow the completion of commercial harvest; one to two year period

Alternative 4 – Activities would occur for a one or two year period

Activity Fuels Treatment

Alternatives 2 and 3 - Activities include yarding tops attached, grapple piling, and hand piling; the yarding of tops will occur during commercial harvest; the grapple piling and hand piling will follow completion of the commercial harvest and precommercial thinning; limited by snow depth.

Alternative 4 – Activities include grapple piling and hand piling.

Prescribed Fuels Treatment

Alternative 2, 3 and 4 – Burning would occur during spring or fall periods; burning could occur annually for five years; scheduling is highly dependent on weather conditions; a maximum of 3,000 acres per year would be burned; burning limited to one grazing pasture per year; burning would not occur within harvest or commercial thinning units until these activities including activities fuels treatments are completed. These burn operations would be coordinated with the Grazing Permittee and the Rangeland Management Specialist administering the affected allotments. Where possible the burning would be fitted to the grazing systems being used on the affected allotments to minimize impacts to the permittee's ranch operations.

Road Closures and Decommissioning

Alternatives 2 and 3 - Purchaser Closures (Timber sale) – Post closure notices – 1 year prior to closure; install closures the year following closure posting of notice.

Alternatives 2, 3, and 4 - Other closures and decommissioning would occur as funding becomes available during the next five years; reopening of closed roads would occur immediately.

Forest Plan Amendments

Alternatives 2, 3 and 4 were designed, in part, to adjust 3 Dedicated Old Growth Areas and create 3 new Replacement Old Growth Areas. Selecting *Alternative 2, 3 or 4 would include a site-specific, nonsignificant amendment* (Management Area designations) to the Malheur Plan. The management allocations would increase MA 13 (Old Growth) by 554 acres and decrease MA 1&2 (General Forest and Rangeland) by 264 acres and decrease MA 14 (Visual Corridors) by 290 acres. Visual corridor standards would still apply in seen areas (Visual Corridors) along Highway 7 and 26.

Another nonsignificant amendment would be needed to select Alternative 2 to allow commercial thinning in 70 acres identified as satisfactory big game cover.

Management Requirements, Constraints, and Design Measures

The Forest Service developed the following design measures to be used as part of the action alternatives. Throughout the project, all applicable Timber Management, Road Systems, Fuels Management, Watershed Management, and Vegetative Management BMPs (General Water Quality Best Management Practices, Pacific Northwest Region 1988) will be used to enable the achievement of water quality standards. (A complete list of Best Management Practices is located in the Project File):

Table 2.1 – Wildlife Management Requirements, Alternatives 2 and 3.

Wildlife Alternatives 2 and 3	Objective	Responsible Person
<p><i>Down Logs – Commercial Harvest</i> Where existing, maintain down logs at the following levels: in ponderosa pine 3-6 pieces/acre, 12-inch min. diameter at small end, >6 feet (20-40 total feet/acre); in mixed conifer 15-20 pieces/acre, 12-inch min. diameter at small end, >6 feet (100-140 total feet/acre); in lodgepole pine 15-20 pieces/acre, 8-inch min. diameter at small end, >8 feet (120-160 total feet/acre).</p>	<p>Provide down log habitat and long-term productivity.</p>	<p>Sale Administrator</p>
<p><i>Raptor Nests – Commercial Harvest</i> New raptor nests discovered in or immediately adjacent to the project area during project implementation will have nest protection and disturbance standards adhered to (see Table 2.3). To conduct activities during a prohibited date a waiver must be obtained.</p>	<p>Protect new raptor nests from alteration and disturbance</p>	<p>Sale Administrator</p>
<p><i>Snags – Commercial Harvest</i> The Forest Plan Record of Decision defines snags as standing dead trees, usually greater than 40 feet in height and 12 inches dbh. They provide habitat for raptor nesting and primary cavity excavator species. In order to preserve this habitat, snags 12 inches dbh and larger will be retained unless they present a safety hazard, or must be removed for road reconstruction, temporary road construction, and on log landings. Retaining these snags will maintain foraging opportunities for primary excavator species. Large live trees within 50 feet of large snags (those at least 18 inches dbh and 40 feet tall) will be retained. This will protect and maintain these existing large snags. To help protect and develop future snags 12 inches dbh or greater, take advantage of variable spacing and unthinned patches in thinning units to retain live trees around snags.</p>	<p>Snag Protection and long-term recruitment of snags</p>	<p>Silviculturist and Marking Crew</p>

<p align="center">Wildlife Alternatives 2 and 3</p>	<p align="center">Objective</p>	<p align="center">Responsible Person</p>																												
<p>Connectivity Corridors – Commercial Harvest A minimum of 25% of each stand within connectivity corridors will be retained and left as clumps distributed throughout the unit if available. Each clump is expected to be no smaller than one acre in size.</p> <p>Canopy cover is to be retained in the upper 1/3 of the site potential.</p>	<p>Maintain connectivity corridors</p>	<p>Silviculturist and Marking Crew</p>																												
<p>Variable Tree Spacing – Commercial Thinning Retain variable tree spacing within harvest units. The density will vary as much as 50% across each stand. 5 to 15% of the understory will be retained in unthinned patches from 2 to 5 acres in size for wildlife cover.</p> <p>Variable Spacing- Density Requirements</p> <table border="0"> <tr> <td>Dry (Ponderosa Pine) Forest Sites</td> <td>Prescribed Average 50 sq./ft. basal area</td> </tr> <tr> <td>Basal Area</td> <td>Percentage of Stand</td> </tr> <tr> <td>25</td> <td>10%</td> </tr> <tr> <td>40</td> <td>15%</td> </tr> <tr> <td>50</td> <td>50%</td> </tr> <tr> <td>60</td> <td>15%</td> </tr> <tr> <td>Unthinned</td> <td>5-15%</td> </tr> </table> <table border="0"> <tr> <td>Dry Mixed Conifer Sites</td> <td>Prescribed Average 65 sq./ft. basal area</td> </tr> <tr> <td>Basal Area</td> <td>Percentage of Stand</td> </tr> <tr> <td>45</td> <td>10%</td> </tr> <tr> <td>55</td> <td>15%</td> </tr> <tr> <td>65</td> <td>50%</td> </tr> <tr> <td>75</td> <td>15%</td> </tr> <tr> <td>Unthinned</td> <td>5-15%</td> </tr> </table>	Dry (Ponderosa Pine) Forest Sites	Prescribed Average 50 sq./ft. basal area	Basal Area	Percentage of Stand	25	10%	40	15%	50	50%	60	15%	Unthinned	5-15%	Dry Mixed Conifer Sites	Prescribed Average 65 sq./ft. basal area	Basal Area	Percentage of Stand	45	10%	55	15%	65	50%	75	15%	Unthinned	5-15%	<p>Maintain variable spacing to maintain wildlife security cover</p>	<p>Silviculturist and Marking Crew</p>
Dry (Ponderosa Pine) Forest Sites	Prescribed Average 50 sq./ft. basal area																													
Basal Area	Percentage of Stand																													
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55	15%																													
65	50%																													
75	15%																													
Unthinned	5-15%																													
<p>Snags/Down Wood – DOG/ROG Locations – Temporary Road Construction Where temporary roads are constructed within or adjacent DOGs, ROGs and PWFA all felled hazard trees greater than 12” dbh will be retained on site. No temporary roads would be constructed within DOGs.</p>	<p>Projection of Snags and down wood in Dedicated Old Growth, Replacement Old Growth, and Pileated Woodpecker Feeding Areas.</p>	<p>Sale Administrator</p>																												
<p>Blue Grouse – Harvest Activities To provide blue grouse winter roosts, retain large mistletoe infected or “wolfy” Douglas-fir trees along ridge tops and large scab openings, where available</p>	<p>Protect Blue Grouse Winter Roosts</p>	<p>Sale Administrator, District Silviculturist, District Wildlife Biologist</p>																												

Table 2.2 – Wildlife Management Requirements, Alternatives 2, 3 and 4.

Wildlife Alternatives 2, 3, and 4	Objective	Responsible Person
<p>Snag Protection – Prescribed Burning No ignition will occur within 100 feet of a snag 12 inches dbh or greater, in order to preserve existing snags. No ignition will occur within 100 feet of featured down logs as described above to minimize charring and potential loss. Marked and designated wildlife trees will be protected. Protections will not preclude use of aerial ignition.</p>	Protect large diameter snags during prescribed burning	Fuels Planner and Burning Crew
<p>Shrubland Protection - Prescribed Burning To protect large shrublands including mountain mahogany, bitterbrush and sagebrush, no ignition would occur within 100 feet.</p>	Protect shrublands during prescribed burning	Fuels Planner and Burning Crew
<p>Mountain Mahogany Protection - Prescribed Burning To minimize mountain mahogany mortality no ignition within 100 feet.</p>	Protect mountain mahogany during prescribed burning	Fuels Planner and Burning Crew
<p>Down Logs – Prescribed Burning Prescribed fire activities will minimize fire consumption of down logs greater than 12 inches at the small end, and snags greater than 12 inches in diameter breast height (dbh). Underburning and fuel treatment will not result in consumption greater than 3” (1.5 inches per side) of the featured large logs described above.</p>	Protect down logs during prescribed burning.	Fuels Planner and Burning Crew
<p>Aspen Sites Prescribed Burning Prescribed fire will be excluded from 14 mapped aspen sites of approximately 27 acres by but not limited to the following; use of roads, hand line, or natural barriers.</p>	Protect aspen stands during prescribed burning	Fuels Planner, Burn Boss
<p>Elk Calves and Deer Fawns – Prescribed Burning Prior to ignition of spring (after May 1) burns, if crews site lone elk or deer, they will search the area for calves or fawns.</p>	Protection of calves and Deer Fawns during spring underburning.	Fuels Planner and Burning Crew
<p>Satisfactory Cover – Prescribed Burning Minimize understory tree mortality to less than 5 percent during prescribed burning in identified satisfactory stands. Excluding fire from these stands is acceptable.</p>	Maintain requirements of satisfactory cover during prescribed burning	Fuels Planner and Burn Boss

Table 2.3– Raptor Timing Restrictions , Alternatives 2 and 3.

Summary of Raptor Timing Restrictions, Alternatives 2 and 3 – Commercial Harvest			
Description	Timing – Activities Permitted*	Timing – Activities Prohibited**	Notes
Occupied goshawk nest sites (within PFA or within ½ mile of nest sites)	Activities can occur: October 1 – March 31	Activities are prohibited: April 1 – September 30	Historic nest sites in project area
* Activities are permitted in all locations during these periods except within prescribed nesting areas, i.e., for goshawks, no activities within 30-acre nesting area; for all other raptors, no activities within 100 feet of nest trees. ** Activities are only prohibited within distances specified in Column 1 for each species.			

Table 2.4 – Soils Management Requirements, Alternatives 2 and 3.

Soils Alternatives 2 and 3	Objective	Responsible Person
<p>Skid trails – Commercial Harvest Skid trail locations shall be designated and approved prior to logging. On areas where existing skid trails spaced 100-140 feet apart can be reused, reuse the old skid trails. Otherwise, space skid trails about 120 feet apart (except where they converge at landings and junctions); using existing skid trails where possible and appropriate.</p>	<p>(1) Keep soil impacts as small as practical, especially long-lasting impacts; and (2) keep detrimental soil impacts from this harvest and past harvests to less than 20% of the area of each sub-unit. (Limit soil damage.)</p>	<p>Sale Administrator/ Purchaser</p>
<p>Skid trails – Commercial Harvest Skidders shall not be allowed off skid trails. Directional felling and/or tractor winching will be used where necessary. Low ground pressure equipment (=8.5 psi) can be allowed off skid trails on dry, frozen, or snow covered soil. "Dry" means July through September, or obviously dry during other months. "Frozen" means frozen to a depth of 4 inches or more. "Snow covered" means sufficient snow depth to prevent soil disturbance and compaction.</p>	<p>Limit soil damage.</p>	<p>Sale Administrator/ Purchaser</p>
<p>Slopes Greater than 35% - Commercial Harvest Avoid skidding on slopes steeper than 35%, where feasible, using directional felling and tractor winching. There shall be no skidding on any slope steeper than 45%.</p>	<p>Limit soil damage.</p>	<p>Sale Administrator/ Purchaser</p>
<p>Soil Moisture – Commercial Harvest – Commercial Harvest No skidding will be done under wet soil conditions, when ruts six inches or deeper would form.</p>	<p>Limit soil damage</p>	<p>Sale Administrator/ Purchaser</p>
<p>Soil Condition – Subsoiling-Commercial Harvest The purchaser shall subsoil skid trails in units 049, 80, and 124 where the soil is suitable and where subsoiling would not spread noxious weeds. Subsoiling need not be done if the unit is logged under frozen or snow-covered conditions.</p>	<p>Keep detrimental soil impacts below 20%</p>	<p>Sale Administrator/ Purchaser</p>
<p>Soil Erosion – Subsoiling- Commercial Harvest Erosion from subsoiling skid trails shall be controlled by subsoiling in a "J" pattern, by water bars, or by comparable measures. If runoff cannot be diverted out of the furrows (such as in draw bottoms), do not subsoil. Skid trails on slopes steeper than 28% should not be subsoiled. Do not subsoil sections of skid trails where excessive rock will be pulled to the surface.</p>	<p>Limit soil damage.</p>	<p>Sale Administrator/ Purchaser</p>
<p>Soil Condition – Skidding – Commercial Harvest Skidding on units 68, 70, 72, 78, 90,142, 146, and 150 is limited to dry, frozen, or snow covered soil. For some of these units, subsoiling could be substituted for this requirement, upon approval of a soils specialist.</p>	<p>Keep detrimental soil impacts below 20%</p>	<p>Sale Administrator/ Purchaser</p>

Soils Alternatives 2 and 3	Objective	Responsible Person
Skidding on unit 148 is limited to frozen or snow covered soil.	Keep detrimental soil impacts below 20%	Sale Administrator/ Purchaser
Skid Trails – Cross Drains – Commercial Harvest Erosion from skid trails and tractor winch furrows shall be controlled by the use of cross drains or comparable measures. Outfalls of the cross drains shall be clear and located on soil where water will infiltrate, not on shallow or impermeable soil. Cross drains on skid trails should be spaced appropriately for the terrain.	Limit long-lasting soil damage.	Sale Administrator/ Purchaser
Skid Trail Seeding – Commercial Harvest Skid trails and disturbed soil shall be seeded as specified in Forest Plan Forest-Wide Standards 128 & 129.	Limit long-lasting soil damage. Seeding is necessary to supplement other erosion control measures.	Sale Administrator/ Purchaser
Landing Location– Commercial Harvest Re-use existing landings where feasible and where they are away from shallow soils and ephemeral draws unless approved by a hydrologist, soil scientist, or fisheries biologist.	Protect water quality and limit soil damage.	Sale Administrator/ Purchaser
Landings – Subsoiling – Commercial Harvest Subsoil and revegetate (trees or grass) all landings where feasible.	Speed recovery of damaged soil	Sale Administrator/ Purchaser
Non-Forest Areas- Equipment – Commercial Harvest Equipment traffic on the non-forest or juniper woodland, shallow soil inclusions shall be kept to a minimum.	To avoid concentrating water and erosion.	Sale Administrator, Purchaser
Non-Forest Areas- Equipment – Commercial Harvest Units 076 (the northeastern tip); 106; 108; 149 - no ground based equipment will be allowed on the small, non-forest or juniper woodland, shallow soil inclusions.	To avoid concentrating water and erosion.	Sale Administrator, Purchaser
Moist Soil Areas – Skidding – Commercial Harvest Unit 108 (the seasonally moist soil area northwest of the sharp bend in the road); Unit 128 (the seasonally moist area below the draw near the northeast corner of the unit) - Ground based equipment may be used only when ruts are less than 2 inches deep	To avoid providing channels for water, and to keep detrimental compaction to a minimum	Sale Administrator, Purchaser

Table 2.5 – Soils Management Requirements, Alternatives 2, 3 and 4.

Soils Alternatives 2, 3, and 4	Objective	Responsible Person
Ground Cover - Prescribed Burning Ground cover standards will be met as specified in the Forest Plan (Chapter IV, page 40). Soil erosion hazard, for areas within 50 feet of channels or ephemeral draws, is one step higher than that of the adjacent upland soil (unless a soils specialist, hydrologist, or fish biologist determines otherwise for a specific area).	Limit soil damage	Fuels specialist
Soil Protection – Grapple Piling Mechanical fuel control shall be done with low ground pressure (≤ 8.5 psi) machinery on dry soil, and machinery will stay on skid trails where possible.	Limit soil damage.	Sale Administrator

Table 2.6 – Watershed/Fisheries Management Requirements, Alternatives 2 and 3.

Watershed/Fisheries Alternatives 2 and 3	Objective	Responsible Person
RHCAs- Commercial Harvest Riparian Habitat Conservation Areas (RHCA) for Category 1, 2, and 4 streams and for Category 3 and 4 wetlands shall be consistent with PACFISH. (100-300')	Protect fishbearing perennial and intermittent streams with PACFISH buffers.	Fisheries Biologist, Hydrologist
Skidding – Draw Bottoms – Commercial Harvest There shall be no skidding up or down draw bottoms, except where approved by a soils specialist, hydrologist, or fish biologist.	Protect ephemeral draws	Sale Administrator
RHCAs- Road Activities – Commercial Harvest Road activities on Category 1 & 2 streams associated with removal, replacement, or improvement of culverts will be done during low flow periods. Cease all work if storm events occur and increase stream flows.	Reduce sediments; protect perennial and fish-bearing streams.	Fisheries Biologist, Hydrologist
RHCAs – Hazardous Substances – Commercial Harvest The Forest Service will require a Hazardous Substances Plan and Prevention of oil spill Plan from contractor the be reviewed and approved prior to implementation activities. Fuels and other toxicants shall not be stored within RHCAs, and other provisions of Pacfish Standard RA-4 shall be observed.	Prevent petroleum products or other deleterious materials from entering stream systems	Sale Administrator, Project Engineer COR
RHCAs – Road Work – Commercial Harvest For road work, operate machinery on road prism.	Reduce erosion/sedimentation potential	Sale Administrator, Project Engineer
RHCAs – Landing Locations – Commercial Harvest Landings, especially fueling sites, shall not be located in ephemeral draws or RHCAs without approval of hydrologist, soil scientist or fisheries biologist. This includes both new and existing landing sites.	Reduce sediment transport or erosion.	Sale Administrator
Draw bottoms – Skidding – Commercial Harvest If skidding across draw bottoms that show signs of water flow, skid only when the soil in the draw is dry or frozen, and place slash or other ground cover on the skidtrail after use.	Reduce erosion/sediment transport	Sale Administrator
RHCAs – Industrial Camping – Commercial Harvest Industrial camping permits will be required. Locations will be coordinated with a biologist before permits are issued.	Minimize resource damage.	Sale Administrator
RHCAs – In-stream Road Work – Commercial Harvest The work period for all in-stream work will be July 15 through August 15, as specified in The Oregon Guidelines For Timing Of In-Water Work To Protect Fish And Wildlife Resources, June 2000.	Reduce impacts during fish spawning period	COR
Protected or Restricted Road Use – Commercial Harvest In order to reduce or eliminate effects to water quality during project activities near RHCAs—no contractor/purchaser road use will be authorized on: Any decommissioned road in an RHCA. 2600252 from mile post 0.23 to the end of the road (T11,R35,Sec.22,26,27) 2620190 in the RHCA, from the junction of the 2620 to approximately 300 feet from the 2620447 junction (T11,R35,Sec. 24)	Reduce sediment transport or erosion.	Sale Administrator, Project Engineer

Watershed/Fisheries Alternatives 2 and 3	Objective	Responsible Person
<p><i>Dust Abatement – Log Haul – Commercial Harvest</i></p> <p>Dust abatement would be done on roads during rock and timber haul within RHCAs and elsewhere as prescribed by Malheur National Forest's Roads Rules, 1991. Within RHCAs, this would be accomplished by: watering the road, and/or by reducing the traffic speed to no greater than ten miles per hour. Field reconnaissance and past performance indicate water can be withdrawn from designated water sources while still meeting water quality standards. Proposed water sources would be located in two different areas:</p> <p>Blue Mountain Work Center on Road 2600877. There is a rock area behind a gate, near Clear Creek, which has been developed for water withdrawal.</p> <p>Obtaining water at the above sites would follow recommendations developed by National Marine Fisheries Service (May 1996). These recommendations include: the pump intake must not exceed 0.2 feet per second. In addition, the hose must be fitted with a screen mesh not exceeding 3/32 inch woven wire or perforated plate screens, or 0.0689 inch for profile screens with a minimum of 40% open area. In addition, intake of water cannot reduce stream flow more than 10%.</p> <p>No timing or flow restrictions are needed at the second site listed below:</p> <p>Rock Pit at Taylor Flat - This is a ground water source that may not have available water during late summer. No timing or flow restrictions are needed at this site.</p> <p>See Project File – Aquatics & Water Quality Report – Appendices A and B for other water withdrawal restrictions.</p>	<p>Reduce impacts resident fish populations</p>	<p>Sale Administrator, Project Engineer</p>
<p><i>Rock Fords – Commercial Harvest</i></p> <p>Throughout operations monitoring will ensure that the rock fords within Category IV RHCAs, intermittent streams, are adequate to allow water flow.</p>	<p>Reduce sediment transport or erosion.</p>	<p>Fisheries Biologist, Hydrologist</p>
<p><i>RHCA -Woody Debris – Commercial Harvest</i></p> <p>All trees felled in RHCAs for safety reasons will be kept on site to meet woody debris objectives because streams in the fisheries analysis area are deficient in LWD in accordance with PACFISH Standard RA-2.</p>	<p>Increase large wood in RHCAs</p>	<p>Sale Administrator, Project Engineer</p>
<p><i>Roads – Log Haul – Commercial Harvest</i></p> <p>Log haul is restricted to roads that are dry or frozen.</p>	<p>Reduce sediment transport or erosion.</p>	<p>Sale Administrator, Project Engineer</p>

Table 2.7 – Watershed/Fisheries Management Requirements, Alternatives 2, 3 and 4.

Watershed/Fisheries Alternatives 2, 3, and 4	Objective	Responsible Person
Draw Bottoms – Fire Lines – Prescribed Fire Fire lines will not be built down draw bottoms. After prescribed burning activities, fire lines will be water barred and/or seeded as necessary to prevent erosion.	Reduce sediment transport to streams.	Fuels specialist
RHCAs – Fire Ignition – Prescribed Burning No fire ignition will occur within RHCAs. This prohibition includes areas within 300 feet of fish-bearing water, 150 feet from the edge of permanently flowing non-fish-bearing streams, wetlands greater than one acre; 100 feet from the edge of scoured channels; and wetlands less than one acre.	Reduce impacts to riparian vegetation	Fuels specialist
RHCAs – Shrubs and Tree Shade – Prescribed Burning At least 95% of the shrub and tree shade, which directly shades permanently flowing stream channels, will be retained.	Maintain stream temperatures	Fuels specialist
Sediment Structures – Road Decommissioning Install temporary structures to protect streams during decommissioning, where needed.	Reduce sediment transport to streams.	COR
Streambank Disturbance- Seeding – Road Decommissioning Areas of streambank disturbance during decommissioning associated with roads will be seeded or planted.	Reduce erosion, sedimentation.	COR

Table 2.8 – Visual Management Requirements, Alternatives 2 and 3.

Visual Corridors Alternatives 2 and 3	Objective	Responsible Person
Temporary Roads – Landing Slash – Commercial Harvest Prior to harvest, the locations and clearing widths for all temporary roads and landings within 500 feet of Highways 7 and 26 will be reviewed by landscape architect or recreation specialist. Harvest activities must maintain a natural appearing landscape. The ground disturbance and clearing of the landings and disposal of logging debris on the landings cannot be visible from the highway and must be topographically screened. If the burning of the landing piles in this zone will cause more than 20% tree mortality surrounding the piles, consider either chipping or hauling the slash to a disposal area.	Reduce evidence of management activity.	Sale Administrator or Contracting Officer's Representative and Landscape architect or recreation specialist.
Temporary Roads- Commercial Harvest Immediately following harvest within 500 feet of Highway 7, all visible temporary roads will be rehabed to reduce the visual disturbance effects. Any stumps grubbed from road surface will be removed from view, the road prism will be smoothed to conform to the existing topography, the ditch along the highway will be reconstructed, and debris such as large rocks and limbs will be place on the cleared ground created by the temporary roads. The road surface will be planted with conifers to hasten recovery.	Reduce evidence of management activity	Sale Administrator or Contracting Officer's Representative and Landscape architect or recreation specialist

<p align="center">Visual Corridors Alternatives 2 and 3</p>	<p align="center">Objective</p>	<p align="center">Responsible Person</p>
<p><i>Subsoiling or earth berms – Commercial Harvest and Road Closures</i> No subsoiling or earth berms will be permitted within 200’ of Highways 26 and 7 associated with the decommissioning of FS 7000043, FS 2620469, and FS 2600200. Debris such as logs or boulders can be used to closed the roads if necessary</p>	<p>Reduce evidence of management and avoid contrasting color impact.</p>	<p>Sale Administrator or Contracting Officer’s Representative</p>
<p><i>Low Cut Stump, Skid Trails, Slash – Commercial Harvest</i> During commercial and precommercial thinning activities, stumps will be cut low to the ground (less than 6”) within 200 feet of State Highway 7 and US Highway 26 .This will reduce visibility within visual corridors. Ground disturbing skid trails will not be located within 100 feet of Highways 7 and 26 unless winter logged or skid trails do not expose mineral soil. Slash created by harvest activities and precommercial thinning will be hand piled up to 200 feet from Oregon State Highway 7 and US Highway 26.</p>	<p>Reduce evidence of management and avoid contrasting color impact.</p>	<p>Sale Administrator or Contracting Officer’s Representative</p>
<p><i>Harvest Prescriptions – Commercial Harvest</i> Within the foreground areas in the harvest units, a mosaic of stocking levels and tree sizes will be retained. Avoid creating abrupt transitions between thinned and unthinned stands in the foreground. Retain western larch as a component of stands in which it occurs naturally. Increase views of western larch where it occurs in the foreground.</p>	<p>Reduce evidence of management and encourage the increase in stocking of western larch.</p>	<p>Silviculturist</p>
<p><i>Marking/Ribbons – Commercial Harvest</i> Within 200 feet of the highways, marking paint is to be applied to the side of the tree facing away from the road. Ribbon and signs in this 200 foot zone are to be removed upon completion of the harvest unit activities.</p>	<p>Reduce evidence of management and avoid contrasting color and form impact.</p>	<p>Marking Crew Leader Sale Administrator</p>
<p><i>Burning Prescriptions – Prescribed Burning</i> Burning prescriptions in visual foreground areas would be developed to produce low intensity fire, minimizing damage to the larger diameter overstory trees. Those trees greater than 21”dbh within 200 feet to the highways would be protected from high intensity flames that could incur mortality. This protection could include such activities as raking needles away from the base of trees or wetting down the area around the tree prior to ignition. Burning intensities within 200 feet along the visual corridors for U.S. Highway 26 and Oregon State Highway 7 will be controlled by ignition methods and techniques to retain a minimum of 80% of the live crowns. Isolated small trees within a stand of larger trees may end up having less than 80% of the live crown remaining.</p>	<p>Reduce evidence of management and avoid contrasting color and form impact.</p>	<p>Fuels Specialist</p>

<p align="center">Visual Corridors Alternatives 2 and 3</p>	<p align="center">Objective</p>	<p align="center">Responsible Person</p>
<p><i>Fire lines – Prescribed Burning</i> Minimize construction of fire lines that can be seen from Highways 26 and 7. If fire lines are determined necessary, they will be constructed shortly before use, and rehabilitated (camouflaged) as soon as possible after burning. The objective is to reduce the period that they are visible. Only hand fire lines will be constructed in areas where they can be seen from Highways 26 and 7.</p>	<p>Reduce evidence of management and avoid contrasting color and form impact.</p>	<p>Fuels Specialist</p>

Table 2.10 – Special Use Management Requirements, Alternatives 2, 3 and 4.

<p align="center">Special Use Permits (Powerlines and Ditches) Alternatives 2, 3, and 4</p>	<p align="center">Objective</p>	<p align="center">Responsible Person</p>
<p><i>Special Use Site Protection – Prescribed Burning</i> During burning operations there is the potential to damage permitted improvements such as ditches, fences, power poles and lines, telephone pedestals and fiber glass location markers. Burning operations should protect existing improvements and coordination with permittee’s and adjacent property owners will need to take place prior to conducting the burning operations to address specific concerns. Protecting powerlines and poles during burning should avoid the hazards of weakening poles and powerlines falling to the ground.</p> <p>Care should also be taken when crossing with vehicles to protect ditch bank integrity.</p> <p>Ditches will need to be cleaned out after burning operations to remove material that may have rolled or fallen into irrigation ditches to prevent blocking water flow during irrigation season causing potential breaching.</p>	<p>Protection of improvements during burning</p>	<p>Fuels specialist</p>

Table 2.11 – Noxious Weeds Requirements, Alternatives 2, 3, 4.

<p align="center">Noxious Weeds Alternatives 2, 3, and 4</p>	<p align="center">Objective</p>	<p align="center">Responsible Person</p>
<p><i>Invasive Plan Prevention Standards –All Activities</i> All heavy equipment (bulldozers, skidders, graders, backhoes, log trucks, etc.) that will operate outside the limits of the road prism will be cleaned prior to entering on to National Forest System Lands.</p> <p>Equipment used within known locations of noxious weed infestations would be cleaned prior to moving to another site within the forest or project area.</p> <p>Only weed-free seed, straw and mulch will be used for road decommission and erosion control. If State certified straw and /or mulch is not available, use sources certified to be weed free using the North American Weed Free Forage Program standards (see Appendix O of the Invasive Plants EIS) or a similar certification process.</p> <p>- Where other design measures require seeding use only certified weed free native seed mixes.</p> <p>Use only gravel, fill, sand, and rock that is judged to be weed free by District or Forest weed specialists.</p> <p style="padding-left: 40px;">Inspect active gravel, fill, sand stockpiles, quarry sites, and borrow material for invasive plants before use and transport.</p> <p style="padding-left: 40px;">Treat or require treatment of infested sources before any use of pit material</p> <p>Conduct road blading, brushing and ditch cleaning in areas with high concentrations of invasive plants in consultation with District or Forest-level invasive plant specialists, incorporate invasive plant prevention practices as appropriate.</p> <p>If new sites of invasive plants are located all ground disturbance activities should cease in the vicinity of the newly located infestation. Before the activities resume an invasive plant specialist (botanist, etc.) is to be contacted so the situation can be evaluated and any appropriate actions identified.</p> <p>Noxious weed surveys would be done for 1 to 5 years after the project on and along decommissioned, closed, and temporary roads as well as skid trails and landings used during the project.</p>	<p>Reduce the introduction, establishment and spread of invasive plants associated with this project.</p> <p>Detect new infestations of invasive plants.</p>	<p>Sale Administrator, Project Engineer, COR</p>

Table 2.13 – Range Management, Alternatives 2, 3, 4.

Range Management Alternatives 2, 3, and 4	Objective	Responsible Person
<p>Range Management- All Activities The Grazing Permittees and the Rangeland Management Specialist will be kept informed of scheduling of project activities that would affect grazing operations.</p> <p>All range improvements (such as fences, spring developments etc.) are to be protected. If they are damaged they will be repaired to FS specifications by the entity responsible for the damage prior to leaving the area or before the improvement is needed for grazing.</p> <p>Prescribed burn operations will be coordinated with the Grazing Permittee and the Rangeland Management Specialist administering the affected allotments. Where possible the burning would be fitted to the grazing systems being used on the affected allotments to minimize impacts to the permittee’s ranch operations.</p> <p>It is anticipated that after an area is burned livestock grazing would resume after a rest period of one full growing season in accordance with the Forest’s Post Fire Interim Grazing Guidelines (2003). Following this rest a District interdisciplinary team will determine if forage recovery and species diversity is sufficient to resume grazing. Examples:</p> <p>(1) If the burn occurs before green-up then grazing may resume the following year.</p> <p>(2) If the burn occurs after green-up then grazing may resume the second year after the burn.</p> <p>*In these two examples the time to resume grazing is assuming that the reviewing interdisciplinary team determines that the vegetation has recovered sufficiently.</p> <p>If livestock are present on either side of a fence, means will be taken to protect the integrity of the grazing schedule, and prevent the movement of livestock to other pastures. This could include contractual requirement to assure gates are kept closed, placement of temporary cattle guard or presence of a “gate keeper”. If no livestock are present, gates and fences shall be operable prior to logging activities proceeding to the next pasture, while cattle are in the project area.</p> <p>Fence right of ways, stock driveways, trails, other access to other range improvements will be cleared of slash produced by logging or post sale activities</p>	<p>Minimize affects of project activities on the permittee’s grazing operations and reduce the risk of accidents due to permittees being in the wrong place at the wrong time.</p> <p>Protect government and permittee investments.</p> <p>Prevent unscheduled movement between pastures and allotments by livestock.</p>	<p>Sale Administrator, COR, person in charge of prescribed burn operations, Contractor</p>

Table 2.14– Study Plot Management Requirements, Alternatives 2, 3 and 4.

Research Study Plots Alternatives 2 and 3	Objective	Responsible Person
<p>Study Plots – All Activities A 50 foot no treatment zone will be placed around thinning study plots. A total of 18 plots will be protected from both harvest and prescribed fire. To protect study plots a visible boundary will be posted at the the outside of the 50 foot buffer. The plots' centers and the surrounding trees out to 50 feet will be designated with a orange paint band.</p> <p>Study plots are located within harvest Units 66, 72, and 74A. Skid trails and landings will not be located within study plot protection zones. Trees will be directionally felled away from protection zones.</p>	<p>Protection of study plots</p>	<p>Sale preparation specialist</p>

Table 2.15 – Recreation Management Requirements, Alternatives 2 and 3.

Recreation Alternatives 2 and 3	Objective	Responsible Person
<p>Snowmobile Trails – Snow Plowing – Commercial Harvest Two snowmobile trails are co-located (share the roadway) with proposed haul routes. Crawford Creek snowmobile trail #S-258 is co-located on the following roads: The 26000207 road — This road accesses proposed unit 68 and part of unit 66. The 26000204 road — This road accesses proposed units 60, 62, 64, 70, 72, 74, 76 and part of unit 66. The 2620 road — This road accesses proposed units 12, 14, 30, 34, 38, 40, 41, 49, 52, 53, 54, 56, 58, 78, 102, 104, 106, 108, 110, 112, and 152. Summit Creek snowmobile trail #S-259 is co-located with the 2622 road that accesses units 44 and 46. Plowing and use of these roads for harvest activities during the winter recreational season, generally December 15th through April 15th (though timing varies with snow conditions), will be coordinated in advance with forest recreation representatives from the Blue Mountain Ranger District on the Malheur National Forest and the Unity Ranger District of the Wallowa Whitman National Forest. The objective of coordination will be ensure safety and provide a continuous alternate route for snowmobile use when possible. Harvest activity use will take precedence over recreational use.</p>	<p>Limit impacts on snowmobiling</p>	<p>Recreation specialist and sale administrator</p>

Table 2.16 – Recreation Management Requirements, Alternatives 2, 3 and 4.

Recreation Alternatives 2, 3 and 4	Objective	Responsible Person
Public Notification – Prescribed Burning Notify public of burning activities prior to hunting season and notify local residents.	Keep public informed during burning activities	Fuels specialist

Table 2.17 – Heritage Management Requirements, Alternatives 2 and 3.

Heritage Alternatives 2 and 3	Objective	Responsible Person
Heritage Sites – Commercial Harvest All NRHP eligible and potentially eligible (unevaluated) sites will be avoided from any ground disturbing impacts during all timber harvest activities, with the exception of the Sumpter Railroad grade (See project design below)	Site protection	Sale Administrator/District Archaeologist
Sumpter Valley Railroad – Temporary Road – Commercial Harvest A temporary road crossing will be allowed across a Sumpter Valley Railroad grade. The crossing will be restored to its original condition after use per the terms of the 1986 PMOA for Management of Historic Railroad Systems. The temporary road will be subsoiled but will be prohibited on the railroad grade (coordinate with Zone Archaeologist).	Protect railroad grade	Sale Administrator/District Archaeologist

Table 2.18 – Heritage Management Requirements, Alternatives 2, 3 and 4.

Heritage Alternatives 2, 3 and 4	Objective	Responsible Person
Heritage Sites - Fuel Treatments There will be no piling, hand or with ground-based machines (i.e. grapple), within the boundaries of a NRHP eligible or potentially eligible (unevaluated) site; all hand and grapple piling and burning of slash or fuel concentrations will take place outside of site boundaries.	Site Protection	Sale Administrator/District Archaeologist
Wooden Structural Remains - Prescribed Burning All NRHP eligible and potentially eligible (unevaluated) historic properties with structural remains or other wooden feature types will be avoided or protected during all burning activities. Eligible historic remains will be identified on the ground and proper protection measures will be conducted during the burning activities.	Site Protection	Fuels Planner/District Archaeologist
Lithic Scatter Sites – Prescribed Burning Under the terms of the Management Strategy for the Treatment of Lithic Scatter Sites (Keyser et al., 1988), low intensity burning will have no effect on the prehistoric eligible or potentially eligible (unevaluated) sites.	Site Protection	Fuels Planner/District Archaeologist

Heritage Alternatives 2, 3 and 4	Objective	Responsible Person
<i>Sites – Hand lines – Prescribed Burning</i> There will be no hand lines constructed through the boundaries of NRHP eligible or potentially eligible sites.	Site Protection	Fuels Planner/District Archaeologist
<i>New Sites – All Activities</i> If cultural resources are encountered during project implementation, all ground-disturbing activities will cease until the Zone Archaeologist is contacted, assesses the situation, and recommends appropriate action.	New site Protection	District Archeologist

Table 2.19 – Safety Management Requirements, Alternatives 2 and 3.

Safety Alternatives 2 and 3	Objective	Responsible Person
<p>Unit 116: This proposed tractor unit is located adjacent to Highway 7 in the Taylor Flat area. Safety concerns with activities around this unit (including procedures, additional Oregon State bonding and insurance, timing and weather conditions) would be met for traffic during operations involving reopening a closed road and construction of a temporary junction with Highway 7. During the construction of this junction State certified flaggers would control traffic in accordance with requirements by ODOT standards. All compliance with safety issues would be a part of the contract with the purchaser/contractor or any person or party completing work items. After activities are complete the road will again be closed and the temporary junction will be decommissioned.</p> <p>Felling in Units 22, 24, 60, 62, 64, 116, 118, 120, 122, 127, 130, and 136: Felling trees within 200 feet of the edge of the pavement on U.S. Highways 7 and 26 in these units may pose hazards to traffic. Safety concerns (including procedures, timing and weather conditions) would be met for all traffic during operations involving tree felling in these areas. State certified flaggers would control traffic in accordance with requirements by ODOT standards, during felling within 200 feet of the pavement on Highways, 7 and 26. All compliance issues would be a part of the contract with the contractor.</p>	Maintain public safety near highways	Sale administrator

Table 2.20 – Safety Management Requirements, Alternatives 2, 3 and 4.

Safety Management Requirement/Mitigation Measure Alternatives 2, 3 and 4	Objective	Responsible Person
During prescribed burning operations adjacent the highway, hazard signs would be placed along highway and ODOT notified?	Maintain public safety	Fuels specialist

Table 2.21 – Summary of Timing Restrictions, Alternatives 2, 3 and 4.

Description	Timing
Preferred In-stream Work Period	Activities can occur: July 15 – August 15
Occupied Goshawk Nest sites (within ½ mile)	Activities can occur: October 1 – March 31
Other occupied Raptor Nest sites (within ½ mile)	Activities can occur: October 1 – February 1
Must coordinate use of roads: 2600207, 2600204, 2620, and 2622 with forest recreation representative to ensure snowmobile safety. Harvest use takes precedence.	Activities must be coordinated during snow season: December 15 – April 15 (dates may vary with snow season)

Table 2.22 – Plant Management Requirements, Alternatives 2, 3 and 4.

Plants Alternatives 2, 3 and 4	Objective	Responsible Person
Protect <i>Phacelia minutissima</i> habitat, areas supporting false hellebore (<i>Veratrum californicum</i>), should be avoided with vehicles and heavy equipment even if they dry out late in the season.	Protect <i>Phacelia minutissima</i> habitat	Forest Botanist
Protect <i>Carex idahoensis</i> habitat, prescribed burning should only produce only low to moderate fire severity so rhizomes will survive and sprout after the burn.	Protect <i>Carex idahoensis</i> habitat	Forest Botanist
Protect <i>Achnatherum</i> species habitat, vehicles and off-road equipment should avoid scabland areas.	Protect <i>Achnatherum</i> species habitat	Forest Botanist

Monitoring Plans

1. Vegetation Monitoring

Tree marking will be monitored to ensure compliance with the silvicultural prescription and marking guide.

All areas planned for tree planting will be examined prior to planting. Exams will assess levels of competing vegetation, pocket gopher activity, and other environmental conditions. Seedling species and stock type will be prescribed as well as site preparation, planting, and protection methods. Any changes from methods prescribed in this document will require additional NEPA analysis.

Planted areas will be monitored for seedling survival, growth, and damaging agents. Stocking surveys will occur periodically until planting areas are certified adequately stocked and “free to grow”. Deficient areas will be replanted to at least minimum stocking. Protection measures may be implemented to increase tree survival.

2. Watershed and Fisheries

Monitor Best Management Practices (BMPs): Five to fifteen percent of the timber harvest areas will be monitored to ensure BMP standards are being met. Monitoring would be done by the District hydrologist, fisheries biologist, soil scientist, or trained technicians after completion of the project.

Monitor Unit Boundaries along RHCAs: Monitor 10% of timber harvest units adjacent to RHCAs to ensure adequate buffering of mechanized harvest/fuels reduction activities.

Monitor Road Decommission and Reconstruction Activities: Implementation monitoring would be conducted to determine if decommission or reconstruction activities were completed. Following completion of road decommission or reconstruction activities, effectiveness monitoring would be completed at year 1 and 3. Monitoring would consist of ocular surveys completed by hydrology or fisheries personnel (including photographs) on decommissioned road prisms within 100 feet of streams and at stream crossings to check for erosion (rilling or sheet) and/or establishment of ground cover on the prism and sediment transport to streams.

3. Grazing

An interdisciplinary team consisting of at least two resource specialists, such as a range conservationist, botanist, ecologist, silviculturist, or hydrologist, would conduct the monitoring following the prescribed burns to determine if the percent ground cover has been reestablished.

4. Invasive Plant Monitoring and Treatment

Noxious weed surveys would be done for 1 to 5 years after the project on and along decommissioned, closed, and temporary roads as well as skid trails and landings used during the project.

5. Fire and Fuels Monitoring

Monitoring of work conducted under grapple and hand piling contracts would consist of periodic inspections while work is in progress and after completion to determine compliance with contract standards. Prescribed burning implementation monitoring includes burn day monitoring to ensure burning is conducted within the parameters stated in the Burn Plan. This monitoring is completed by fire personnel. Weather, flame length, smoke dispersal, would be a minimum of what is recorded. Fuel reduction and resultant tree mortality will be monitored through fuels plots and walk through surveys by fire personnel.

6. Heritage Sites

Heritage sites will be monitored by the District Archeologist during project implementation.

Comparison of Alternatives

Table 2.22. Alternative Treatment Activities

TREATMENTS	Alternative 1 No Action	Alternative 2 Proposed Action	Alternative 3	Alternative 4
Vegetation Treatments				
Commercial Thinning (acres)	0	2,073	1,506	0
Shelterwood Harvest (acres)	0	119	0	0
Precommercial Thinning (acres)	0	935	666	795
Planting Conifers (acres)	0	119	0	0
Fire and Fuels Treatments				
Prescribed burning (acres)	0	5,300*	5,300*	5,300*
Activity Fuel Treatments from Timber Harvest				
Grapple Piling (acres)	0	877	631	649
Yard Tops Attached (acres)	0	507	276	0
Hand Piling (acres)	0	174	140	146
Yarding Systems				
Tractor (acres)	0	2,192	1,506	0
Volume Harvested (MBF)	0	6,800	4,300	0
Road Activities Associated w/Logging				
Temporary Rd. Construction (miles)	0	8.6	1.5	0
Road Reconstruction (miles)	0	10.9	10.9	0
Road Maintenance (miles)	0	35.2	31.9	0
Road Access Activities (Includes only Mill Cr. Subwatershed; additional activities occur outside the subwatershed – see Appendix A and C)				
Closures (Gate or Sign) (miles)	0	0.7	0.7	0.7
Closures (Berm or Sign) (miles)	0	0.2	0.2	0.2
Decommissioning (miles)	0	17.8	17.8	17.8
Open Closed Road (miles)	0	1.7	1.7	1.7
Additional ROGs designated	0	3 new	3 new	3 new
Adjustment of DOGs	0	3	3	3

*Not all areas would be burned. Fire would be excluded from aspen stands, Dedicated Old Growth, and research plots.

Table 2.23. Acres of Commercial Harvest Treatment by Alternative within Forest Plan Management Areas

Management Area	Alt. 1	Alt. 2	Alt. 3	Alt. 4
1 – General Forest	0	402	296	0
13 – Dedicated Old Growth	0	88 (ROG)	50 (ROG)	0
14 – Visual	0	461 – Foreground 1,390 - Middleground	238 – Foreground 987 - Middleground	0

Note: These acres do not total the number of harvest acres shown in Table 2.22. The management areas overlap. For example, an area identified as dedicated old growth can also be within the visual foreground.

Table 2.24. Road Density Summary: Existing and Proposed (Mill Cr Subwatershed ONLY)

Status	Existing	Proposed
Open (Miles)	50.7	51.1
Closed to Motorized Vehicles (Miles)	62.8	44.6
New Decommissioning (Taken off road system)		17.8*
Open Road Density (Miles per sq. Mile)	1.8	1.8

* Majority of roads proposed for decommissioning are already closed
 (Road density: Mill Cr Sws – 17, 846 ac or 17,835/640 = 27.87 sq mi
 Existing: 50.7/27.87 = 1.82 and Proposed: 51.1/27.87 = 1.83)

Table 2.25. Proposed Changes for Management Area 13 (All Action Alternatives)

DOG/ROG	Existing MA 13 (Acres)	Proposed MA 13 (Acres)	RHCA Overlap with MA 13 (Acres)	Forest Plan Management Allocation Changes (Acres)		
				MA 1&2	MA 14	MA13
134 - DOG	382	395	46	-8	-5	13
134 - ROG	0	256	24	-149	-107	256
241 - DOG	169	169	6	0	0	0
241 - ROG	0	62	11	-14	-48	62
335 - DOG	273	317	28	-21	-23	44
335 - ROG	0	179	0	-72	-107	179
Total	824	1384	115	-264	-290	554

Table 2.26. Comparison of Alternatives by Issue and Measurement

Key Issue	Unit of Measure	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Temporary Road Construction	Miles	0	8.6	1.5	0
Log Haul and Rd Maintenance within RHCAs	Miles	0	5.6	5.5	0
All Roads (Open and Closed)	Miles	113.5	95.7	95.7	95.7
Roads within RHCAs (Open and Closed)	Miles	16.9	11.0	11.0	11.0
Equivalent Roaded Acres	Year - %	2006 – 7.6%	2006 – 9.3%	2006 – 8.9%	2006 – 7.6%
		2011 – 6.5%	2011 – 8.0%	2011 – 7.6%	2011 – 6.5%
Timber Harvest	Acres	0	2,192	1,506	0
Big Game Cover within Mill Creek SWS	%	Forage – 50.2 %	Forage – 55.7%	Forage – 54.2%	Forage – 51.7 %
		Marginal – 47.1%	Marginal – 42 %	Marginal – 43.1%	Marginal – 45.6 %
		Satisfactory – 2.7%	Satisfactory – 2.3%	Satisfactory – 2.7 %	Satisfactory – 2.7%

Key Issues**Roads/Commercial Timber Harvest**

There is a concern that the proposed ground disturbing activities associated with road construction and commercial timber harvest could degrade water quality and impact soil productivity.

Measures or elements for evaluating the issue:

- Miles of temporary road.
- Miles of log haul and road maintenance in RHCAs.
- Total road miles in Mill Creek sub-watershed.
- Equivalent Roaded Area
- Acres of timber harvest
- Miles of RHCA road remaining

Big Game Cover

This thinning would degrade the satisfactory cover by decreasing the tree density which in turn reduces the average canopy closure needed to maintain this standard.

Measures or elements for evaluating the issue:

- Quantitative assessment on big game cover %

CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Introduction

This Chapter summarizes the physical, biological, social, and economic environments of the project area and the effects of implementing each alternative on that environment. It also presents the scientific and analytical basis for the comparison of alternatives presented in the alternatives chapter.

The three action alternatives have many similar treatments and effects. To make the discussion of the effects analysis less redundant, these similar effects are identified in a “Common to All Action Alternatives” or “Common to Action Alternatives” sections following the discussion of the No Action – Alternative 1. After the “Common to All” section are the effects unique to each of the three action alternatives. The existing condition is described within the effects discussion for the alternatives.

The temporal scales used throughout the effects analysis are described as short, mid and long term. Unless otherwise stated, short-term represents impacts that may occur in less than 5 years, mid-term 5 to 20 years and long-term more than 20 years.

The listing of past, present, and foreseeable activities are identified in Appendix D. These activities were considered by each Interdisciplinary Team specialist for potential cumulative effects. These effects are discussed within each of the following resource effects sections. Only those activities that would create possible cumulative effects were analyzed within these resource effects sections. The analysis of the past actions follows the Council on Environmental Quality guidance provided on June 24, 2005.

Forest Vegetation

Regulatory Framework

Malheur Plan Direction and Standards

This section describes the Forest Wide Standards and timber management constraints set forth in the Malheur National Forest Land and Resources Management Plan (Forest Plan).

Forest-Wide Standards

Timber Management (Forest Plan, pgs. IV-36-38)

- Based on site-specific silvicultural prescriptions, apply even-aged or uneven-aged management systems to forest timber stands. Determine the applicable

management system for any timber stand through the use of specific management area direction and project level environmental analysis.

- Before scheduling stands for a clear-cut or seed tree regeneration system or a final removal of a shelterwood, ensure that the site has the capability to be adequately restocked within 5 years.
- Planting stock will be grown from the seed of phenotypically superior trees within the seed and elevation zones of collection, except where a certified silviculturist certifies that another location is acceptable without loss of productivity.
- Manage to maintain or re-establish ponderosa pine, at time of regeneration, on sites where ponderosa pine is sub-climax.
- Schedule and implement precommercial thinning to achieve desired stocking level based on a site-specific silvicultural examination and interdisciplinary prescription.

Insects and Disease

Apply integrated pest management principles to minimize the impacts of the mountain pine beetle, western spruce budworm, tussock moth and other insect and disease infestations. Avoid the creation of vegetation conditions that could promote insect and disease infestations.

REGIONAL FORESTER'S FOREST PLAN AMENDMENT #2

All timber sales will be designed to incorporate the interim riparian, ecosystem and wildlife standards as set forth in the Regional Foresters Forest Plan Amendment #2. These standards supersede previous Forest Plan and other management guidelines. The amendment incorporates three standards; riparian, ecosystem, and wildlife. Personal use firewood sales, post and pole sales, sales to protect health and safety, and sales to modify vegetation within special use recreation areas are exempt from these standards. Precommercial thinning, fiber sales, sales of dead material <7" dbh, salvage sales outside old growth, and commercial thinning and understory removal sales are not subject to the ecosystem standard.

Analysis Methods

Modeling is used to project stand development for future structural stages. The INFORMS program was used to run the FVS growth simulator on all of the forested stands within the project area. The Forest Vegetation Simulation (FVS) model, with the Blue Mountain variant, is being used to compare between alternative treatments. Long-term projections become estimates at best; however, results do show trends and are useful for comparing different alternatives.

Assumptions

Assumptions for the INFORMS Model

- ❑ Benchmarks for the future structural stage analysis are set at a time immediately after treatment has occurred and 50 years from now.
- ❑ The mechanical treatments in this alternative are only applied once, at the start of the modeling time period. They are not repeated again within the 50 year modeling cycle.
- ❑ There was no adjustment for the modified thinning in the connectivity corridors
- ❑ Prescribed burning is applied only once and in the first decade in the INFORMS model.
- ❑ The stands without mechanical treatment are grown using the assumptions for the No Action Alternative.

- No other stand disturbances occur that result in stand replacement (fire, insects, wind, etc.).

(The above modeling constraints are used to simplify the analysis and are to be used for comparative purposes only and are not meant to accurately predict actual future conditions.)

The following conditions are reasonable expectations for the future management of the area and are used to estimate the effects of the various alternatives. All alternatives are compared using this set of assumptions for the future.

Assumptions for Estimating Effects

- The Historic Range of Variation (HRV) approximates the Desired Condition.
- The future climate will be within the current range of variation.
- Current insects and diseases will continue to inhabit the forest and populations will fluctuate depending on stand conditions.
- The current trends in forest stand composition, structure, and density will continue, assuming that no further mechanical vegetation management would occur.
- Regenerating resulting from opening up stands will be kept at low levels by periodic underburning.

Affected Environment

Past Management Activity

Native Americans lived and passed through the area and used it for food hunting and gathering. They set fires in addition to the natural fires to manage the forests for their uses.

Settlement by European immigrants began in the mid-1800's, initially by those involved in mining and grazing. Timber harvesting was localized, mainly for mine props and buildings. Beginning in the 1900's with the coming of the Sumpter Valley Railway, lumbering began in earnest in the ponderosa pine found on the lowlands. A major permanent track ran down the Middle Fork John Day valley and numerous temporary spurs were constructed along every creek and drainage in the watershed to haul timber to a number of mills constructed in and nearby Bates and Austin. Towards the middle of the century, harvest moved upland to the middle elevations and consisted of partial removal of the higher value species. The early 1900's also saw the formation of the National Forests and eventually fire suppression, which along with intensive grazing reduced the amount of fires to a low level.

The combination of timber harvest and fire suppression gradually converted forests from early seral species to a higher proportion of late seral species. Stand densities and multi-layer canopies also increased across the forests. These late seral trees are not resistant to forest insects, diseases, or to fire.

Within the last three decades there have been several outbreaks of defoliating insects and bark beetles that have caused widespread mortality. In the Middle Fork drainage there have been several large, high severity fires that have burned across the landscape including areas that historically burned at a low intensity but at frequent intervals. These have been fueled by the increased dead and down timber, dense stands, and multiple crown layers creating ladder fuels

into the upper tree crowns. The effect has been to convert large acreages to the stand initiation structural stage, drastically changing wildlife habitat and impacting streams and aquatic life.

Approximately 1,000 acres of timber harvest in the last 15 years has begun to correct the past changes, concentrating on thinning overstocked stands and shifting the species composition of late-seral species stands to more resilient early-seral species. These timber management projects include Tip Thin, Dan's Thin, Wye, Spike, and Pog Pogo which are listed in Appendix D. There has been approximately 800 acres of commercial thinning mostly in small to medium diameter ponderosa pine stands. The approximately 200 acres of regeneration treatments in fir-dominated stands have removed many of the late-seral species and retained healthy early-seral species trees, and reforested with early-seral species with the goal of shifting the species composition to more resilient early-seral tree species.

Precommercial thinning has been applied to hundreds of acres in the lower elevations of the area, predominately in the ponderosa pine stands. The effect has been to select the better growing trees and reduce competition between trees, resulting in increased growth rates and larger trees produced in a shorter time period.

Biotic Conditions

Information concerning stands has been gathered through a combination of photo interpretation, formal timber stand exams, informal exams (1993-1995), and walk-throughs (1999).

The analysis area is largely forested. The lower elevations and south facing slopes are generally ponderosa pine with ground vegetation of pine grass, elk sedge, and common snowberry. Other tree species include western larch, Douglas-fir, lodgepole pine and grand fir. These stands are generally young and even-aged due to the nature of past harvests. There is low structural diversity and a lack of larger diameter trees and snags. The limiting factors to vegetative growth are competition for water, sunlight and soil nutrients.

The rest of the plant associations are predominantly grand fir. The grand fir series contain grand fir, Douglas-fir, western larch, lodgepole pine and ponderosa pine. Pinegrass, twinflower, grouse huckleberry, and big huckleberry dominate ground vegetation. These stands are typically overstocked multi-stratum canopies that are at high risk for insect and disease problems and stand replacement fire. Lodgepole pine with ground vegetation of grouse huckleberry occurs in the upper elevations.

There are five forested biophysical environments that occur within the analysis area as displayed in the table below.

Table V – 1. Biophysical Environments within the Subwatershed

Biophysical Environment	Acres	Percent within the Subwatershed
Hot-Dry	700	4 %
Warm-Dry	10,700	60 %
Cool Moist	100	1 %
Cool-Dry	700	4 %
Cold-Dry (Lodgepole)	3,700	21 %
Non-Forest	1,800	10 %

***Biophysical Environments - PAG (Plant Association Groups)** - Vegetation classification using similar moisture and temperature environments resulting in similar fire regimes.

- Hot-Dry Forest – Occupy low to mid elevations and mainly south slopes. Stands are composed primarily of ponderosa pine. Fire regime is low intensity, high frequency (10-15 years) over most of the area, with small patches of mortality.
- Warm-Dry Forest – 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. Fire regime is low intensity, high frequency (10-15 years) over most of the area, with small patches of mortality.
- Cool-Moist Forest – 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, and western larch. 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 would range from 200 to 2,000 acres.
- Cool-Dry Forest – Occupy mid to higher elevations, northerly aspects and cooler areas that are relatively dry. Stands are composed of ponderosa pine, Douglas-fir, grand fir, lodgepole pine, western white pine, and western larch. 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 would range from 200 to 2,000 acres.
- Cold-Dry Forest – Occupy high elevation sites, northerly aspects, and colder, relatively dry areas. Stands are composed of Engelmann spruce, subalpine fir, whitebark pine, and lodgepole pine and the fire regime is high intensity, low frequency (50-275+ years) with noticeable susceptibility to torching and crown fires.
- Woodlands – Occupy dry sites at low to mid elevations, often on south slopes. Stands are historically open ponderosa pine savannahs and sparse western juniper that was maintained by frequent fires.

Hot-Dry Biophysical Environments

Hot-Dry forests occupy approximately 700 acres (4 % of the Mill Subwatershed). 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.

Species composition includes nearly pure stands of ponderosa pine to mixes where ponderosa pine is the dominant species and Douglas-fir, grand fir, western larch, and lodgepole pine occur in lesser amounts. The hot-dry forests were subject to frequent, low intensity fires that maintained the ponderosa pine in the stands.

In some locations juniper is increasing its range into the hot-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.

Species Compositions and Successional Development

The low intensity/high frequency disturbance regime common in this forest type favored fire resistant species (ponderosa pine, and to a lesser extent western larch and Douglas-fir) and development of more open stands with little vertical structure. Shade tolerant species (grand fir and Douglas-fir) were generally susceptible to these fires due to their thinner bark when young and persistent, low hanging crown characteristics. 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.

Overall, the frequency of these fires made them an agent of stability in these forest ecosystems. They kept the ground vegetation dominated by fire adapted grasses (such as pine grass and elk sedge), while promoting and maintaining mature forest vegetation dominated by ponderosa pine.

Disturbance Processes

Hot-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 natural ignition (i.e. lightning) or Native American people burned in the form of underburns and small areas of lethal fires on a frequency of every 10-35 years in these forest types (Agee 1993, Hall 1977). 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 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 PVG. The Summit Fire burned with stand replacement intensity across $\frac{3}{4}$ of the area burned, much more intense than 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.

Impacts of the recent (1985-1992) spruce budworm outbreak have been relatively minor in the hot-dry forest as there is a lack of sufficient host trees (grand fir and Douglas-fir) to sustain populations.

Diseases

The primary root diseases in dry forests are Annosus and Armillaria that 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 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 increased ability of trees to ward off infections due to lower stand densities.

Dwarf mistletoe was present in low levels throughout the hot-dry forests of the watershed. It 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. Levels of mistletoe infection vary and are generally low in the planning area, probably a result of the historic clearcutting that removed most of the overstory trees.

Mechanical

Windthrow of occasional trees also added structural diversity by creating small gaps in the forest canopy, facilitating establishment of understory vegetation. Generally, ponderosa pine is relatively wind firm, but small patches of blowdown do occur.

Human

Human related disturbances (timber harvest, fire exclusion) have affected the dry forests more than the other forest types across the watershed. In the past, the most harvests focused on the removal of the larger overstory ponderosa pine.

The most noticeable feature is the absence of large ponderosa pine trees in many stands. This is particularly evident in the lower and mid elevations due to early railroad logging; there are few large trees and an abundance of young, small to medium sized trees. Many of the young ponderosa pine stands have been precommercial thinned in the past and some have already been commercial thinned too.

Table V – 2. Hot-dry Forest HRV and Current Structural Stages

Structural Stage*	Historic Range of Variation ¹	Current Condition
Stand Initiation (SI)	5-15%	0%
Stem Exclusion Open Canopy (SEOC)	5-20%	40%
Stem Exclusion Closed Canopy (SECC)	0-5%	0%
Understory Reinitiation (UR)	0-5%	3%
Young Forest Multi-strata (YFMS)	5-10%	40%
Old Forest Single-stratum (OFSS)	20-70%	0%
Old Forest Multi-strata (OFMS)	5-15%	17%

The above percentages are based on professional judgment of the historical extent of structural stages. (Powell, 1998).

***Structural Stage** – Classification of forest stands by developmental stage and size.

- Stand Initiation (SI) – A single canopy stratum of seedlings and saplings established after a stand replacing disturbance.
- Stem Exclusion Open Canopy (SEOC) – A single canopy stratum of pole to small saw sized timber that excludes an understory by lack of water.
- Stem Exclusion Closed Canopy (SECC) – A single canopy stratum of pole to small saw sized timber that excludes an understory by shade.
- Understory Reinitiation (UR) – The overstory has been opened up by natural mortality or thinning, allowing an understory to become established.
- 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.
- Old Forest Single Strata (OFSS) – Large trees are frequent, limited understory and one canopy level.
- Old Forest Multi Strata (OFMS) – Large trees are frequent, has multiple canopy levels.

Warm-Dry Biophysical Environments

Warm-Dry forests occupy approximately 10,700 acres (60% of the Mill Subwatershed). 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.

Warm-dry forests are represented by an array of plant associations, indicating the wide range of environments they occupy. Species compositions range from nearly pure ponderosa pine to mixes of ponderosa pine, Douglas-fir, grand fir, western larch, and lodgepole pine. The warm-dry forest includes most of the Douglas-fir plant associations and the drier grand fir plant associations (up to and including the grand fir/grouse huckleberry assoc.), since they all were subject to frequent, low intensity fires that maintained early seral species in the stands.

Species Compositions and Successional Development

The low intensity/high frequency disturbance regime common in this forest type favored fire resistant species (ponderosa pine, western larch, and to a lesser extent Douglas-fir) and development of more open stands with little vertical structure. Shade tolerant species (grand fir and Douglas-fir) were generally susceptible to these fires due to their thinner bark when young and persistent, low hanging crown characteristics. This was also true for moist forests occurring in the 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/regeneration.

Overall, the frequency of these fires made them an agent of stability in these forest ecosystems. They 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.

Disturbance Processes

Warm-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 natural ignition (i.e. lightning) or American Indian people burned in the form of underburns and small areas of lethal fires on a frequency of every 10-35 years in these forest types (Agee 1993, Hall 1977). 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 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 PVG. The Summit Fire burned with stand replacement intensity across $\frac{3}{4}$ of the area burned, much more intense than 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 warm-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.

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 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* that 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 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 increased ability of trees to ward off infections due to lower stand densities. Frequent fires also helped keep root diseases at low levels due to the promotion of soil fungi that compete 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, 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 when growing poorly due to overstocking.

Dwarf mistletoe was present in low levels throughout the dry forests of the watershed. It 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 and stands with infected overstories that are spreading to susceptible understory trees.

As with insects, these forest diseases play an important role in creating structural diversity, creating a source of snags and down logs, and providing important wildlife habitat and recycling nutrients "locked up" in trees and logs to maintain soil productivity. At severe levels, these diseases can greatly inhibit the development of a stand, limiting growth and habitat potential.

Mechanical

Windthrow of occasional trees also added 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 played an important role in providing a diversity of vegetative conditions and associated habitats across the landscape.

Human

Human related disturbances (timber harvest, fire exclusion) have affected the dry forests 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.

The most noticeable feature is the absence of large ponderosa pine trees in many stands. This is particularly evident in the lower and mid elevations due to early railroad logging; there are few large trees and an abundance of young, small to medium sized trees. 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.

Table V – 3. Warm-dry Forest HRV and Current Structural Stages

Structural Stage	Historic Range of Variation¹	Current Condition
Stand Initiation (SI)	5-15%	1%
Stem Exclusion Open Canopy (SEOC)	5-20%	20%
Stem Exclusion Closed Canopy (SECC)	1-10%	36%
Understory Reinitiation (UR)	1-10%	17%
Young Forest Multi-strata (YFMS)	5-25%	19%
Old Forest Single-stratum (OFSS)	5-55%	3%
Old Forest Multi-strata (OFMS)	5-20%	4%

¹The above percentages are based on professional judgment of the historical extent of structural stages. (Powell, 1998).

Cool Moist Biophysical Environment

Cool Moist forests occupy approximately 100 acres (1% of the Mill Subwatershed) 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 will develop forest vegetation dominated by grand fir, Douglas-fir, and spruce. Where frost is frequent, lodgepole pine will be

the dominant species. Ponderosa pine, western white pine, western larch, and lodgepole pine are early seral species that are dependent on disturbances to maintain suitable growing conditions.

Species Compositions and Successional Development

The historic species composition of the cool 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 European influences. Lodgepole pine generally dominated in cold air pockets, which favored it over the less cold hardy species. Western white pine was likely present in greater proportions since blister rust, an exotic disease, had not been introduced.

Species composition varies depending upon the successional development stage, past disturbances, and microclimate or microsite 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 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 and cooler areas (such as along riparian areas and headwater areas) have increased amounts of Engelmann 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.

Disturbance Processes

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 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 which would occur every 10-50 years. Every 100 to 200 years there would be an infrequent disturbance that was generally a high severity, stand replacing fire. The extent of the 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 50-275+ years (Agee 1993).

Tree mortality was variable, as the tree species that grow in the moist forest 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, Engelmann 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. The moist forests occupying the transitional areas with the dry forests experienced more frequent, low to moderate intensity

fires, resulting in vegetative and structural characteristics more similar to the dry forests (see Dry Forest section).

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 volatilization and leaching 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 (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 the bark beetle mortality also set the stage for regeneration/renewal by creating conditions conducive for subsequent high intensity fires.

Evidence of the 1970s mountain pine beetle outbreak is common. 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 released; resulting 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 with elevated levels of root disease. In these areas, root diseases decrease the vigor of infected trees, which are then attacked by insects. Douglas-fir bark beetle activity is present in association with 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 (namely true firs), multiple canopy layer conditions and increased tree stress resulting from high stand densities and climatic conditions (i.e. drought periods) 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, 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 a high intensity stand replacement type fire.

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. 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 atopellis 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 European occupation of the Pacific Northwest.

Dwarf mistletoe was present throughout these forest types. Lodgepole pine, western larch ponderosa pine, and Douglas-fir dwarf mistletoes 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 within 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 (true fir strain) of the 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 (30+ inch diameter) hollow, decayed live grand fir trees are often sought out as denning habitat by black bears and other mammals, and also provide excellent primary and secondary cavity nesting habitat.

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 know 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 seems to be fairly resistant to the disease.

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 composition 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.

Table V – 4. Cool Moist Forest HRV and Current Structural Stages

Structural Stage	Historic Range of Variation¹	Current Condition
Stand Initiation (SI)	1-10%	0%
Stem Exclusion Open Canopy (SEOC)	0-5%	15%
Stem Exclusion Closed Canopy (SECC)	5-25%	3%
Understory Reinitiation (UR)	5-25%	32%
Young Forest Multi-strata (YFMS)	40-60%	11%
Old Forest Single-stratum (OFSS)	0-5%	0%
Old Forest Multi-strata (OFMS)	10-30%	39%

¹The above percentages are based on professional judgment of the historical extent of structural stages. (Powell, 1998).

Cool-Dry Biophysical Environment

Cool-dry forests occupy approximately 700 acres (4% of the Mill Subwatershed) on drier, colder frost pockets throughout the watershed.

Species Compositions and Successional Relationships

Species compositions and structural characteristics of the cool-dry 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 cool-dry forests have not changed substantially over time, resulting in little change in the fire severity from historic times to the present.

In the absence of a major disturbance such as fire, cool-dry forests will develop forest vegetation dominated by grand fir, Douglas-fir, and western larch. Where frost is frequent, lodgepole pine will be the dominant species. Lodgepole pine is the primary early seral species that would initially occupy a site. In stands with a longer fire-free interval, climax species such as grand fir 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.

Disturbance Processes

Cool-dry forests were not economically attractive in the past; therefore timber harvest has been at a lesser level than in the warmer and drier forests.

Fire

Historically, wildfire was the major disturbance affecting cool-dry 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 higher elevation location of the cool-dry forest stands. The extent of fires was highly variable due to topography and the extent of flammable lodgepole stands. Fire size could be as small as one stand of trees or as large as several thousand acres.

Fire return intervals in these forest environments were on the magnitude of 50-275+ years (Agee 1993).

Tree mortality from fires is high; many of the trees in this group retain branches to the ground for a long time and grow in dense, multistory patches. This predisposes them to torching and crowning fire behavior which kills all of the trees in the stand. Additionally, the thin bark of these species does not protect them from basal heating, making them easily killed, even by light ground fires. Stand establishment after disturbance is often very rapid.

Fire is still the most influential disturbance process occurring in cool-dry forests. The impact of fire suppression is much less in this forest type than in other types, due to long fire return intervals. The main effect of fire suppression over the last 70 plus years has been to increase the species diversity, allowing more fir and spruce to occupy the stands than would naturally occur.

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 cool-dry 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. 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 infected stands at small scales (less than 1 acre). 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.

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.

Mechanical

Wind throw 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

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 somewhat limited with the exception of salvage harvest of beetle killed lodgepole pine stands in the northeast portion of the project area that has resulted in regeneration of those stands.

All of these disturbance processes played an important role in providing a diversity of vegetative conditions and associated habitats across the landscape.

Table V – 5. Cool-dry Forest HRV and Current Structural Stages

Structural Stage	Historic Range of Variation¹	Current Condition
Stand Initiation (SI)	5-30%	0%
Stem Exclusion Open Canopy (SEOC)	0-5%	0%
Stem Exclusion Closed Canopy (SECC)	5-35%	0%
Understory Reinitiation (UR)	5-20%	53%
Young Forest Multi-strata (YFMS)	5-20%	0%
Old Forest Single-stratum (OFSS)	1-10%	0%
Old Forest Multi-strata (OFMS)	1-20%	47%

¹The above percentages are based on professional judgment of the historical extent of structural stages. (Powell, 1998).

Cold-Dry (Lodgepole) Biophysical Environment

Cold-dry forests occupy approximately 3700 acres (21% of the Mill Subwatershed) on high elevation sites, northerly aspects, and in the colder frost pockets throughout the watershed.

Species Compositions and Successional Relationships

Species compositions and structural characteristics of the cold-dry 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.

In the absence of a major disturbance such as fire, cold-dry forests will develop forest vegetation dominated by grand fir, western larch, subalpine fir, and Engelmann spruce. Where frost is frequent, lodgepole pine will be the dominant species. Lodgepole pine and western larch are the primary early seral species that would initially occupy a site. In stands with a longer fire-free interval, climax species such as grand fir, 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.

Disturbance Processes

Cold-dry forests were not economically attractive in the past; therefore timber harvest has been at a lesser level than in the warmer and drier forests.

Fire

Historically, wildfire was the major disturbance affecting cold-dry 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 higher elevation location of the cold-dry forest stands. The extent of fires was highly variable due to topography and the extent of flammable lodgepole stands. Fire size could be as small as one stand of trees or as large as several thousand acres. Fire return intervals in these forest environments were on the magnitude of 50-275+ years (Agee 1993).

Tree mortality from fires is high; many of the trees in this group retain branches to the ground for a long time and grow in dense, multistory patches. This predisposes them to torching and crowning fire behavior which kills all of the trees in the stand. Additionally, the thin bark of these species does not protect them from basal heating, making them easily killed, even by light ground fires. Stand establishment after disturbance is often very rapid.

Fire is still the most influential disturbance process occurring in cold-dry forests. The impact of fire suppression is much less in this forest type than in other types, due to long fire return intervals. The main effect of fire suppression over the last 70 plus years has been to increase the species diversity, allowing more fir and spruce to occupy the stands than would naturally occur.

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 infected stands at small scales (less than 1 acre). 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 atopellis 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.

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.

Mechanical

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

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 somewhat limited with the exception of salvage harvest of beetle killed lodgepole pine stands in the northeast portion of the project area that has resulted in regeneration of those stands.

All of these disturbance processes played an important role in providing a diversity of vegetative conditions and associated habitats across the landscape.

Table V – 6. Cold-dry Forest HRV and Current Structural Stages

Structural Stage	Historic Range of Variation¹	Current Condition
Stand Initiation (SI)	1-20%	1%
Stem Exclusion Open Canopy (SEOC)	0-5%	9%
Stem Exclusion Closed Canopy (SECC)	5-20%	14%
Understory Reinitiation (UR)	5-25%	36%
Young Forest Multi-strata (YFMS)	10-40%	1%
Old Forest Single-stratum (OFSS)	0-5%	5%
Old Forest Multi-strata (OFMS)	10-40%	34%

¹The above percentages are based on professional judgment of the historical extent of structural stages. (Powell, 1998).

Aspen Stands

Aspen is found in several locations within the Mill Subwatershed. It is a unique habitat that is currently much reduced from its historical extent. It is felt that the combination of fire suppression, heavy grazing by both domestic and wild ungulates, and conifer encroachment has reduced the survival of aspen and a deteriorating condition of the remaining stands.

Non Forest Biophysical Environments

Non forest areas occupy approximately 1,800 acres (10% of the Mill Subwatershed).

Dry meadows and grasslands are found in several locations within the planning area and are characterized by generally shallow and rocky soils. They were historically maintained by frequent wildfires in an open savannah condition with a few widely spaced ponderosa pine trees and juniper woodlands. With fire suppression there has been some ingrowth of juniper and ponderosa pine trees.

There are several moist meadows, including Phipps Meadow, Japanese Meadow, Lobelia Meadow, Pie Meadow, and smaller riparian meadows scattered through the area. Small groups of quaking aspen are found in moist areas. They are mainly in declining condition from historical distribution due to reduction in fires, conifer shading and competition, and grazing by both domestic and wild animals.

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 trees 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

Fire

Fire was the dominant disturbance process in woodlands, occurring as frequent, low intensity underburns in the past.

Human

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.

Levels of Growing Stock Research Plots

There are 18 long-term research plots that have been established in the Mill Subwatershed that are being used to test the effects of various thinning densities on tree growth. They are on ½ acre in size and have a 30' buffer around them that needs to be protected from outside influence by this project to retain their worth for the future.

Environmental Consequences

Vegetative conditions within the project area are not within the Historic Range of Variability (HRV) within most biophysical environments. In addition, the species composition and stand densities are changed from the historical conditions, leading to a forest that is less resilient to natural disturbances. Changed vegetative conditions from the proposed treatments may not provide the same levels of habitat or food sources.

Measures of Success for developing a Resilient and Sustainable Forest:

- Acres and percentage change of structural stages in relation to the HRV
- Acres and percent change in areas treated to reduce overstocking and to change species composition.

Alternative 1 - No Action

Direct and Indirect Effects

Introduction

This alternative does not treat any stands by commercial harvest, precommercial thinning, mechanical fuel treatment, or prescribed fire.

Composition and Density

The forest is now mostly overstocked compared with historical levels except where recent management has thinned forest stands. While many stands were precommercial thinned several decades ago, the amount of growth and understory re-initiation has made these stands overstocked again. Along with the overstocking, there has been a large increase in the proportion of Douglas-fir and true firs in both the hot-dry and warm-dry forest types due to both past harvest that removed the early seral species of large diameter and to the exclusion of fire that would have removed most of the fire susceptible species in favor of the fire resistant species of ponderosa pine and western larch..

Since there would be no treatment with Alternative 1 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.

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 of the overstocked stands, development of old forest stand structures would develop slowly with old forest single strata increasing from 0% to 8% and old forest multi strata from 17% to 59% in the next 50 years. 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 to develop old forest structures. 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 HRV for stand structure.

Table V – 7. Effects of No Action on Hot-dry Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5-15%	5-20%	0-5%	0-5%	5-10%	20-70%	5-15%
Existing	0%	40%	0%	3%	40%	0%	17%
10	0%	40%	0%	3%	40%	0%	17%
50	0%	33%	0%	0%	0%	8%	59%

Table V –8. Effects of No Action on Warm-dry Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5-15%	5-20%	1-10%	1-10%	5-25%	15-55%	5-20%
<i>Existing</i>	1%	20%	36%	17%	19%	3%	4%
10	1%	20%	36%	17%	19%	3%	4%
50	0%	5%	24%	6%	19%	10%	36%

Table V – 9. Effects of No Action on Cool Moist Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	1-10%	0-5%	5-25%	5-25%	40-60%	0-5%	10-30%
<i>Existing</i>	0%	15%	3%	32%	11%	0%	39%
10	0%	15%	3%	32%	11%	0%	39%
50	0%	0%	3%	33%	0%	0%	64%

Table V – 10. Effects of No Action on Cool-dry Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5-30%	0-5%	5-35%	5-20%	5-20%	1-10%	1-20%
<i>Existing</i>	0%	0%	0%	53%	0%	0%	47%
10	0%	0%	0%	53%	0%	0%	47%
50	0%	0%	0%	88%	0%	0%	12%

Table V – 11. Effects of No Action on Cold-dry Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	1-20%	0-5%	5-20%	5-25%	10-40%	0-5%	10-40%
<i>Existing</i>	1%	9%	14%	36%	1%	5%	34%
10	1%	9%	14%	36%	1%	5%	34%
50	0%	0%	13%	36%	9%	35%	7%

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.

Aspen

Aspen will continue to be encroached on by conifers, leading to decline in vigor and numbers. Reproduction will remain low due to the lack of fire and continued browsing by ungulates will eliminate those few suckers that do attempt to grow.

Pristine Areas/Roadless Areas/Wilderness

The areas planned for mechanical treatments have previously been harvested by railroad logging in the 1910-1940's, or truck logging in the 1950-60's. Old railroad grades and roads are found throughout the planning area. None of the timber stands to be treated are in an unaltered condition due to the past harvesting, which mostly removed the larger and more valuable ponderosa pine. In addition, fire suppression has allowed the ingrowth of many more trees and

the conversion of some stands from early seral species like ponderosa pine to late seral species like grand fir.

Genetic Diversity

The existing genetic diversity within units scheduled for regeneration harvest (in the other alternatives) will retain the existing natural genetic diversity. Generally, trees that have grown up in near proximity are relatively homogeneous and share pollen with nearby trees, resulting in narrow genetic variability.

Levels of Growing Stock Research Plots

There will be no direct adverse effects to the research plots by this alternative. The risk of a large crown fire would still remain as the surrounding stands would still be in dense conditions with close spaced crowns and ladder fuels. Also, the risk of an insect outbreak starting in the surrounding overstocked stands and killing trees in the research plots is still a possibility. Either situation would result in reducing the viability of the research plots for future data gathering.

Resiliency and Sustainability

The resiliency and sustainability of the forest will continue to decline and it will remain at risk to natural disturbances that have outcomes larger and more severe than happened historically. Overstocked forest stands will continue to slow in growth and decrease in vigor as stand density continues to increase. Trees will slowly increase in size, but will remain multi-storied. The bulk of the stands which will grow into old forest will be continue to be old forest multi-stratum (OFMS) structural stage with very few growing into old forest single stratum (OFSS), continuing the imbalance compared to HRV. Late seral species will continue to increase occupancy in the 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. Research has determined that trees have increased susceptibility when radial tree growth is less than 10/20ths of an inch per decade. 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, as the late seral species like grand fir and Douglas-fir are much more susceptible to defoliating insects. 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.

Cumulative Effects

Resiliency and Sustainability

With no mechanical or prescribed fire treatments, the forested stands would remain at risk to disturbances by insects, disease, or wildfire that are larger in scale and severity than happened historically. These disturbances can cross subwatershed boundaries into surrounding areas causing varying amounts of change. There would be no change to the existing condition and there would be no additional cumulative effects from this project.

The foreseeable project in adjacent subwatersheds including the Fuel Reduction projects along Highways 7 and 26 and the Blue/Davis Placer Vegetation Management Project would continue the recent trend to improve forest health and reduce the overall fire danger in the area. These projects would increase the resiliency of the forest to natural disturbances and move the species and structural composition of the forest more like historical conditions.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Introduction

Most treatment is planned to take place in the Hot-dry and the Warm-dry biophysical environments. No harvesting is planned in existing old forest stands in the Warm-dry biophysical environment, and all treatments are designed to enhance growth of young stands into old forest structural stages and to enhance the sustainability of the forest to have enough time to grow into the old forest stages. These are the areas that are most in need of restoration to return the forest to a more resilient and sustainable condition. The stands not treated would have the same effects as discussed for the No Action alternative.

Composition and Density

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.

Reducing the stand density will encourage natural regeneration to occur in the thinned stands. Observations show that when stand densities are below 50 ft²/acre BA ponderosa pine regenerates quite readily and can form another understory. Periodic prescribed fire is recommended in the future to maintain the understory to an acceptable level to maintain the historic conditions of low stocking and few ladder fuels.

The commercial and precommercial thinning treatments in connectivity corridors will improve stand conditions somewhat, but not to the degree as the standard thinning treatments, as the stand density will not be as low. It is anticipated that an additional thinning will be necessary in the

future to maintain the stands in good growing condition, and to remove additional late-seral trees.

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 portions of stands that resemble commercial thinning would respond by increasing their crowns and roots, increasing an ability to utilize nutrients and water. 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 portions of 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

Structural Stages

There is currently a lack of old forest stand structures due to timber harvest, fires, and other disturbances. The increased tree growth from thinning would cause the development of old forest structural stages to accelerate, allowing the thinned stands to grow into the large size classes sooner. In the Warm-dry biophysical environment old forest single strata is projected to increase from 3% to 21% and old forest multi strata from 4% to 35% in the next 50 years for a total of 56% in old forest stages. This is compared to the No Action alternative that only increases the percentage of old forest single strata to 10% in 50 years and old forest multi strata to 36% for a total of 46% in the old forest stages. While the old forest multi strata remains about the same between the alternatives, the proportion of old forest single strata is about doubled by the treatments in Alternative 2.

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 would be resilient to disturbance and would be the least likely to “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.

The thinning treatments in connectivity corridors will not reduce the stand density as much as the standard thinning, therefore it will improve stand conditions somewhat, but not to the degree as thinning to the lower basal areas. If not thinned again in the future, growth will slow and it

would take an additional time to reach the old forest structural stage than with the 50 basal area thinning.

Where shelterwoods are created for regeneration to early seral species, the seedlings would grow rapidly, and with proper spacing control, would eventually develop into the large forest single strata structural stage. They would be more resistant to insects and disease than the current late seral species, but are susceptible to fire until they are about 30 years old. After that time they would be more resistant to fire due to their thicker bark and lack of persistent lower limbs (ladder fuels).

Stands treated would be, or would be growing towards, the HRV for stand structure.

Table V – 12. Effects of Alternative 2 on Hot-dry Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5-15%	5-20%	0-5%	0-5%	5-10%	20-70%	5-15%
Existing	0%	40%	0%	3%	40%	0%	17%
10	0%	40%	0%	3%	39%	1%	17%
50	0%	8%	0%	0%	0%	46%	46%

Table V – 13. Effects of Alternative 2 on Warm-dry Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5-15%	5-20%	1-10%	1-10%	5-25%	15-55%	5-20%
Existing	1%	20%	36%	17%	19%	3%	4%
10	1%	22%	34%	19%	17%	3%	4%
50	0%	10%	14%	4%	16%	21%	35%

Table V – 14. Effects of Alternative 2 on Cool Moist Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	1-10%	0-5%	5-25%	5-25%	40-60%	0-5%	10-30%
Existing	0%	15%	3%	32%	11%	0%	39%
10	0%	15%	3%	32%	11%	0%	39%
50	0%	0%	3%	33%	0%	0%	64%

Table V – 15. Effects of Alternative 2 on Cool-dry Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5-30%	0-5%	5-35%	5-20%	5-20%	1-10%	1-20%
Existing	0%	0%	0%	53%	0%	0%	47%
10	0%	0%	0%	53%	0%	0%	47%
50	0%	0%	0%	86%	2%	0%	12%

Table V – 16. Effects of Alternative 2 on Cold-dry Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	1-20%	0-5%	5-20%	5-25%	10-40%	0-5%	10-40%
Existing	1%	9%	13%	36%	2%	5%	34%
10	1%	9%	14%	38%	2%	3%	32%
50	0%	1%	7%	35%	11%	40%	6%

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.

Riparian Vegetation

No mechanical thinning or other vegetative treatments are planned with this alternative. Prescribed fire is not planned to be ignited in riparian vegetation, but there is the chance that low intensity fire might burn into riparian areas during the burning operations from nearby uplands, since no fire lines are planned along the riparian areas. Past experience has shown that the different moisture regime in the riparian areas moderates the fire behavior so that there are only minor effects to the streamside vegetation. Shrubs and conifers providing streamside shade are almost never affected because they do not burn with enough intensity to cause mortality.

In the outer portions of the riparian areas where the moisture regime transitions into drier conditions similar to the surrounding uplands, the result is more of a mosaic of burned and unburned areas with some shrub and small conifer mortality. This creates an opportunity for more shrubs, which were adapted to sprout after frequent fires and needing sunlight, to increase as the stands become more open.

Aspen

Aspen in stands would not be treated by thinning or burning. As in Alternative 1, aspen will continue to be encroached on by conifers, leading to decline in vigor and numbers. Reproduction will remain low due to the lack of fire and continued browsing by ungulates will eliminate those few suckers that do attempt to grow.

Pristine Areas/Roadless Areas/Wilderness

The areas planned for mechanical treatments have previously been harvested by railroad logging in the 1910-1940's, or truck logging in the 1950-60's. None are in an unaltered condition due to the previous timber harvesting, which mostly removed the larger and more valuable ponderosa pine. In addition, fire suppression has allowed the ingrowth of many more trees and the conversion of some stands from early seral species like ponderosa pine to late seral species like grand fir. The proposed treatments are designed to allow the stands to grow into a condition that replicates past conditions more closely than the current stands.

Genetic Diversity

Units scheduled for regeneration harvest by planting will have increased genetic variability compared to native stock since the tree seed the seedlings are grown from is collected from widely separated trees. Generally, trees that have grown up in near proximity are relatively homogeneous and share pollen with nearby trees, resulting in narrow genetic variance. Current seedlings are grown from seed collected in the wild from selected genetic trees (not from clonal seed orchards). Genetic tree selection guidelines ensure that trees are widely dispersed across the local seed zone within the same elevation band.

Levels of Growing Stock Research Plots

There will be no direct adverse effects to the research plots by this alternative, as they would be buffered by a minimum of 50' no-treatment zone. The risk of a large crown fire would be reduced in those surrounding stands that are treated by either prescribed burning or by thinning. Also, the risk of an insect outbreak starting in the surrounding overstocked stands would be reduced in those that are thinned. Therefore, this alternative would increase the likelihood that these plots would still be usable for future data gathering.

Resiliency and Sustainability

Approximately 43% of the area diagnosed for treatment is proposed for thinning and regeneration. Thinned 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. Shelterwood regeneration in mixed conifer stands will shift the species composition towards early-seral species that are more resistant to insects and diseases and are not as susceptible to fire damage and crown fires. Fuel reduction treatments and prescribed burning will reduce the fuel loadings on the forest floor and reduce the chances of a fire becoming stand replacement intensity.

Insect Risk

Thinning is prescribed in ponderosa pine stands. 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 with increased growth over the next several decades 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).

The host tree species for spruce budworm, tussock moth, and fir engraver will be reduced by thinning mixed conifer stands. 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 since both the thinnings and the shelterwood cuts will 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. This will eventually allow 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.

Cumulative Effects

The area considered for cumulative effects is the Mill Creek subwatershed and the immediately adjacent subwatersheds. The effects of past and present activities listed in Appendix D have been integrated into and described under the affected environment. The effects of planned future activities in adjacent subwatersheds include the fire hazard reduction along Highway 26 and 7 and around the Austin Junction Area and the Blue/Davis Placer vegetation management project to the immediate west.

Most of the effects of the planned activities on the forest vegetation are mainly local in nature with limited geographic scope. These effects have been discussed in the previous direct and indirect effects section. The major cumulative effect is the impact on the resiliency and sustainability of the forest.

Resiliency and Sustainability

Past activities in the 1990's in this subwatershed have made some small scale positive changes in the overall forest health and sustainability. The planned actions in this alternative, in combination with the past actions, will create a matrix of treated stands over most of the subwatershed. These treatments will be over a sufficient proportion of the landscape to serve to reduce the severity and extent of wildfire and also the chance of insects and disease reaching an outbreak situation. Disturbances within treated stands are expected to be reduced in intensity and duration, as a result of better growing conditions and a more resistant species mix. Disturbances in stands not treated will be smaller in geographic scope and more within historic scales as there will be less unbroken blocks of stands in unhealthy condition.

The foreseeable future actions listed above are anticipated to further increase the overall sustainability and resiliency of the forest as a whole, especially those activities planned in nearby subwatersheds. By creating large blocks of land with a matrix of treatments, the risk of large-scale disturbances will be reduced over the landscape.

With the planned mechanical and prescribed fire treatments, the risk of large-scale disturbances to forested stands would be reduced. These disturbances can cross subwatershed boundaries into surrounding areas causing varying amounts of change; therefore, reducing risk in one area also has a beneficial effect to the surrounding areas. This alternative does the most treatment of stands and has the most beneficial increase in forest resiliency to disturbance by fire, insects, and disease, reversing the adverse effects of past overstory removal and fire suppression.

Alternative 3

Introduction

This alternative thins approximately 613 less acres of overstocked timber stands and eliminates all 119 acres of the shelterwood harvest. No harvesting is planned in existing old forest stands in the Warm-dry biophysical environment, and all treatments are designed to enhance growth of young stands into old forest structural stages and to enhance the sustainability of the forest to have enough time to grow into the old forest stages. The prescribed burning remain the same as Alternative 2. Compared to Alternative 2, Alternative 3 treats 67% of the area that Alternative 2

treats. Stands that are not treated would be subject to the same effects as discussed for the No Action Alternative.

Direct and Indirect Effects

Composition and Density

Alternative 3 would have about 613 acres less commercial thinning, no shelterwood harvest and regeneration, and about 269 acres less precommercial thinning than Alternative 2. The effects of this alternative on stand composition and density correspond to about 67% of the effects of Alternative 2.

Structural Stages

Approximately 67% of the stands will be treated by Alternative 3 compared to the amount of stands treated by Alternative 2. Development of old forest single strata stand structures will be reduced while old forest multi-strata will be the same as in Alternative 2. There is an 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.

Most of the treatments are in the Warm-dry biophysical environment and old forest single strata is projected to increase from 3% to 16% and old forest multi strata from 4% to 37% in the next 50 years. This is compared to the No Action alternative that increases the percentage of old forest single strata to 10% and old forest multi strata to 36% in 50 years, and Alternative 2 that increases the percentage of old forest single strata to 21% and old forest multi strata to 35% in 50 years.

Table V – 17. Effects of Alternative 3 on Hot-dry Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5-15%	5-20%	0-5%	0-5%	5-10%	20-70%	5-15%
<i>Existing</i>	0%	40%	0%	3%	40%	0%	17%
10	0%	40%	0%	3%	40%	0%	17%
50	0%	9%	0%	0%	0%	44%	47%

Table V – 18. Effects of Alternative 3 on Warm-dry Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5-15%	5-20%	1-10%	1-10%	5-25%	15-55%	5-20%
<i>Existing</i>	1%	20%	36%	17%	19%	3%	4%
10	1%	20%	34%	19%	19%	3%	4%
50	0%	10%	15%	5%	17%	16%	37%

Table V – 19. Effects of Alternative 3 on Cool Moist Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	1-10%	0-5%	5-25%	5-25%	40-60%	0-5%	10-30%
<i>Existing</i>	0%	15%	3%	32%	11%	0%	39%
10	0%	15%	3%	32%	11%	0%	39%
50	0%	0%	3%	33%	0%	0%	64%

Table V – 20. Effects of Alternative 3 on Cool-dry Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5-30%	0-5%	5-35%	5-20%	5-20%	1-10%	1-20%
Existing	0%	0%	0%	53%	0%	0%	47%
10	0%	0%	0%	53%	0%	0%	47%
50	0%	0%	0%	86%	3%	0%	11%

Table V – 21. Effects of Alternative 3 on Cold-dry Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	1-20%	0-5%	5-20%	5-25%	10-40%	0-5%	10-40%
Existing	1%	9%	14%	36%	1%	5%	34%
10	1%	9%	14%	35%	2%	5%	34%
50	0%	1%	7%	33%	10%	44%	5%

Understory Vegetation

The effects on the understory will be reduced from Alternative 2, since Alternative 3 only treats 67% of the area.

Aspen

Aspen in stands would not be treated by thinning or burning. As in Alternative 1, aspen will continue to be encroached on by conifers, leading to decline in vigor and numbers. Reproduction will remain low due to the lack of fire and continued browsing by ungulates will eliminate those few suckers that do attempt to grow.

Pristine Areas/Roadless Areas/Wilderness

The effects will be much the same as Alternative 2, but since Alternative 3 only treats 67% of the stands as Alternative 2, it will take longer to reach historic conditions in the stands not treated to increase growth and resiliency.

Genetic Diversity

Results will be similar to Alternative 2 but there is no regeneration harvest and the thinning is being done on 33% less stands.

Levels of Growing Stock Research Plots

There will be no direct adverse effects to the research plots by this alternative, as they would be buffered by a minimum of 50' no-treatment zone. The risk of a large crown fire would be reduced in those surrounding stands that are treated by either prescribed burning or by thinning. Also, the risk of an insect outbreak starting in the surrounding overstocked stands would be reduced in those that are thinned. Therefore, this alternative would increase the likelihood that these plots would still be usable for future data gathering.

Resiliency and Sustainability

Alternative 3 treats about 33% less of the area compared with Alternative 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 on reducing the risk of insect attacks would be approximately 33% less compared to Alternative 2.

Disease Risk

The effects of this alternative on reducing disease would be approximately 33% less compared to Alternative 2.

Cumulative Effects

Resiliency and Sustainability

Compared to Alternative 2, the reduced amount of treatment in Alternative 3 will leave a larger proportion of forested stands at risk to large scale disturbances, increasing the risk to forested areas outside the project area. Still, the overall effect will be an improvement in the ability of the forest to resist disturbances. This takes into consideration the same recent past and foreseeable future projects listed in Appendix D that were considered in analyzing the effects for Alternative 2.

Alternative 4

Introduction

This alternative does no commercial timber harvest at all. The precommercial thinning and prescribed burning is at the same level as in Alternative 2. This alternative treats the least amount of the stands identified as needing treatment to meet the desired condition than the other action alternatives. This is a decrease of approximately 60% from the area treated by Alternative 2, and the precommercial thinning is expected to be much less effective than the commercial entries proposed for Alternative 2 for improving forest resiliency and sustainability, as only trees less than 9" dbh would be cut. The stands not treated would have the same effects as discussed for the No Action alternative.

Direct and Indirect Effects

Composition and Density

This alternative thins about 1,300 less acres (60% less area) than Alternative 2, and will remove fewer trees since the precommercial thinning would only be up to 9" DBH. Thinned stands are only expected to marginally respond to the thinning as the stands would still be in an overstocked condition with the stand basal area only slightly reduced.

The only gain would be in the decrease in the fire hazard due to the removal of much of the understory and the treating of the thinning slash. Surface fires would burn with less intensity and there would be less ladder fuels, however the resistance to crown fire spread would be the same as there would be little change in the overstory crown structure. Removing the understory will

facilitate the reintroduction of fire into these stands resulting in a slight shift back towards historical conditions.

This alternative is the farthest from meeting the Desired Condition for a sustainable forest of all of the action alternatives. It thins least amount of stands to the desired density.

Structural Stages

Development of old forest stand structures in the thinned stands, with the increased growth rates will take about the same amount of time as the No Action Alternative. There is a slightly decreased risk of uncharacteristically severe wildfire that could set back structural stage development, both for the treated stands and surrounding stands.

Table V – 22. Effects of Alternative 4 on Hot-dry Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5-15%	5-20%	0-5%	0-5%	5-10%	20-70%	5-15%
Existing	0%	40%	0%	3%	40%	0%	17%
10	0%	40%	0%	3%	40%	0%	17%
50	0%	33%	0%	0%	0%	8%	59%

Table V – 23. Effects of Alternative 4 on Warm-dry Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5-15%	5-20%	1-10%	1-10%	5-25%	15-55%	5-20%
Existing	1%	20%	36%	17%	19%	3%	4%
10	1%	20%	36%	17%	19%	3%	4%
50	0%	5%	24%	6%	19%	10%	36%

Table V – 24. Effects of Alternative 4 on Cool Moist Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	1-10%	0-5%	5-25%	5-25%	40-60%	0-5%	10-30%
Existing	0%	15%	3%	32%	11%	0%	39%
10	0%	15%	3%	32%	11%	0%	39%
50	0%	0%	3%	33%	0%	0%	64%

Table V - 25. Effects of Alternative 4 on Cool-dry Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	5-30%	0-5%	5-35%	5-20%	5-20%	1-10%	1-20%
Existing	0%	0%	0%	53%	0%	0%	47%
10	0%	0%	0%	53%	0%	0%	47%
50	0%	0%	0%	88%	0%	0%	12%

Table V – 26. Effects of Alternative 4 on Cold-dry Forest Structural Stages

Year	SI	SEOC	SECC	UR	YFMS	OFSS	OFMS
HRV	1-20%	0-5%	5-20%	5-25%	10-40%	0-5%	10-40%
Existing	1%	9%	14%	36%	1%	5%	34%
10	1%	9%	14%	36%	1%	5%	34%
50	0%	0%	13%	36%	9%	35%	7%

Understory Vegetation

The effects of this alternative would be similar to the No Action Alternative, but the thinning of the understory would have some small benefit to the re-establishment of shrubs and forage species.

Aspen

Aspen in stands would not be treated by thinning or burning. As in Alternative 1, aspen will continue to be encroached on by conifers, leading to decline in vigor and numbers. Reproduction will remain low due to the lack of fire and continued browsing by ungulates will eliminate those few suckers that do attempt to grow.

Genetic Diversity

Results will be similar to the No Action Alternative due to the limited extent of management proposed.

Levels of Growing Stock Research Plots

There will be no direct adverse effects to the research plots by this alternative, as they would be buffered by a minimum of 50' no-treatment zone. The risk of a large crown fire would be reduced in those surrounding stands that are treated by either prescribed burning or by precommercial thinning. Also, the risk of an insect outbreak starting in the surrounding overstocked stands would be slightly reduced in those that are thinned. Therefore, this alternative would slightly increase the likelihood that these plots would still be usable for future data gathering, but not to the extent provided by Alternative 2.

Resiliency and Sustainability

This alternative thins about 60% less area than Alternative 2 at a much lower intensity (the basal area will not be materially reduced). Ponderosa pine stands will very slightly increase in growth and vigor as the stand density is reduced slightly.

Treated stands will be not be able to grow much better than presently, so it will not be any more resistant to insects, disease, and fire damage.

Insect Risk

The effects of this alternative on reducing the risk of insect attacks would be approximately the same as the No Action Alternative

Disease Risk

The effects of this alternative on reducing disease would be approximately the same as the No Action Alternative.

Cumulative Effects

Resiliency and Sustainability

With the least amount of mechanical treatments, the risk to forested stands would remain relatively high to large-scale disturbances. Fire hazard is decreased a moderate amount but the

risk of insect or disease is not materially decreased. These disturbances can cross subwatershed boundaries into surrounding areas causing varying amounts of change.

Consistency with Direction and Regulations

Forest Plan

The No Action Alternative does not meet the Forest Plan direction to establish ponderosa pine (and other early seral species) in appropriate sites to increase fire, insect, and disease resiliency.

The Action Alternatives (Alts. 2, 3, and 4) all meet the direction to minimize losses due to insects and disease by managing stands at appropriate densities and by selecting for the more insect and disease resistant ponderosa pine and western larch. Both natural regeneration and planting are utilized to reforest the shelterwood harvest areas and seed used to grow the seedlings is collected from superior trees within the seed zone and elevation band.

Regional Forester Forest Plan Amendment #2 (Eastside Screens)

All alternatives meet the direction to not decrease old forest structural stages, since no live trees over 21" are to be harvested (except for incidental trees cut for road and landing construction and for safety).

There is no shelterwood harvesting planned in the old forest structural stages. Nor is there is any thinning harvesting in old forest structure stands in the warm-dry biophysical environment, as it is below HRV in that biophysical environment (Scenario A). There is no net loss of old forest (LOS) structure with any of the alternatives. The prescriptions for the connectivity corridors between old forest structure stands are designed to maintain the stands in the upper 1/3 of site potential.

The Action Alternatives (Alts. 2, 3, and 4) all do a better job meeting the objective to protect existing old forest structure and to shorten the time to grow additional old forest structural stages than the No Action Alternative. This is because thinning overstocked stands will increase growth rates and sustainability against loss to insects, disease, and fire. Of the action alternatives, Alt. 2 does the best, followed by Alt. 3, and Alt. 4 does the least amount of increasing sustainability and long-term viability.

Irreversible and Irretrievable Commitments of Resources

Irreversible Commitments

There are no anticipated long-term irreversible commitments of the forest vegetation since it is renewable as long as the soil productivity is maintained. There may be short-term losses of growth related to soil compaction, but compaction is to be kept below 20% of the forest area, and the growth reduction on compacted ground is about 15%. This would result in a total maximum growth loss of approximately 3% per year of the growth potential until the compaction gradually diminished (in about 50 years). The gain from thinning can be expected to off-set this growth loss.

Irretrievable Commitments

There are irretrievable commitments of the growth of forest vegetation for about 5 years because of the new landings and roads that are built for the salvage operation. They are to be rehabilitated after use, but there will be a lag in reforestation and growth since the sites are impacted more heavily than the surrounding forestland.

Fire and Fuels

Introduction

Fuels management is a process of managing the hazard in relation to the size and severity of a potential fire event. The objective of fuels management is to reduce the fire hazard to a level where cost effective resource protection is possible should a wildfire ignite. Fire behavior is a function of fuels, weather, and topography. Of these three components affecting wildland fire behavior, only fuels can be manipulated.

Regulatory Framework

Malheur National Forest Plan

The Malheur National Forest Plan includes Fire Management Direction to ensure that fire use programs are cost-effective, compatible with the role of fire in forest ecosystems, and responsive to resource management objectives and that fire presuppression and suppression programs are cost-effective and responsive to the Forest Plan (Appendix G).

The goals for fire management are to: 1) initiate initial management action that provides for the most reasonable probability of minimizing fire suppression costs and resource damage, consistent with probable fire behavior, resource impacts, safety, and smoke management and 2) identify, develop, and maintain fuel profiles that contribute to the most cost-efficient fire protection program consistent with management direction (Forest Plan, pg. IV-4).

The following applicable Forest wide direction is provided for fire management: manage residue profiles at a level that will minimize the potential of high intensity wildfire and provide for other resources (Forest Plan, pg. IV-44). Air quality standards require that air quality impacts be minimized, especially to Class I airsheds and smoke sensitive areas, mitigation measures be used when appropriate, and burning is conducted in accordance with the State Smoke Management Plan (Forest Plan, pg. IV-40).

The Malheur National Forest Fire Management Plan (FMP) provides operational guidance on how to carry out fire management policies that will help achieve resource management objectives. The Fire Management Plan is updated annually or as policy and Land and Resource Management Plans change. A fire management planning system that recognizes both fire use and fire protection as inherent parts of natural resource management will ensure adequate fire suppression capabilities as well as support fire reintroduction efforts (FMP).

The fuels management portion states that the appropriate type and amount of fuel treatment is tiered to the Forest Plan Management Area specific Standards and Guidelines. Levels and methods of fuel treatment will be guided by the protection and resource objectives of each management area. Emphasis will be on ecological restoration treatments. Where appropriate, fuels treatments will allow for the utilization of wood residues using a marketing strategy.

National Fire Plan

The National Fire Plan (USDA Forest Service & USDI Bureau of Land Management 2001) provides national direction for hazardous fuel reduction, restoration, rehabilitation, monitoring, applied research, and technology transfer. The USDA Forest Service and Department of Interior (DOI) are developing a common strategy for reducing fuels and restoring land health in fire-prone areas. The USDA Forest Service prepared a document outlining strategies for protecting people and the environment by restoring and sustaining land health; Protecting People and Sustaining Resources in Fire-adapted Ecosystems – A Cohesive Strategy (USDA Forest Service 2000). The purpose of the strategy is to:

- Establish national priorities for fuel treatment; ensuring funding is targeted to the highest risk communities and ecosystems.
- Evaluate tradeoffs between programs that emphasize wildland urban interface and those emphasizing ecosystem restoration and maintenance.
- Measure the effectiveness of strategic program options at different funding levels.
- Recommend a strategic program to best achieve national fuel treatment objectives for community protection and ecosystem restoration and maintenance.
- Emphasize landscape-scale, cross-boundary treatments that reduce hazards while providing benefits to other ecosystem values.

The strategy will emphasize improved working relationships between federal land managers, as well as with multiple key disciplines inside the various land management and regulatory agencies and bureaus across geographic scales. National Fire Plan goals and objectives include:

- Reducing the number of small fires that become large
- Restoring natural ecological systems to minimize uncharacteristically intense fires
- Creating new jobs in both the private and public sectors
- Improving capabilities of state and volunteer fire organizations
- Reducing threats to life and property from catastrophic wildfire

The 10-Year Comprehensive Strategy (reflects the views of a broad cross-section of governmental and non-government stakeholders. It outlines a comprehensive approach to the management of wildland fire, hazardous fuels, and ecosystem restoration and rehabilitation on Federal and adjacent State, tribal, and private forest and range lands. Congress directed the Secretaries of Interior and Agriculture to work with the Governors to develop this strategy in the FY 2001 Interior and Related Agencies Appropriations Act (P.L. 106-291). The primary goals of the 10-Year Comprehensive Strategy are:

1. Improve prevention and suppression
2. Reduce hazardous fuels
3. Restore fire adapted ecosystems

4. Promote community assistance

The Implementation Plan (May 2002) outlines specific performance measures for each of the primary goals listed above: Only the goals to reduce hazardous fuel are listed below.

Goal Two – Reduce Hazardous Fuels

- a. Number of acres treated that are (i) in the wildland urban interface, or (ii) in condition classes 2 or 3 in fire regimes 1, 2, or 3 outside the wildland urban interface, and are identified as high priority through collaboration consistent with the Implementation Plan, in total, and as a percent of all acres treated.
- b. Number of acres treated per million dollars gross investment in Measures a.(i) and a.(ii) respectively.
- c. Percent of prescribed fires conducted consistent with all Federal, State, Tribal and local smoke management requirements.

Analysis Methods

The Integrated Forest Resource Management System (INFORMS) software program was used for this project's analysis. INFORMS was designed for such project level analysis and provides an interface to a variety of analysis tools such as the Most Similar Neighbor (MSN), Forest Vegetation Simulator (FVS), and the Fuels and Fire Extension for FVS (FFE-FVS). The Most Similar Neighbor (MSN) was used to fill in missing vegetation data within the project area based on existing vegetation data of similar stands. This information was verified by specialists with knowledge of the area and changes were made. FVS, using the Blue Mountain variant, was used to simulate stand growth and the compare stand characteristics and structural stages between alternatives. FFE-FVS was used for fire and fuels effects. Torching and crowning indices were determined by the Forest Vegetation Simulator (FVS) based on stand information and are used to create a torch code and a crown code in Informs. Crown fire potential was determined using Fuels Tool of INFORMS. Canopy base height and crown bulk density are used to compare differences in alternatives. The Fire Regime Condition Class (FRCC) was derived from the use of the FRCC tool within INFORMS for the landscape. Stand level FRCC was from the forest wide FRCC coverage. Additional information including assumptions and constraints about FVS and FFE-FVS can be found at www.fs.fed.us/fmfc/fvs/index and additional information on the INFORMS software can be found at www.fs.fed.us/informs. Long-term projections become estimates at best; however, results do show trends and are useful for comparing different alternatives. With this analysis it should be remembered that, for any one stand, the total set of attributes will describe the stand pretty well but any one attribute cannot be depended upon to be accurate (Informs User Guide).

Affected Environment

Weather

Weather is important for thunderstorm generation and for precipitation and wind patterns that are affect fire behavior. The weather patterns are influenced by several factors including the position and intensity of upper level wind currents, the high and low pressure systems over the Pacific Ocean, and the variations in the topography. Two major frontal zones affect the Malheur National Forest. One, a Pacific air mass boundary is relatively moist and the second is a drier

continental air mass. There is a thermal trough that migrates northward in spring and summer with occasional intrusions of monsoon moisture from the southwest. Strong convection occurring during this time period sets the stage for multiple ignitions. In early summer the drier continental air mass results in a prolonged drying trend.

The Blue Mountains experience hot, dry east winds several times a month during the summer and fall. These winds have low relative humidity, can quickly dry the fine fuels that carry fire, and can be strong. Valleys that run east-west and have low saddles at their crest are likely to be affected by these winds more than north-south valleys or areas with more topographic definition. Local winds are associated with differential heating of the landscape are important throughout the Blue Mountains: up-valley winds during the day, down-valley at night. Topographic influences interact with weather, but have direct effects on fire as well. Steep slopes are more likely to burn than flat ones, southerly aspects more than northerly, and ridgelines more than valley bottoms.

Fire Risk

Fire risk is the chance of a fire starting from any ignition source and is determined by using the frequency of past fire starts. Fire frequency is expressed statistically as the number of fire starts per one thousand acres per year. The dominant fire ignition source in the southern Blue Mountains is lightning. Lightning ignitions vary by elevation, aspect and fuel type.

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.

From the Upper Middle Fork John Day Watershed Analysis, fire frequency is 1.0 fire per one thousand acres per decade. For the Mill Creek subwatershed the fire frequency is slightly greater than 1.0 putting the subwatershed and the project into the high fire risk rating. About 78 percent of the fire starts that have occurred within the subwatershed have been caused by lightning, and 22 percent have been human caused.

Fire Hazard

Fire hazard most commonly refers to the difficulty of controlling potential wildfire. Fire behavior characteristics such as rate-of-spread, intensity, torching, crowning, spotting, fire persistence, or resistance to control are generally used to determine and describe fire hazard. As Brown et al (2003) indicated, fire severity can be considered an element of fire hazard.

The influences of fine fuels such as litter, duff, grasses and small woody fuels (less than 3 inches diameter) have the most affect on spread rate and intensity of fires. These fuels are used in fire behavior models developed for predicting the fire behavior of the initiating fire (Rothermel 1983). Coarse Woody Debris (>3inches) have little influence on spread and intensity of the initiating fire; however, they can contribute to development of large fires and high fire severity. Fire persistence, resistance-to-control, and burnout time (affects to fire fighter and public safety, soil heating and tree mortality) are significantly influenced by loading, size, and decay state of large woody fuel. Torching, crowning, and spotting contribute to large fire growth and are greater where large woody fuels have accumulated under a forest canopy. Large woody fuel, especially containing large decayed pieces, are a suitable fuelbed for firebrands and can hold smoldering fire for extended periods of time (Brown et al 2003). Spot fires can also be started in

rot pockets of standing snags. The distance firebrands travel is dependent of size of the firebrand, wind speed, and height above ground of the source.

Fire behavior and severity depend on the properties of the various fuel strata and the continuity of those fuel strata. The fire hazard can be characterized by the potential for fuels to cause specific types of behavior and effects. Fuelbeds can be classified into 6 strata: 1) tree canopy, 2) shrubs/small trees 3) low vegetation, 4) woody fuels 5) moss, lichens, and litter, and 6) ground fuels (duff) (Graham et al. 2004). This project primarily addresses four of the six fuelbed strata listed above, tree canopy, small trees, woody fuel, and litter.

The probability of ignition is related to fine fuel moisture content, air temperature, the amount of shading of surface fuels, and an ignition source (lightning or human). Open stands generally offer a drier and warmer microclimate than closed, denser stands. The denser stands usually have more shading of the fuels keeping humidity higher and air temperature lower. Open stands also tend to allow higher wind speeds. Historic stand structure played an important role in maintaining fire-dependent forest types, such as ponderosa pine. (Graham, et al, 2004).

Current fuel conditions in the project area are a result primarily of the exclusion of fire, timber harvest and livestock grazing. The lack of fire has allowed a build up of crown, surface and ground fuels. Grazing has reduced grasses, a fine fuel and primary fire carrier. Past harvest activities have changed the structure and species composition so higher levels of fire susceptible species and greater numbers of smaller trees are now present on the landscape.

Fire Regimes and Condition Classes

A natural fire regime is a general classification of the role fire would play across a landscape in the absence of modern human intervention, but including the influence of aboriginal burning (Agee 1993, Brown 1995). Coarse scale definitions for natural (historical) fire regimes have been developed by Hardy et al. (2001) and Schmidt et al. (2002) and interpreted for fire and fuels management by Hann and Bunnell (2001). The five natural (historical) fire regimes are classified based on average number of years between fires (fire frequency) combined with the severity (amount of replacement) of the fire on the dominant overstory vegetation. The five regimes include:

- ❑ I – 0-35 year frequency and low (surface fires most common) to mixed severity (less than 75% of the dominant overstory vegetation replaced);
- ❑ II – 0-35 year frequency and high (stand replacement) severity (greater than 75% of the dominant overstory vegetation replaced);
- ❑ III – 35-100+ year frequency and mixed severity (less than 75% of the dominant overstory vegetation replaced);
- ❑ IV – 35-100+ year frequency and high (stand replacement) severity (greater than 75% of the dominant overstory vegetation replaced);
- ❑ V – 200+ year frequency and high (stand replacement) severity.

Specific to the Blue Mountains, fire regimes have been identified for all plant associations. In addition, fire frequency with the percent of any fire that may be mixed severity or stand replacing has been identified for all plant associations in the Blue Mountains. This information

is displayed in Table F-1. See the vegetation section for more information on the Plant Association Groups.

Table F – 1. Mill Creek Subwatershed Fire Regime Summary for Upland Forests

Fire Regime Group	Plant Association Group	Mean Fire Interval and Replacement Fire %	Percent within Mill Subwatershed
I	Hot-dry Upland Forest	15 years and 10%	4%
I	Warm-dry Upland Forest	22 years and 24%	61%
III	Cool Moist Upland Forest	59 years and 30%r	<1%
IV	Cool-dry Upland Forest	111 years and 67%	4%
IV	Cold-dry Upland Forest	143 years and 57%	21%

The Fire Regimes for non-forested vegetation is dependent upon the moisture regime and whether it is upland or riparian. Sufficient data was not available for all shrublands, grasslands, or herblands. The Fire Regime for these areas can be I, II, III, or IV.

A fire regime condition class (FRCC) is a classification of the amount of departure from the natural regime (Hann and Bunnell 2001). Coarse-scale FRCC classes have been defined and mapped by Hardy et al. (2001) and Schmidt et al. (2001). They include three condition classes for each fire regime. The classification is based on a relative measure describing the degree of departure from the historical natural fire regime. This departure results in changes to one (or more) of the following ecological components: vegetation characteristics (species composition, structural stages, stand age, canopy closure, and mosaic pattern); fuel composition; fire frequency, severity, and pattern; and other associated disturbances (e.g. insect and diseased mortality, grazing, and drought). All wildland vegetation and fuel conditions or wildland fire situations fit within one of the three classes. The three classes are based on low (FRCC 1), moderate (FRCC 2), and high (FRCC 3) departure from the central tendency of the natural (historic) regime (Hann and Bunnell 2001, Hardy et al. 2001, Schmidt et al. 2002). The central tendency is a composite estimate of vegetation characteristics (species composition, structural stages, stand age, canopy closure, and mosaic pattern); fuel composition; fire frequency, severity, and pattern; and other associated natural disturbances. Low departure is considered to be within the natural (historic) range of variability, while moderate and high departures are outside.

Characteristic vegetation and fuel conditions are considered to be those that occurred within the natural (historic) fire regime. Uncharacteristic conditions are considered to be those that did not occur within the natural (historic) fire regime, such as invasive species (e.g. weeds, insects, and diseases), “high graded” forest composition and structure (e.g. large trees removed in a frequent surface fire regime), or repeated annual grazing that maintains grassy fuels across relatively large areas at levels that will not carry a surface fire.

Determination of amount of departure is based on comparison of a composite measure of fire regime attributes (vegetation characteristics; fuel composition; fire frequency, severity and pattern) to the central tendency of the natural (historical) fire regime. The amount of departure is then classified to determine the fire regime condition class.

A fire under current conditions would not burn as a low severity surface fire. Fires would be mixed severity to stand replacing with detrimental effects to other resources that did not historically occur. Another ecological component that has changed and is contributing to the departure from the natural fire regime includes the vegetation condition. Tree densities are much

higher, and species composition has shifted to have a higher proportion of shade tolerant, fire susceptible fir. Insect and disease are contributing to tree mortality in the area that then contributes to surface fuel loading as trees fall to the ground.

At the landscape scale, the appropriate scale at which to evaluate fire regimes and ecological departure for FRCC determination (Hann et al 2003), the current condition is FR1CC2 at 35% departure. The percentage range defining moderate departure is 33% to 66%. There is a low-moderate level of departure from historic conditions. The uncharacteristic conditions include; several of the structural stages being outside the range of historic variability, and the fire frequency having been altered.

The Forest FRCC coverage indicates that approximately 43% of the subwatershed is in Fire Regime 1 and a Condition Class 3 and 14% is Fire Regime 1 and a Condition Class 2.

Fuel Models and Fuel Loadings

Fuel models (FM) are used to help describe and quantify surface fuel situations and estimate fire behavior. Criteria for choosing a fuel model involves assessing the fuel strata that will support the fire as it spreads and generates heat intensity. Where fuel beds are fairly continuous with similar fuel characteristics, one model can provide a realistic representation of expected fire behavior. A description of the Fuel models, their characteristics and their representation in the project area follows:

Fuels in Fuel model 1 areas consist mainly of grass and herbaceous plants. Very little shrub or tree vegetation is present, generally less than one-third of the area. Fires in this model are mainly on the surface, move rapidly, and cause very little mortality in established stands but serve to limit seedling development in the understory. The natural mosaic pattern of fire allows even aged clumps of trees to form across the landscape. Average fuel loading for this fuel model is less than one ton per acre.

FM 2 includes open shrub lands and ponderosa pine stands. Also, grasslands being encroached by conifers, as well as light understory development is typical. These stands may include clumps of fuels or small concentrations of dead down material that could generate higher intensity fire and may produce firebrands. Fire spread is primarily through the fine curing grass, dead herbaceous fuels, and litter. Historically, much of the area within the Crawford project area would have been represented by fuel model 2.

FM5 represents short shrubs or young green stands with no dead wood. Fire is generally carried in the surface fuels that are made up of litter cast by shrubs and the grasses and forbs. Fires are usually not intense because of light fuel loads and the foliage contains little volatile material.

FM 8 represents a closed canopy of short-needle conifers with a compact surface-fuel litter layer. Representative vegetation types are mixed conifers of lodgepole, Douglas fir, subalpine fir, white fir, and larch. The surface-fuel layer is mainly needles and occasional twigs with very little undergrowth. Fires are typically slow burning with low flame lengths. An occasional heavy fuel concentration may cause a flare up, but the chance of any erratic fire behavior is small. Only under severe weather conditions with high temperatures, extremely low relative humidity, and high wind speeds does this fuel bed pose a high fire hazard.

FM 9 areas have mature stands with small amounts of understory development. Fires spread through surface litter that has accumulated under more dense stands of ponderosa pine. Concentrations of dead-down woody material will contribute to possible torching of overstory trees.

FM 10 represents an area in which there is a moderate loading of larger size fuel at the surface layer. In this model, fires burn in the surface and ground fuels with greater fire intensity than the other fuel models. The fuel bed contains a moderate loading of large size fuels from insect/disease, wind damage, or natural mortality. High heat intensity, torching, spotting, and crowning may be expected during wildfire events; resistance to control is high.

FM12 is similar to FM 10 in that the primary fire carrier is larger woody debris but it has heavier loadings than FM10. High heat intensity, torching, spotting, and crowning may be expected during wildfire events and resistance to control is high.

Within the project area, many stands identified as fuel model 2 have a component of fuel model 10 where there are areas of higher fuel loadings due to insect caused or density induced mortality has occurred. Fuel models 3, 4, 6, 7, and 11 are not represented in the subwatershed. The following table displays fuel models for the project area. Fuel model 12 is not represented in the existing condition. Average flame lengths for each fuel model are also displayed.

Flame lengths are an indicator of fire intensity and the type of fire attack that can be used on a fire. A flame length less than four feet can be attacked with hand tools, and fire fighters can work close to the flame. Flame lengths of 4-8 feet will require heavy equipment, such as bulldozers, and fire size will be larger and more costly to suppress. Flame lengths greater than 8 feet usually require air attack and again the fire size will be larger and more costly to suppress. In short, the probability of suppressing fires at small acreages decreases as flame length increases. Currently, a fire on approximately 39% of the area could be controlled by solely by handcrews based only on the predicted flame length displayed in Table F – 2.

Table F – 2. Crawford Project Area Fuel Model Summary

Fuel Model	Acres	% of Area	Average Flame Length
1	1460	8%	5
2	8649	41%	7
5	153	1%	3
8	6696	38%	4
9	828	5%	5
10	1460	8%	5

The surface fuels are often characterized by fuel loading. There are size classes used to measure fuel loadings, 0-.25", .25-1", 1-3", and 3"+. Because most of the area where treatment is proposed with this project is in Fire Regime 1 or within the Warm-dry and Hot-dry plant association groups (PAGs), the fuel loading discussion is limited to Fire Regime 1 areas. The project is only affecting other PAGs to a small degree. For much of this environment, a close representative photo to show desired surface fuel conditions is (4-PP-4) from the Photo Series for Quantifying Natural Forest Residues in Common Vegetation Types of the Pacific Northwest

(May 1980). This photo indicates that the desired surface fuels would have been less than 10 tons per acre with disturbance from the natural fire regime. The 3"plus size class of fuels would make up a majority of the loading. Duff accumulations would be fairly low. The loading would vary somewhat depending where in the natural fire cycle the area was.

The current condition of the average tons per acre indicates surface fuel loads are at the desired condition. However, not taken into account in these averages are, stands identified as fuel model 2 have a component of fuel model 10 where there are areas of higher fuel loadings due to insect caused or density induced mortality has occurred. The loading in these areas can be up to 20 tons per acre with 13 tons per acre in the 3 inch plus size class.

Table F – 3. Existing Average Tons per Acre by Fuel Size Class

Fuel Size Class	AVERAGE TONS/ACRE	DESIRED SURFACE FUEL – TONS/ACRE
0-.25	0.30	.2
.25-1	0.56	1.2
1-3	0.98	2.3
3+	6.35	4.7
Total	8.19	8.4

Crown Fire Hazard Indices

Crown fires are generally considered the primary threat to ecological and human values. They occur when surface fires create enough energy to preheat and combust fuels well above the surface. (Agee, 2002) Crown fires are typically faster moving than surface fires, more difficult to suppress, and pose the greatest threat to fire fighter safety from increased fire line intensities and long distance spotting. These risks force an indirect suppression strategy, which increases acres burned, and thus increases fire severity on the landscape, resulting in more tree mortality, and smoke production. Torching index and crowning index are both used as indices of crown fire hazard. Torching index is the 20 foot wind speed in miles per hour at which a surface fire is expected to ignite the crown layer and crowning index is the 20 foot wind speed needed to support an active or running crown fire. Torching index depends on surface fuels, surface fuel moisture, canopy base height, slope steepness, and wind reduction by the canopy. As surface fire intensity increases, or canopy base height decreases, it takes less wind to cause a surface fire to become a crown fire. Crowning index depends on canopy bulk density, slope steepness, and surface fuel moisture content. As a stand becomes denser, active crowning occurs at lower wind speeds and the stand is more vulnerable to crown fire (Reinhardt, et al, 2003). As stated earlier, slopes within the project area are gentle to moderately steep so slope steepness is not a major component of crowning index.

The current potential for crown fire is displayed in Table F-4. Approximately 40% of the subwatershed has at least a high potential for crown fire should a fire start.

Table F – 4. Current Crown Fire Potential

Crown Fire Initiation Potential	% of Mill Creek subwatershed
Extreme	1%
Very-High	19%
High	20%
Medium	43%
Low	7%

Sixty four percent of the subwatershed consists of plant associations within Fire Regime 1. These systems historically had rather short fire free periods that prevented high fuel loads from accumulating and limited the layers within the stand. The crown fire potential for areas of Fire Regime I would be low under historical conditions. Currently, the amount of area with a high or greater potential for crown fire is greater than would have occurred historically.

Air Quality

The project area lies adjacent to Austin, Bates area, a large high mountain valley with the Middle Fork John Day River draining the surrounding area. The lowest elevation of the valley is at Austin/ Bates, where the river flows from the valley to the west. The prevailing winds are from the southwest and west. During the day, diurnal heating forces air up valley and up slope out of the valley. During the night, air follows the drainages in the valley towards Austin/ Bates. Inversions effect air quality the most during the winter months, but during the rest of the year inversions sometimes develop in the morning hours, but dissipate by noon. There are several homes scattered in the Austin/Bates area that are often affected by smoke from nearby burning, with the town of Austin/Bates being most affected.

The Strawberry Mountain Wilderness is a Class I airshed and is located 20 miles to the southwest of the project area. In class I areas, only very small increments of new pollution above already existing air pollution levels are allowed. The State has designated visibility protection periods for class 1 airsheds from July 1st to September 15th for Central Oregon and the Cascades. At this time these protection periods have not been set for Class 1 airsheds in Eastern Oregon. Monitoring has not shown that visibility within the area is degraded, so the state does not list the Strawberry Mountain in the short-term or long-term strategy.

Smoke Sensitive areas have been identified and the La Grande Basin is the closest listed non-attainment area (PM 10). LaGrande is located approximately 45 air miles to the northeast of the project area. Ada County, Idaho (includes Boise and the north half of the county) is a non-attainment area (carbon monoxide) located 150 air miles southeast of the project area.

Currently, air quality in surrounding sensitive areas is limited to short term impacts. These impacts result from wood burning for home heating, prescribed burning, and field burning to the west and from the Boardman coal fire power plant and the Three Mile Canyon Farm in Boardman to the north. Air quality can be reduced from smoke produced by wildfires burning many miles from the project area. The impact to the Class I airshed is from field burning in the

Willamette Valley and Central Oregon. Haziness can last for several days in the spring and summer. The visibility impairment from the north is primarily a winter time occurrence.

Burning will follow the guidance provided by the Oregon Smoke Management Plan and specifically, Directive 1-4-1-601, the Operational Guidance for the Oregon Smoke Management Program. This agreement is between the NE Oregon federal land management agencies and Oregon ODF. It limits smoke emissions to 17,000 tons of particulate a year. It is assumed that 2,000 tons is produced from wildland fires, with 15,000 tons allowed for prescribed burning. It is agreed that this level of activity will not degrade regional air quality. ODF monitors activity, and if the 15,000 ton limit is reached will shut down prescribed fire activity.

Each state, including Oregon, has a State Implementation Plan (SIP) which provides the means by which these goals are to be attained. The SIP may contain measures such as emission standards for air pollution sources, air quality permit programs, and regulations controlling specific air pollutant sources such as mobile sources, wood-burning stoves and slash burning. Any burning in Oregon needs to comply with the State of Oregon Smoke Management Implementation Plan. Forest Service policy is to integrate air resource objectives into all Forest Service planning and management activities. The Forest Service and Oregon Department of Environmental Quality entered into a Memorandum of Understanding (MOU) concerning air quality. All alternatives would follow the agreements within the MOU. Because of this, the impacts from any activity are minimized. Smoketracs is the program that is used to meet our requirement to report prescribed fire smoke management to the State of Oregon.

Environmental Consequences

Fire suppression and other forest management practices have altered forest types, primarily the warmer and drier upland forests, resulting in a higher composition of fire intolerant species, more vertical and horizontal tree crown and canopy continuity, and higher levels of surface fuels. Reduced horizontal and vertical forested stand continuity and reduced surface fuel loadings will reduce potential wildfire intensity and severity. The stands proposed for treatment were selected primarily for the silvicultural need and while fuel reduction is accomplished at the same time, not all stands necessarily would show a substantial change in the measures used below.

Measures of fuel reduction to address the fuels hazard reduction need:

- Percentage change in crown fire initiation potential in treatment areas
- Acres and percent change in areas treated to reduce vertical and horizontal fuel continuity.

Alternative 1 - No Action

Introduction

This alternative does not treat any stands by commercial harvest, precommercial thinning, mechanical fuel treatment, or prescribed fire. Ongoing management practices and activities such as travel management, road maintenance, dispersed recreation, invasive plant management, fire protection, and livestock grazing would continue within the project area.

This alternative does not treat vertical or horizontal fuel continuity. There would be a 2% increase in the area with a high or greater crown fire potential over the next 50 years. This may be a small increase, however, currently much of the area has a higher potential for crown fire than would have occurred historically.

Direct and Indirect Effects

If no action is taken, the fuels (surface, ladder, and canopy) in the project area will continue to increase. The potential for a fire to be a stand-replacing wildfire rather than a low-intensity and low severity fire that historically occurred would increase. Fuels, including downed-woody material, needle litter, and duff accumulation will increase from current levels. Fuel ladders caused by live crowns near the ground are common throughout the stands and would remain as places where surface fires can move into the tree crowns. Dense seedlings and saplings will continue to be present at high levels in those stands that have not undergone a recent silvicultural treatment. Areas will remain in their current Conditions Class for a time period but will eventually move into the next higher Condition Class or show a further departure within the same Condition Class.

Large ponderosa pine will continue to be vulnerable to mortality from wildfires due to deep accumulations of duff that has built up around the base of the boles. Forested areas on Douglas-fir and grand fir sites that historically were dominated by ponderosa pine will continue toward their climax vegetation. This will eventually result in a transition from fire resistant ponderosa pine forests to more fire susceptible Douglas-fir and grand fir forests in all except the driest plant communities that can support only ponderosa pines. Conifers will continue to slowly encroach into small meadows in the project area, resulting in an overall loss of dry meadows as an ecosystem component. Native shrubs and other native ground vegetation in the project area are adapted to low severity fire. This vegetation has been adversely impacted by the shading from increased canopy cover and competition from conifers. The absence of fire has resulted in higher levels of surface fuels which would increase the duration and temperature of fire. Increase fire severity due to increased fuel levels, will cause mortality in species that historically re-sprouted or were stimulated by low severity fire.

If a wildfire would occur, many stands would experience a passive crown fire or torching (some crowns burn as individual trees or groups of trees) with high levels of stand mortality (up to 99% of the basal area). In stands within fire regime 1, an uncharacteristic high intensity fire can be expected with passive or active crown fires and spotting. Fire severity is expected to be high with damage to soils and mortality in all size classes of trees (up to 99% of the basal area).

Fire Regimes and Condition Classes

A fire under current conditions would not burn as a low severity surface fire. Fires would be mixed severity to stand replacing with detrimental effects to other resources that did not historically occur.

The vegetation condition is another ecological component that would continue to contribute to the departure from the natural fire regime. Tree densities would continue to increase and species would continue the shift to having higher proportions of shade tolerant, fire susceptible fir. Stand conditions would increase susceptibility to insect and disease effects at levels that are

highly departed from the natural fire regime. The Fire Regime Condition Class for the project area would continue to increase showing the increasing departure from the natural fire regime.

Fuel Models and Fuel Loadings

Without treatments to reduce surface fuel loads (prescribed fire and piling and burning) including downed-woody material, needle litter, and duff accumulation will increase from current levels.

The representation of fuel models across the project area changes over time as does the fuel loading of each fuel model. Most notably is the 41% increase in Fuel model 10 and the 6% increase in fuel model 12 as displayed in Table F-5. The increases in these fuel models mean more area with larger size down woody material comprising the surface fuels. This indicates fires would burn with higher intensities and crowing and spotting would occur. The severity on the landscape would increase resulting in high levels or mortality and non-desirable

As displayed in Table F-6, the amount of fuels (tons/acre) would increase compared to the existing condition. Fuel loading in each size class would increase and there would be a total increase of approximately 10.5 tons/acre. The six to twelve inch trees and twelve inch and large trees that have died will become surface fuels in the next 50 years.

These departures from the existing condition models and fuel loadings describe fires that will burn high intensity and severity. As surface and ladder fuels increase the stands become more vulnerable to a stand replacement fire. High heat intensity, torching, spotting, and crowning may be expected during wildfire events; resistance to control is high.

Table F – 5. Change in Fuel Model from Existing Condition over 50 years

Fuel Model	Acres	% of Forested Area – Existing Condition	% of Forested Area - in 50 years	% Change
1	1411	8%	7%	-1%
2	3997	41%	22%	-19%
5	0	0%	0%	0%
8	1401	38%	7%	-31%
9	1049	5%	5%	0%
10	8827	8%	49%	+41%
12	1100	0%	6%	+6%

Table F – 6. Change in Average Tons per Acre by Fuel Size Class over 50 years

Fuel Size Class	Average Tons/Acre Existing Condition	Average Tons/Acre in 50 years	Change over 50 years
0-.25	0.30	0.75	+.45
.25-1	0.56	2.02	+1.46
1-3	0.98	2.37	+1.39
3+	6.35	13.4	+10.76
Total	8.19	18.54	+10.35

Crown Fire Hazard Indices

There would be an increase in the amount of area where it is more likely that a surface fire is expected to ignite the crown layer and an increase in the area that becomes more vulnerable to a sustainable crown fire over the next 50 years. The amount of area that is at least at a high potential for crown fire increases 2% over the next 50 years as displayed in Table F-7 and this potential would characterize 42% of the subwatershed. There isn't a lot of change over 50 years as the changes in stand structure and density occurs slowly, especially when stands are overstocked and growth is slow. See the vegetation section for more information on stand structure and composition.

Table F – 7. Crown Fire Initiation Potential

Crown Fire Initiation Potential	Existing Condition - % of subwatershed	In 50 years - % of subwatershed	Change over 50 years
Extreme	1%	5%	+4%
Very-High	19%	15%	-4%
High	20%	22%	+2%
Medium	43%	43%	No change
Low	7%	4%	-3%

Overstocked stands will continue to grow slowly slowing stand structure change. Stand density would increase and tree vigor decrease. Late seral species would continue to increase in mixed species stands. Fires would burn as crown fires or with torching (some crowns burn as individual trees or groups of trees) resulting in high levels of stand mortality (up to 99% of the basal area) and damage to soils. Most of the area historically had rather short fire free periods that prevented high fuel loads from accumulating and limited the layers within the stand. Although the change over 50 years is a small percentage change in increased crown fire potential, there is currently and will continue to be in the future much of the area with a higher potential for crown fire than would have occurred historically.

Air Quality

The No Action Alternative would have the least immediate impact on air quality because there is no prescribed burning or pile burning. All biomass does remain available for consumption by wildfires and would continue to accumulate, increasing the potential for large amounts of smoke during the summer months, when diurnal inversions can concentrate smoke at low elevations. Because wildfires tend to occur at the driest time of the year, fuels are more completely consumed and typically produce three to five times more emissions than early or late season prescribed fires. There is a potential during a wildfire for approximately 440 pounds per acre of PM_{2.5} emissions. These concentrations of smoke can have high particulate levels that can cause health problems or violate summertime Class I air quality visibility standards for wilderness areas. The communities of Austin, Bates, and Unity would be impacted by smoke from a wildfire in this area.

Cumulative Effects

The activities in Appendix D – “Cumulative Activities Considered” have been considered for the incremental impact of this alternative when added to other past, present, and reasonably foreseeable future actions for the cumulative effects on fuels. The area considered for

cumulative effects is the Mill Creek subwatershed and the immediately adjacent subwatersheds. The effects of future activities are considered in this analysis and include the fire hazard reduction along Highway 26 and 7 and around the Austin Jct. Area and the Blue/Davis/Placer vegetation management project to the immediately west of the project area. These projects will reduce surface, ladder, and crown fuels thereby reducing the potential for crown fires and increase the overall resiliency of the forest.

The past harvest activity as listed in Appendix D have been incorporated into the existing condition. The selective removal of large diameter ponderosa pine in past harvests has contributed to converting the forest to late seral species or to overstocked stands of ponderosa pine that are not as resistant to fire. More recent harvest (since 1990) has largely reduced the stand density and favored the early seral ponderosa pine when possible. This has helped stands become more fire resistant, as they were under historical conditions. Past grazing reduced fine fuels likely decreasing a fire's rate of spread, flame length, and potential size. Ongoing grazing can also reduce the fine fuels. Fire in an area that has been grazed may have decreased rates of spread and decreased flame lengths.

Alternative 2:

Introduction

Most treatment is planned within the hot-dry and warm-dry plant association groups also classified as Fire Regime I. These areas are most in need of restoration to return the forest to a more resilient and sustainable condition. Stands not receiving treatment would have effects similar to those discussed under the No Action Alternative. Crown or canopy fuels and ladder fuels would be treated by commercial harvest treatments and precommercial thinning. Surface fuels would be treated by hand or grapple piling and burning the piles, and/or underburning. Observations by Cram (2006) that mechanical treatment followed by prescribed fire (including pile burning) had the greatest influence toward mitigating fire severity.

This alternative reduces the horizontal and vertical fuel continuity on more acres than the other alternatives mechanically treating 2,192 acres and utilizing prescribed fire on up to approximately 4,800 acres of the 5,300 acres burning perimeter. As a result of the treatments proposed under Alternative 2, there would be an immediate decrease (approximately 6% of the subwatershed) of the area with a high potential for crown fire.

Direct and Indirect Effects

Mechanical thinning (including commercial and precommercial) can be effective in reducing vertical fuel continuity that contributes to the initiation of crown fires, especially when the thinning removes smaller trees. The net effect of removing ladder fuels is that surface fire burning through treated stands are less likely to ignite the overstory canopy fuels (Graham et al. 2004). Thinning is effective at reducing the probability of crown-fire spread because specific trees are targeted and removed from the fuels bed. In some cases, removing trees from the canopy and understory could conceivably increase surface wind movement and facilitate drying live and dead fuel. Commercial and precommercial thinning should mitigate these factors by reducing the fuel load and potential for fire spread (Peterson et al. 2004). Other benefits of these treatments include increased growth and improved vigor on residual trees, which in turn

decreases their susceptibility to mortality from insect and disease. See the vegetation section for more information benefits to the residual stands.

Slash created through thinning and existing surface fuels would be treated by one of or a combination of the following: yarding tops attached, hand piling and burning, and grapple piling and burning. This reduces the surface fuel load that existed prior to thinning as well as fuel loads resulting from the thinning activity. The commercial and precommercial treatments result in a short term increase in surface fuel loading when trees are cut and material is put on the ground. This is a short term increase because thinning will be followed (within approximately one to two years) by hand piling, grapple piling, or underburning.

The benefit of prescribed fire on altering fuel structure and wildfire behavior and effects have long been observed and reported. Prescribed fire is a useful tool to alter potential fire behavior by influencing multiple fuelbed characteristics, including:

- Reducing loading of fine fuels, duff, large woody fuels, rotten material, shrubs, and other live surface fuels, which together with compactness and continuity change the fuel energy stored on the site and potential spread rate and intensity.
- Reducing the horizontal fuel continuity (shrub, low vegetation, woody fuel strata), which disrupts growth of surface fires, limits the buildup of intensity, and reduces spot fire ignition probability.
- Increasing compactness of surface fuel components, which retards combustion, rates (Graham et al. 2004).

Prescribed burning often consumes some of the lowest ladder fuels, and kills the lower tree branches, which raise the live crown above the ground surface. Prescribed burning can reduce fire intensity and severity from wildfires (Omi, Martinson 2002, Pollet, Omi, 1999). The primary stand attributes that control fire behavior are surface fuel condition, crown bulk density, and crown base height (Graham 1999). Prescribed burning reduces downed woody material and ladder fuels, including removal of some understory trees and increasing the ground to crown distance through scorch. In a study of the effects of low intensity fires on ponderosa pine forests in Zion National Park, needle/litter fuel load layer was reduced by 54 percent, duff loading was reduced by 35 percent and pole sized trees were reduced by 18 percent (Bastian 2001). With the reduction in ladder fuels, there will be a reduced probability of a surface fire moving into the tree crowns.

Fire Regimes and Condition Classes

Fire regime 1, a low severity and high frequency regime, comprises approximately 64% of the Mill Creek subwatershed, most of which is in the project area. Proposed treatments will change vegetation characteristics including stand density, species composition, structural stage and will change fuel composition and potential fire severity, components relating to change from reference conditions. Mechanical treatment that also being prescribed burned would occur on approximately 1,200 acres. After completion of all treatments, these stands will be changed to a Condition Class 1. Maintenance burning in these stands will be needed to maintain them in Condition Class 1.

Mechanical treatment of stands not followed by prescribed burning will improve the stand Condition Class but stands wouldn't be considered to be CC1 until prescribed fire is applied. Untreated stands will remain in the existing FRCC and most will depart further from the reference conditions resulting in changes from FRCC 2 to FRCC 3.

At the landscape scale, the appropriate scale at which to evaluate fire regimes and ecological departure for FRCC determination (Hann et al 2003), the project area moves closer to the reference condition but remains in the same Condition Class. Future prescribed burning and as more stands reaching old forest structural stages will help move the project area into a FRCC 1.

Fuel Models and Fuel Loadings

Prescribed burning (underburning) would occur within an approximate 5,300 acre area of the 14,950 acre project area over the next 5 years. Within the 5,300 acres, not all acres would be burned and there are different objectives for areas with resource concerns. Burning would be accomplished in the fall and spring times of year when weather and moisture conditions are appropriate and after much of the mechanical work is completed. Multiple prescribed burning entries may be needed to reduce the ladder and surface fuels to reach the desired fuel composition, which has increased beyond historical conditions and allow for future management of natural ignitions. Ignition would be by hand or would be by ATVs. The prescribed fire perimeter is comprised of roads and all other interior control lines would be primarily roads. An estimated 1.5 miles of handline may be used as a control line around and adjacent to private lands and to tie road to road.

Within the 5,300 acre burn boundary, approximately 67% is within the warm-dry plant association group and approximately 9% is within the hot-dry biophysical plant association group. All of this is a fire regime 1, historically with low intensity, frequent fire. Under this alternative approximately 1,200 acres will be thinned prior to burning.

The objectives of utilizing prescribed fire are to reduce surface fuels, reduce litter depth, and increase canopy base height. Prescribed fire is not being utilized to change the structural stage of any the stands. Some tree mortality is expected and acceptable in forested stands. Acceptable mortality ranges are as follows:

- ❑ Trees 0-5" dbh, tree mortality is expected to range from 5 to 15%.
- ❑ Trees 5-10" dbh, tree mortality is expected to range from 5 to 10%.
- ❑ Trees 10-20"+ dbh, tree mortality is expected to range from 1 to 5%.

These mortality levels are based on averages over the whole burning area and recognize the fact that fire is a relatively inexact tool and that there would be some localized areas where mortality reaches 100%. Mortality patches should be kept to less than 2 acres wherever possible and preferably to the ¼ to ½ acre size that was thought to exist under historic conditions (Agee, 1993).

No more than 3,000 acres would be burned using prescribed fire during any one year. Also burning would be limited during any one year to one grazing pasture. The recovery of vegetation, including forage production and species diversity, would be monitored after

prescribed burning to ensure the areas are ready to support livestock grazing on a sustainable level.

Within the 5,300 acres, fire would be excluded from the following areas; approximately 450 acres of Designated old-growth (including 03134PW and a portion of 03335PP), 14 aspen sites of approximately 27 acres, and 11 research plots with at least a 50 foot buffer. Fire would be excluded from these areas by methods including but not limited to the use of roads as control lines or fireline construction.

Also within the 5,300 acres, lightning would not occur but fire would be allowed to back into approximately 500 acres of non-forested stands and into RHCAs. The non-forested acres typically have minimal fuel loads which are discontinuous and therefore rarely burn. Ignition would not occur within the RHCAs. Past district experience has shown that when fire is allowed to back into RHCAs the effects are dependent on the existing vegetation. As soon as vegetative species and moisture regimes within the RHCA change and become more shaded with more moisture and higher humidity, the fire would not burn, so riparian vegetation is rarely affected. Shrubs and conifers providing streamside shade and riparian vegetation are rarely affected because they do not burn with enough intensity to cause mortality.

Approximately 425 acres of late and old structure are within the 5,300 acres and not within the DOG. Underburning in these areas would be low intensity with the objective of reducing surface fuels while minimizing tree mortality, especially in the larger trees. Methods to protect large trees can include raking the litter and bark accumulation away from the base of the tree, not burning areas where concentrations of large trees exist, burning when duff moistures under the larger trees is 120% or greater which has been determined to not cause damage to the base of the tree (Scott, 2002).

Approximately 340 acres of ROG are within the 5,300 acres. Prescribed fire in this area would minimize mortality in the larger trees as described above and minimize loss of snags and large down wood.

Approximately 178 acres providing satisfactory cover are within the 5,300 acres. Much of the identified satisfactory cover is also late and old structure. Underburning in these areas would retain multi-storied stand characteristics and high canopy closures. After implementation, these areas would still meet the requirements of satisfactory cover. Objectives of underburning would be to reduce surface fuels, while minimizing overall tree mortality. Emphasis would be placed on minimizing understory tree mortality (less than 5 percent) currently providing big game security cover. Excluding fire from these stands is also acceptable.

Prescribed burning with an average flame length of 1 to 3 feet can reduce surface fuel loadings to desirable levels. There are desirable direct effects resulting from prescribed burning including decreased surface loadings and increased canopy base heights. These results are sustained for variable lengths of time. Other treatments that reduce surface fuel loading proposed under this alternative include hand piling, grapple piling and burning of all piles. Observations by Cram (2006) that mechanical treatment followed by prescribed fire (including pile burning) had the greatest influence toward mitigating fire severity. Treatments of the Proposed Action approximately maintain the current condition of acres of each Fuel Model as displayed in Table F-8 but decrease the overall fuel loading as displayed in Table F-9.

Table F – 8. Alternative 2 - Acres of Fuel Models after treatments

Fuel Model	Acres	% of Forested Area Existing Condition	% of Forested Area after treatment
1	1412	8%	7%
2	7729	41%	43%
5	757	1%	4%
8	5975	38%	33%
9	505	5%	2%
10	1413	8%	7%

With the treatments that reduce surface fuels (prescribed fire and piling and burning the piles) there is an approximate 4.7 tons per acre decrease from the existing condition. As one of the primary stand attributes that control fire behavior is surface fuel condition, the reduced fuel loadings will contribute to less wildfire intensity and severity.

Table F – 9. Alternative 2 - Change in Average Tons per Acre by Fuel Size Class

Fuel Size Class	Average Tons/Acre – Existing Condition	Average Tons/Acre – After Treatment	Change
0-.25	.3	0.15	-.15
.25-1	.56	0.34	-.22
1-3	.98	0.59	-.39
3+	2.64	3.02	-1.09
Total	9.93	5.22	-4.71

Crown Fire Hazard Indices

Commercial and precommercial thinning overstocked stands would reduce ladder fuels, increase the average distance between the ground and the crown of the trees, and increase the distance between the crowns of the trees. Created slash and existing surface fuels would be treated by one of or a combination of the following: yarding tops attached, hand piling and burning, grapple piling and burning, and through the application of understory prescribed fire. These treatments reduce the surface fuel load. Other benefits of these treatments include increased growth and improved vigor on residual trees, which in turn decreases their susceptibility to disturbance from insects and disease. Observations by Cram (2006) that mechanical treatment followed by prescribed fire (including pile burning) had the greatest influence toward mitigating fire severity. Specifically, as density and basal area decreased and mean tree diameter increased, fire severity decreased. See the vegetation section for additional effects on composition and density, and structural stages.

As a result of the treatments in Alternative 2, there is an immediate decrease of approximately 6% of the subwatershed with at least a high potential for crown fire.

In order to compare the differences between the action alternatives, the crown fire initiation potential for the area proposed for treatment, mechanical and prescribed burning is displayed. This is displayed as a percentage of approximate 5,700 acres of treatment (4,800) of burning including the harvest and 900 acres of harvest outside the burn boundary). The alternatives can

then be compared using the acres proposed with Alternative 2. The existing condition is also displayed in table F-10.

Table F-10 Alternative 2 - Crown fire initiation potential

Crown Fire Initiation Potential	% of acres proposed under Alt 2 - Existing Condition	% of acres proposed under Alt 2 – Alternative 2	% Change
Extreme	1%	0%	-1%
Very-High	17%	2%	-15%
High	19%	7%	-12%
Medium	49%	50%	+1%
Low	14%	41%	+27%

Within the stands proposed for treatment, canopy base height an important measures of crown fire potential, are substantially changed. Units that are being mechanically treated (2,195 acres) have an average increase of 15 feet in crown base height. Treatment of these stands would also result in a decrease in crown bulk densities and the amount of tree crowns over an area. The resultant crown bulk densities would be sufficiently lowered so even if surface flame length were high enough to reach the crown, fire wouldn't spread in a stand replacing type of crown fire.

Reducing the stand density will encourage natural regeneration to occur in the thinned stands. Observations show that when stand densities are below 50 ft²/acre BA, ponderosa pine regenerates quite readily and can form another understory. Periodic prescribed fire would be needed to maintain lower levels of surface fuels, limit regeneration and ladder fuels. Stands not treated, will have effects as discussed under the No Action Alternative which result in an increase in the areas of high to extreme crown fire potential.

This alternative treats more stands and results in more fuel reduction than the other alternatives. It increases forest resiliency to disturbance by fire, insects, and disease more than the other alternatives. Within the treated area the potential for high severity fire is decreased. Although Alternative 2 treats the most acres, it only mechanically treats approximately 14% of the forested acres within the subwatershed

Air Quality

Approximately 100-140 lbs/acre of PM 2.5 emissions and 120-180 lbs/acre of PM 10 emissions are produced from prescribed burning. Approximately 21-42 lbs/acre of PM 2.5 emissions and 24-46 lbs/acre of PM 10 emissions are produced from handpiles and grapple piling. Alternative 2 would produce more smoke from pile burning than the other Alternatives as it treats more acres. Under Alternative 2, 1,050 acres of pile burning would occur. Alternative 2 would also create more landing piles that would be burned, again because more acres are being treated. Approximately the same amount of smoke would be produced from prescribed burning under this alternative as the other action alternatives. The first entry of prescribed burning would be scheduled for spring when fuel moisture conditions are generally higher which reduces emissions when compared to fall burning or wildfires in the summer. Pile burning generally occurs in the late fall and early winter when moisture conditions allow minimal to no spread outside of the pile area. The emissions from pile burning are at a different time of year than the underburning with this project.

Cumulative Effects

The activities in Appendix D – “Cumulative Activities Considered” are considered in the incremental impact of the actions proposed under this alternative. The cumulative effects of past activities and ongoing actions are described under Alternative 1 – the No Action Alternative. The effects of future activities are considered in this analysis and include the fire hazard reduction along Highways 26 and 7 and around the Austin Junction Area and the Blue/Davis/Placer Vegetation Management Project to the immediate west in adjacent subwatersheds.

With the planned mechanical and prescribed fire treatments, the risk of large-scale disturbances to forested stands would be reduced. Prescribed fire occurring under this alternative would reduce the ground and ladder fuels in the project area. A maintenance burning program would be needed when desired fuel loadings were met to maintain those fuel loadings. Disturbances within treated stands are expected to be reduced in intensity and duration, as a result of reduced surface, ladder, and canopy fuels. Foreseeable future actions are anticipated to reduce the potential for crown fires and increase the overall resiliency of the forest, especially those activities planned in nearby subwatersheds. By creating large blocks of land with a matrix of treatments, the risk of large-scale disturbances will be reduced over the landscape. Past grazing reduced fine fuels likely decreasing a fire’s rate of spread, flame length, and potential size. Ongoing grazing can also reduce the fine fuels. Fire in an area that has been grazed may have decreased rates of spread and decreased flame lengths.

The present and ongoing actions listed in Appendix D – “Cumulative Activities Considered” is expected to have minimal cumulative effects on air quality. Any burning of fuels on private land would potentially add to the emission amounts described above but would only increase the amounts slightly. Pile burning that would occur within the area either of federal or private land generally happens in the late fall and early winter when moisture conditions don’t allow spread outside from the pile area. These pile burns result in low emission levels and are at a different time of year than the underburning with this project.

Alternative 3:

Introduction

This alternative reduces the horizontal and vertical fuel continuity by mechanically treating 1,506 acres and utilizing prescribed fire on up to approximately 4,800 acres of the 5,300 acres burning perimeter. When compared to Alternative 2, Alternative 3 commercially treats approximately 686 fewer acres (or 33% less area) of overstocked timber stands including the 119 acres of shelterwood harvest. This alternative also precommercially thins 269 fewer acres than Alternative 2.

Treatments under Alternative 3 would have a 19% decrease in area with at least a high crown fire initiation potential compared to the treatments under Alternative 2 which would have a 28% decrease.

Direct and Indirect Effects

The beneficial effects of prescribed fire and mechanical treatment are the same as discussed under Alternative 2. Stands that are not treated would be subject to the same effects as discussed for the No Action Alternative.

Fire Regimes and Condition Classes

The acres treated are less than when compared to Alternative 2, but the treatments will change vegetation characteristics including stand density, species composition, structural stage and will change fuel composition and potential fire severity, components relating to change from reference conditions. Mechanical treatment that also being prescribed burned would occur on approximately 960 acres. After completion of all treatments, these stands will be changed to a Condition Class 1. Maintenance burning in these stands will be needed to maintain them in Condition Class 1.

Mechanical treatment of stands not followed by prescribed burning will improve the stand Condition Class but stands wouldn't be considered to be CC1 until prescribed fire is applied. Untreated stands will remain in the existing FRCC and most will depart further from the reference conditions resulting in changes from FRCC 2 to FRCC 3.

At the landscape scale, the appropriate scale at which to evaluate fire regimes and ecological departure for FRCC determination (Hann et al 2003), the project area moves closer to the reference condition but remains in the same Condition Class. There is less of a move closer to the reference condition compared to Alternative 2 because fewer acres are being treated.

Fuel Models and Fuel Loadings

The design of prescribed burning would be the same as discussed under Alternative 2. The effects of treatments to reduce surface fuels, prescribed fire and piling and burning are the same as discussed under Alternative 2 but the acres are less. There are approximately 330 acres less being thinned prior to burning when compared to Alternative 2 and there are approximately 280 acres less of piling (hand or grapple) and burning piles. There are also approximately 230 acres less of yarding tops attached due to less harvest under this alternative.

Crown Fire Hazard Indices

Commercial and precommercial thinning in overstocked stands proposed with this alternative reduces the ladder fuels, increases the average distance between the ground and the crown of the trees, and increases the distance between the crowns of the trees. Created slash and existing surface fuels would be treated by one of or a combination of the following: yarding tops attached, hand piling and burning, grapple piling and burning, and through the application of understory prescribed fire. These treatments would reduce the surface fuel load. Other benefits of these treatments include increased growth and improved vigor on residual trees, which in turn decreases their susceptibility to disturbance from insects and disease. Observations by Cram (2006) that mechanical treatment followed by prescribed fire (including pile burning) had the greatest influence toward mitigating fire severity. Specifically, as density and basal area decreased and mean tree diameter increased, fire severity decreased. See the vegetation section for additional effects on composition and density, and structural stages.

In order to compare the differences between the action alternatives, the crown fire initiation potential for the area proposed for treatment, mechanical and prescribed burning is displayed. This is displayed as a percentage of approximate 5,700 acres of treatment (4,800 of burning including the harvest and 900 acres of harvest outside the burn boundary). The alternatives can then be compared using the acres proposed with Alternative 2. Treatments under Alternative 3 would have a 19% decrease in area with at least a high crown fire initiation potential compared to the existing condition while the treatments under Alternative 2 would have a 28% decrease.

Table F-11. Alternative 3 - Crown fire initiation potential

Crown Fire Initiation Potential	% of acres proposed under Alt 2 - Existing Condition	% of acres proposed under Alt 2 – Alternative 3	% Change
Extreme	1%	0%	-1%
Very-High	17%	6%	-9%
High	19%	10%	-9%
Medium	49%	50%	+1%
Low	14%	34%	+20%

Within stands that are treated, canopy base height, an important measure of crown fire potential is substantially changed. Units that are being mechanically treated (1,506 acres and 33% less than Alternative 2) have an average increase of 15 feet in crown base height. In these units, the crown base height would be maintained at sufficient height from frequent fires that only occasional torching may occur. Treating these stands also decreases crown bulk densities, the amount of tree crowns over an area. The resultant crown bulk densities would be sufficiently low that even if surface flame length were high enough to reach the crown, fire wouldn't spread in a stand replacing type of crown fire.

Over the next 50 years, periodic burning would be needed to maintain lower levels of surface fuels and limit regeneration. The effects on stands that are not mechanically treated would be similar to those discussed under the No Action Alternative and would result in an increase in the areas of high and extreme crown fire potential.

Air Quality

Approximately 100-140 lbs/acre of PM 2.5 emissions and 120-180 lbs/acre of PM 10 emissions are produced from prescribed burning. Approximately 21-42 lbs/acre of PM 2.5 emissions and 24-46 lbs/acre of PM 10 emissions are produced from handpiles and grapple piling. Alternative 3 would produce less smoke from pile burning than Alternative 2 as approximately 280 acres less would be piled. Under Alternative 3, approximately 770 acres of pile burning would occur. Alternative 3 would create fewer landing piles that would be burned, again because more acres are being treated when compared to Alternative 2. Approximately the same amount of smoke would be produced from prescribed burning under this alternative as the other action alternatives. The first entry of prescribed burning would be scheduled for spring when fuel moisture conditions are generally higher which reduces emissions when compared to fall burning or wildfires in the summer. Pile burning generally occurs in the late fall and early winter when moisture conditions allow minimal to no spread outside of the pile area. The emissions from pile burning are at a different time of year than the underburning with this project.

Cumulative Effects

The activities in Appendix D – “Cumulative Activities Considered” are considered in the incremental impact of the actions proposed under this alternative when added to other past, present, and reasonably foreseeable future actions. The cumulative effects of past activities and ongoing actions are as described under Alternative 1 – the No Action Alternative. The effects of planned future activities considered in this analysis include the fire hazard reduction along Highways 26 and 7 and around the Austin Junction Area and the Blue/Davis/Placer Vegetation Management Project to the immediate west.

The planned mechanical and prescribed fire treatments would reduce the risk of large-scale disturbances to forested stands but less than in Alternative 2. The prescribed fire occurring with this alternative would reduce the ground fuels and ladder fuels in the project area. A maintenance burning program would be needed when desired fuel loadings were met to maintain those fuel loadings. Disturbances within treated stands are expected to be reduced in intensity and duration, as a result of reduced surface, ladder, and canopy fuels. Foreseeable future actions are anticipated to reduce the potential for crown fires and increase the overall resiliency of the forest, especially those activities planned in nearby subwatersheds. Compared to Alternative 2, the reduced amount of treatment in Alternative 3 will leave a larger proportion of forested stands at risk to large scale disturbances, increasing the risk to forested areas outside the project area. Past grazing reduced fine fuels likely decreasing a fire’s rate of spread, flame length, and potential size. Ongoing grazing can also reduce the fine fuels. Fire in an area that has been grazed may have decreased rates of spread and decreased flame lengths.

Alternative 4

Introduction

This alternative proposes no commercial timber harvest. There are 795 acres of precommercial thinning and the acres of prescribed burning remain the same as described under Alternative 2. This alternative treats the lowest number of stands identified as needing treatment, to meet the desired condition, of the action alternatives. When compared to Alternative 2, Alternative 4 treats approximately 1,400 fewer acres of overstocked forested stands. When compared to Alternative 3, this alternative treats approximately 710 fewer acres. In addition to fewer acres being treated, precommercial thinning is expected to be much less effective than a commercial entry followed by precommercial treatments, as proposed under Alternatives 2 and 3, at reducing horizontal and vertical fuel continuity.

Treatments under Alternative 4 would have a 19% decrease in area with at least a high crown fire initiation potential compared to the treatments under Alternative 2 which would have a 28% decrease.

Direct and Indirect Effects

The beneficial effects of prescribed fire are the same as discussed in Alternative 2. Precommercial thinning would reduce ladder fuels to some degree but would not open up the canopy to increase the distance between tree crowns.

In addition, thinned stands are only expected to marginally respond to the thinning as the stands would still be in an overstocked condition with the stand basal area only slightly reduced. The effect on stands that do not receive treatment would be the same as discussed under the No Action Alternative.

Fire Regimes and Condition Classes

This alternative does the least to improve Condition Class. Precommercial thinning only partially changes vegetation characteristics including stand density and species composition. Thinned stands are only expected to marginally respond to the thinning as the stands would still be in an overstocked condition with the stand basal area only slightly reduced. Structural stage will not change. After completion of the mechanical treatment that is also being prescribed burned on the 318 proposed acres, the stands will not change to a Condition Class 1 as under Alternatives 2 and 3 because the stands will still be overstocked and structural stages would not change. Precommercial thinning of stands not followed by prescribed burning (approximately 475 acres) will slightly improve the stand Condition Class. Untreated stands will remain in the existing FRCC and most will depart further from the reference conditions resulting in changes from FRCC 2 to FRCC 3.

At the landscape scale, the appropriate scale at which to evaluate fire regimes and ecological departure for FRCC determination (Hann et al 2003), Alternative 4 does the least to improve FRCC. There is less of a move closer to the reference condition compared to Alternative 2 and Alternative 3 because there is no commercial removal to reduce stand density and change structural stages.

Fuel Models and Fuel Loadings

The design of prescribed burning would be the same as discussed under Alternative 2. The effects of treatments to reduce surface fuels, prescribed fire and piling and burning are the same as discussed under Alternative 2 but the acres are less. There are approximately 975 acres less than Alternative 2 and 640 acres less than Alternative 3 that are being thinned prior to burning. There are approximately 250 acres less of piling (hand or grapple) and burning piles compared to Alternative 2 and approximately the same acres when compared to Alternative 3. There are no acres of yarding tops attached due to no harvest under this alternative.

Crown Fire Hazard Indices

Precommercial thinning in overstocked stands would reduce ladder fuels and increase the average distance between the ground and the crown of the trees. Thinning slash and existing surface fuels would be treated by one of or a combination of the following: hand piling and burning, grapple piling and burning, and through the application of understory prescribed fire. These treatments would reduce the surface fuel load. See the vegetation section for additional effects on composition and density, and structural stages.

In order to compare the differences between the action alternatives, the crown fire initiation potential for the area proposed for treatment, mechanical and prescribed burning is displayed. This is displayed as a percentage of approximate 5,700 acres of treatment (4,800 of burning including the harvest and 900 acres of harvest outside the burn boundary). The alternatives can then be compared using the acres proposed with Alternative 2.

Treatments under Alternative 4 would have a 13% decrease in area with at least a high crown fire initiation potential compared to the existing condition while the treatments under Alternative 2 would have a 28% decrease and under Alternative 3 a 19% decrease.

Table F-12. Alternative 4 Crown Fire Initiation Potential

Crown Fire Potential Code	% of acres proposed under Alt 2 - Existing Condition	% of acres proposed under Alt 2 – Alternative 4	% Change
Extreme	1%	1%	0%
Very-High	17%	8%	-9%
High	19%	15%	-4%
Medium	49%	55%	+6%
Low	14%	21%	+7%

Within stands that are treated,. Units that are being mechanically treated (795 acres, 1,400 acres less than Alternative 2 and 710 acres less than Alternative 3) canopy base height, changes but less than under Alternatives 2 and 3 with an average increase of 5 feet.

Over the next 50 years, periodic fire would maintain lower levels of surface fuels and limit regeneration. Stands that are not mechanically treated would have effects similar to those described under the No Action Alternative. Stands that are not treated would increase the areas of high and extreme crown fire potential. Removing the understory will facilitate the reintroduction of fire into these stands resulting in a slight shift towards historical conditions.

Air Quality

Approximately 100-140 lbs/acre of PM 2.5 emissions and 120-180 lbs/acre of PM 10 emissions are produced from prescribed burning. Approximately 21-42 lbs/acre of PM 2.5 emissions and 24-46 lbs/acre of PM 10 emissions are produced from handpiles and grapple piling. Alternative 4 would produce less smoke from pile burning than Alternative 2 or Alternative 3 as fewer acres are being piled and/or only the precommercial created material would be piled. Alternatives 2 and 3 would treat some of the slash created during the commercial harvest as well as the subsequent slash created during the precommercial entry. Under Alternative 4, approximately 790 acres of pile burning would occur while Alternative 2 proposes 1,050 acres and Alternative 3 proposes 770 acres. Alternative 4 would not create any landing piles that would be burned. . Approximately the same amount of smoke would be produced from prescribed burning under this alternative as the other action alternatives. The first entry of prescribed burning would be scheduled for spring when fuel moisture conditions are generally higher which reduces emissions when compared to fall burning or wildfires in the summer. Pile burning generally occurs in the late fall and early winter when moisture conditions allow minimal to no spread outside of the pile area. The emissions from pile burning are at a different time of year than the underburning with this project. More biomass would be available during a wildfire under Alternative 4 than the other action alternatives as it treats the least acres.

Cumulative Effects

The activities in Appendix D – “Cumulative Activities Considered” are incorporated into the incremental impact of the actions of this alternative to determine the cumulative effects on fuels. Cumulative effects of past activities and ongoing actions are as described under Alternative 1 – the No Action Alternative. The effects of planned future activities will be considered in this analysis and include the fire hazard reduction along Highways 26 and 7 and around the Austin Junction Area and the Blue/Davis/Placer Vegetation Management Project immediately to the west of the project area. The fire hazard would remain relatively high to large-scale disturbances and could affect adjacent subwatersheds because this alternative proposes to mechanically treat the fewest acres.

Consistency with Direction and Regulations

The No Action Alternative does not meet the Forest Plan direction to: 1) Initiate initial management action that provides for the most reasonable probability of minimizing fire suppression costs and resource damage, consistent with probable fire behavior, resource impacts, safety, and smoke management and 2) Identify, develop, and maintain fuel profiles that contribute to the most cost-efficient fire protection program consistent with management direction (Forest Plan IV-4). The No Action Alternative also does not meet Forest wide direction to manage residue profiles at a level that will minimize the potential of high intensity wildfire and provide for other resources (Forest Plan IV-44).

The Action Alternatives (Alternatives 2, 3, and 4) all, to differing levels based primarily on acres treated, meet the Forest Plan direction as described above.

Irreversible and Irretrievable Commitments of Resources

There are no irreversible and irretrievable commitments of resources that may result from implementing the alternatives with respect to fire and fuels.

Soil

Regulatory Framework

The Malheur Forest Plan meets all legal and regulatory requirements for soil conservation. Forest Service Manual R6 Supplement No. 2500.98-1, section 2520.2 says objectives of soil management are "To meet direction in the National Forest Management Act of 1976 and other legal mandates. To manage National Forest System lands ... without permanent impairment of land productivity and to maintain ... soil ... quality. Soil quality is maintained when soil compaction, displacement puddling, burning, erosion, loss of organic matter and altered soil moisture regimes are maintained within defined standards and guidelines." So if an action maintains detrimental impacts within the standards and guidelines of the Forest Plan, legal requirements for soil conservation would be met.

Forest-Wide Standards

101. Harvest timber from slopes which are less than 35% using ground skidding equipment and from slopes greater than 35% using cable or aerial systems. Approve exceptions through the environmental analysis process, which will include a logging feasibility analysis (Forest Plan, pg.IV – 37).

125. Evaluate the potential for soil displacement, compaction, puddling, mass wasting, and surface soil erosion for all ground-disturbing activities (Forest Plan, pg.IV – 40).

126. The total acreage of all detrimental soil conditions shall not exceed 20% of the total acreage within any activity area, including landing and system roads. Consider restoration treatments if detrimental conditions are present on 20% or more of the activity area. Detrimental soil conditions include compaction, puddling, displacement, and severely burned soil, and surface erosion (Forest Plan, pg. IV – 40).

127. Minimum percent effective ground cover following land management activities (Forest Plan, pg. IV – 40):

Table S – 1. Malheur Plan effective ground cover standards

Soil Erodibility	First Year %	Second Year %
Very High	60 to 75	75 to 90
High	50 to 60	65 to 75
Moderate to High	45	60
Moderate	38	50
Low to Moderate	30	40
Low	20	30

128. Seed all disturbed soil that occurs within 100-200 feet of a stream or areas further than 200 feet that could erode into a stream (Forest Plan, IV – 40).

129. Seed all skid trails with slopes greater than 20% (Forest Plan, IV – 40).

Analysis Methods

The project soils specialist trained a technician to collect data on the existing condition of soils on all units where harvest is proposed. The technician collected data about detrimental impacts on transects in all stands. These assessments reveal all impacts from past and ongoing activities, including timber harvest, landings, roads, livestock grazing, fuel treatments, and off road vehicles (ORVs). In addition, they reveal if any special design measures are needed during logging. The field sheets documenting survey transects are in the Project Record.

The project soils specialist formed professional judgments on the probable effects based on monitoring, personal observation (including observation in similar areas, and in this area), scientific literature, the Forest Plan Environmental Impact Statement, and professional contacts. These professional judgments are summarized in the "Quantitative logging effects on detrimental soil conditions" part of soils report in the Project Record. However, the quantitative effects

cannot be precisely predicted. Soil science is not advanced enough to make precise predictions. In addition, effects of management depend on unknowns, such as weather, details of implementation, and whether a wildfire will occur.

Spatial boundaries for soil effects are proposed unit boundaries. Unless otherwise stated, effects are described for the time period immediately after the proposed actions, when effects are at a maximum.

Affected Environment

Soil Series

The area was surveyed for an Ecological Unit Inventory (EUI) about 1995-2003. The EUI is not in final form, but much of the information is available, although it is preliminary and subject to change. Figure AE-1 (soils report in the project record) is the EUI Soils Map for the area where harvest would occur. The amount of each soil type can be gauged from this map. Table S-2 shows the soil types found in the area. Soil hazard ratings for surface erosion, compaction, displacement, puddling, and stability are also shown in soils report in the project record. All of these soils, except Lemonex, formed on basaltic parent material. Bennetcreek formed from andesitic tuff and breccia as well as basalt. All these soils except Gaib and Lemonex have more than 35% coarse fragments and less than 35% clay (loamy-skeletal family).

Table S – 2. Soil Types Found in the Project Area

Series	Days with dry soil (number per summer)	Typical Vegetation	Volcanic Ash Thickness (inches)	Total Soil Depth (inches)	Thickness of subsurface clay-enriched horizon (inches)
Alfic Udivitrands	30 to 45	mixed conifer	14 to 26	20 +	3 to 41
Alfic Vitriixerands	45 to 60	mixed conifer	14 to 26	20 +	3 to 41
Bennetcreek	45 to 60	mixed conifer	8 to 13	20 to 40	5 to 17
Bigcow	45 to 60	mixed conifer	8 to 11	40 +	0
Bocker	60 to 120	scab	0	< 10	0
Deardorf	30 to 45	mixed conifer	14 to 18	20 to 40	0
Dennycreek	45 to 60	mixed conifer	7 to 14	40 to 60	10 to 26
Fivebit	60 to 80	JUOC ^a	0	10 to 20	0
Gaib	60 to 90	scab	0	10 to 20	9
Klicker	60 to 75	PSME, PIPO ^a	0	20 to 40	3 to 27
Lemonex	60 to 80	PIPO, PSME ^a	0	20 to 40	19
Limberjim	20 to 40	mixed conifer	14 to 26	40 to 60	5 to 27
McWillis	45 to 60	mixed conifer	14 to 26	60 +	7 to 40
Mountemily	30 to 45	PICO ^a	14 to 22	60 +	0
Olot	45 to 60	mixed conifer	15 to 19	20 to 40	0
Poguepoint	30 to 45	mixed conifer	15 to 22	40 to 60	0
Rebarrow	30 to 45	mixed conifer	15 to 24	60 +	18 to 41
Syrupcreek	30 to 45	mixed conifer	14 to 24	20 to 40	3 to 16
Troutmeadows	30 to 45	PICO ^a	14 to 22	20 to 40	0
Wonder	45 to 60	mixed conifer	9 to 16	20 to 40	0

a JUOC = juniper; PICO = lodgepole pine; PIPO = ponderosa pine; PSME = Douglas-fir

The driest, shallowest soils (Bocker, Fivebit, Gaib) support nonforest "scab" vegetation, with low amounts of ground cover. Because of the low amount of ground cover, these tend to be the most erodible soils (see Soil Hazard Ratings in soils report in the project record). In forested areas of the project area, abundant ground cover combined with the relatively dry climate and gentle to moderately steep topography means erosion is rarely if ever a problem. (In the proposed units, 57% of the land has a slope of 15% or less, and 2% has a slope of 35% or more.) The forest soils with the least available water holding capacity are the Klicker and Lemonex series, which have little or no volcanic ash. Volcanic ash holds a relatively large amount of water, so soils with volcanic ash can usually support moister mixed conifer vegetation. Soils with volcanic ash are the most abundant soils in Crawford Project area. Deeper soils and soils at relatively high elevation also tend to be moist.

Environmental Consequences

Soil effects that are not described below would be so small as to be negligible. These negligible effects include effects on mass movement, effects on detrimentally burned soil, and effects on soil microbes.

Alternative 1

Direct and Indirect Effects

Effects of Past and Ongoing Actions - Current Conditions

Detrimental impacts (see Glossary) exist on tractor units, resulting from 1 to 3 previous timber sales (on each unit) and fuel treatments (Table S-3, Post Treatment Detrimental Soil Conditions, Alt. 1 column). Existing detrimental impacts range from 0 to 14%, and average 6%. Many of the stands with zero or small impacts have not been entered since railroad logging, 60 or more years ago. All units are well below the Forest Plan standard of 20%. Most of the detrimental impacts are from compaction and associated puddling although some displacement also exists. Erosion and detrimentally burned soil are negligible in forested areas.

The assessments reveal all impacts on proposed units from past and ongoing activities, including timber harvest, landings, roads, livestock grazing, fuel treatments, and Off Road Vehicles (ORVs). Appendix D lists the activities that produced these effects. The major effects are from 24 timber sales and associated slash treatments on 4,300 acres since 1978. Almost all the harvest was ground based. Some of the 4,300 acres overlap with each other, and most of them do not affect the proposed units. Some compaction and displacement also remain from timber sales prior to 1978. Effects from most other activities, including livestock grazing (in forests), power line construction and maintenance (except existing roads), and fires, are negligible.

Nitrogen and forest floor organic matter has accumulated since fire suppression became effective so their levels are higher than in the 1800s. Fire usually decreases the amount of forest floor organic matter and nitrogen on the land (though easily available nitrogen often increases for one to a few years). Significant fires have not burned in the area for many decades, so the loss of nitrogen and forest floor organic matter during fires has not occurred. Nitrogen increased as nitrogen from the atmosphere accumulates in the organic matter of biomass, forest floor, and soil, especially due to the fixation of nitrogen by *Ceanothus*.

Forest soil is in good enough condition to support mycorrhizal fungi since trees and most other plants can't survive without it. The climate on Malheur National Forest is relatively unfavorable for decomposer organisms, compared to many other forests, because the Malheur is dry during the summer. This slow decomposition explains the accumulation of fuels in the absence of fire.

Cumulative Effects

Existing impacts include the impacts from all past and ongoing actions. Quantitatively, existing impacts are shown below under Alternative 1 in Table S-3, Post Treatment Detrimental Soil Conditions. Past actions include timber harvest, landing and road construction, fire suppression, livestock grazing, fuel treatments, and ORV use, as described in the "Effects of Past and Ongoing Actions" section above and in, Appendix D.

Root action, animals that burrow in the soil, and freezing water will gradually loosen compacted soil over the course of decades.

Ongoing and foreseeable actions listed in Appendix D (grazing, firewood cutting, and ORV use) would continue to compact a negligible amount of soil, at about the same rate as in the past. This compaction would be counter-balanced by recovery from similar impacts in the past, so the level of detrimental impacts from these ongoing and foreseeable actions would remain at about current levels.

Existing detrimental impacts range from 0 to 14%, and average 6%. Natural recovery would slowly decrease impacts, over the course of decades.

Table S – 3. Post Treatment Detriment Soil Conditions

Unit	Alt 1 %	Alt 2 %	Alt 3 %	Alt 4 %	Design Measure
012	8	18	18	10	
014	4	18	18	6	
022	9	18	18	9	
024	7	17	17	7	
032	6	19	19	8	
038	0	14	2	2	
039	0	14	2	2	
040	4	18	6	6	
041	3	17	5	5	
049	14	18	18	14	subsoil
052	1	9	9	1	
053	1	10	10	1	
054	2	13	13	2	
056	2	13	4	4	
058	4	14	4	4	
060	5	15	15	5	
062	3	14	14	3	
064	10	18	10	10	
066	7	15	15	7	
068	8	18	18	10	dry
069	12	18	18	12	dry
070	12	18	18	12	dry
072	11	18	18	11	dry
074	5	14	14	5	
076	5	15	15	5	
077	5	14	5	5	
078	10	18	18	12	dry
079	5	17	7	7	
080	12	18	18	14	subsoil
082	2	15	15	2	
083	6	15	15	6	
084	4	15	15	4	
088	8	18	18	8	
090	11	18	18	11	dry
091	2	13	13	2	
094	4	15	15	4	
95+96	7	17	17	7	
100	0	11	0	0	
102	0	15	0	0	
103	8	17	17	8	
105	8	17	17	8	
106	8	17	17	8	
108	3	15	15	3	
110	1	12	12	3	

Unit	Alt 1 %	Alt 2 %	Alt 3 %	Alt 4 %	Design Measure
112	9	19	19	11	
113	9	19	9	9	
116	4	15	15	4	
118	9	17	17	9	
120	6	15	15	6	
122	4	13	4	4	
124	13	19	19	15	subsoil
126	5	18	18	7	
128	8	18	18	10	
130	1	13	1	1	
131	1	14	1	1	
132	6	17	17	8	
133	8	18	18	10	
134	1	13	1	1	
135	4	19	4	4	
136	4	14	4	4	
138	8	19	19	10	
142	9	19	11	11	dry
144	3	11	11	3	
146	9	19	19	11	dry
148	13	16	16	13	winter
149	9	17	17	9	
150	9	20	20	11	dry
152	1	13	1	1	

Design Measures are described in greater detail in Chapter 2, Management Requirements, Constraints, and Design Measures.

Subsoil – Following logging, the skid trails will be subsoiled unless logging is under frozen or snow-covered conditions.

Dry – Skidding is limited to dry, frozen, or snow covered soil.

Winter – Skidding is limited to frozen or snow covered soil.

Alternatives 2 & 3

The effects of Alternatives 2 and 3 are similar, except they differ in extent, as described in Chapter 2. For instance, Alternative 2 proposes 2,192 acres of logging, whereas Alternative proposes 1,506 acres.

Direct and Indirect Effects

Roads

During temporary road construction and use, soil may be eroded from the road surface. The sediment would be deposited within 20 feet of the edge of the road. The loss of productivity from erosion would be minor compared to the loss from displacement and compaction. On subsoiled temporary roads, most productivity lost to compaction would be restored; perhaps 1/2

of the area of the roads would be in a restored condition. Productivity lost to displacement and untreated compaction would recover over the course of several decades; about 1/2 of the area of the roads would be in this detrimental condition immediately following road decommissioning. Productivity would be greatly reduced on approximately 11 acres under Alternative 2 and 4 acres under Alternative 3 by displacement and compaction from temporary road construction. Where temporary roads cross shallow soil areas, such as where the road to unit 077 crosses 750 feet of a shallow soil, subsoiling is not feasible, but the road surface would be drained to prevent erosion.

For Alternatives 2, 3, and 4, road decommissioning would increase productivity on about 53 acres of former roads, when they are subsoiled. Subsoiling increases productivity because compaction is reduced. All the roads proposed for decommissioning are native surface. Subsoiling would increase erosion risk a small amount for about two years, as described below in the Subsoiling section. The road surfaces would be subsoiled where feasible, seeded and mulched, and drainage provided. Conifers would be planted on segments located in RHCAs where conditions will support establishment and growth. Over the long term, the conifers would help maintain ground cover and infiltration rate. As described in the Aquatics and Water Quality section of Chapter 3, this risk is acceptable because of the long-term benefit to aquatic resources.

Tractor Harvest

Displacement and erosion from skidding on slopes steeper than 35% would be limited because slopes steeper than 35% occupy a small proportion of tractor units and extensive ground cover in forests absorbs sediment. Design measures, including direction felling and winching, would also help to limit displacement and erosion. Skidding on steep slopes or unsuitable land often causes displacement. Water bar construction also often causes displacement. Skidding also bares soil, decreases infiltration, and channels overland flow, and thus can accelerate erosion. This acceleration occurs especially on steep slopes and on soil where ground cover would be slow to recover, including scab soil. As described in the soils report in the Project Record, "Quantitative Logging Effects on Detrimental Soil Condition" section, sites that have steeper slopes are expected to be more impacted than sites with flatter slopes. Units that may have small slopes steeper than 35% are 12, 22, 40, 41, 49, 82, 83, 84, 88, 90, 91, 95, 128, 130, 131, 133, 134, 135, 148, 149, and 150. It is not feasible to log these small inclusions by skyline or helicopter. The experience of the project soil specialist indicates damage on small slopes less than 45% is acceptable because only moderate amounts of displacement occur, and because of the small size of the area affected.

On roads used for haul, sediment risk will increase a small amount as the road surface is disturbed. This increase will be partially offset by road maintenance to drain runoff off the road surfaces.

Usually erosion of skid trails decreases through one to three years, until it stops. Decreased productivity due to severe displacement and erosion can last hundreds of years. Design measures would keep displacement and erosion to a minimum, within acceptable levels. Design measures that effectively control displacement and erosion include prohibitions on skidding on steep slopes (>45%), limitations on skidding in draws, and seeding and water bar requirements (see Chapter 2). The same slope limitations apply to all soil types because ash soil on steep slopes is easily displaceable, and non-ash soil on steep slopes is relatively easily erodible.

Skidding would cause negligible sediment export from the units, despite sediment movement within units as described in the preceding paragraph. Sediment normally is deposited less than 15 feet down slope from skid trails as the water is slowed by ground cover and percolates into the soil.

Except for areas that are harvested under winter conditions, much of the skid trail area would be compacted, and some of the soil tracked only once or twice would be compacted. As described in the soils report in the Project Record, "Quantitative Logging Effects on Detrimental Soil Condition" section, moist soil or ash soil are probably more susceptible to compaction than dry or non-ash soil. Rocky soil is less susceptible. Compaction usually lasts more than 20 years; some compaction lasts more than 50 years. The soils report in the Project Record explains the calculations used to predict detrimental impacts, most of which are compaction, and presents the results of the calculations. If the unit happens to be harvested over deep snow or on deeply frozen soil, compaction would be about 0.5%. Design measures that are effective at limiting compaction include prohibiting skidding under wet conditions, requiring skid trails to be widely spaced, allowing skidding only under dry or frozen conditions in certain units, allowing only low ground pressure machinery off of skid trails, and requiring skid trails to be subsoiled in certain units. These design measures would keep compaction to a practical minimum and indicate the Forest Plan standard would be met in most units without subsoiling. For instance, Davis and coworkers (2001) examined several units on the Summit Fire, where similar design measures were used and in a similar environment, and found none where standards appeared to be violated.

Puddling is associated with compaction, and statements about compaction also apply for puddling.

Subsoiling

Subsoiling of skid trails is planned for units 049, 080, and 124 because they are expected to exceed 20% detrimental impacts without subsoiling. Site-specific observations indicate most of the soil in these sub-units is suitable for subsoiling in terms of slope, depth, and stoniness, but there are inclusions of unsuitable soils. Subsoiling would mostly, but not entirely, loosen compacted soil. Subsoiling skid trails would reduce detrimental impacts by about 6%. This decrease will ensure these sub-units would meet the Forest Plan Standard.

Landings would also be subsoiled where suitable. Because landings occupy only a small proportion of land (perhaps 3%), and because parts of landings occupied by slash would not be subsoiled, and because much of the detrimental impact on landings is due to displacement as well as compaction, subsoiling landings would decrease detrimental impacts by about 1%.

Subsoiling bares soil, forms channels, makes soil particles more easily detachable, and disrupts roots, thus raising the risk of erosion for a few years. However, subsoiling also increases infiltration which decreases the risk of erosion. Increased infiltration and subsoiling design measures means that sediment production from erosion due to subsoiling would be negligible.

Mechanical Fuels Treatments

Design measures in Chapter 2 require grapple piling equipment to have a low ground pressure, to operate on dry soil, and to operate on skid trails where possible, therefore the project soils

specialist expects grapple piling would compact about 1% of each unit where it is used. Feller bunchers of similar ground pressure operating off skid trails caused about 1.5% compaction (McNeil 1996). This would be in addition to impacts caused by harvest. Perhaps 0.2% of the units would be impacted by detrimental burning of soil beneath grapple piles.

Effects from hand piling and burning would be negligible, because no heavy equipment is used.

Summary of Detrimental Impacts

As shown by the difference between Alternative 1 and Alternative 2 in the Post Treatment Detrimental Soils Condition Table, increases in detrimental impacts range from 3 to 15%, and average 10%. These impacts are from temporary road construction, logging, and subsoiling.

Prescribed Burning

Soil effects from prescribed burning would be minor. Ground cover would decrease, especially during fall burns. However, burning would take place so as to avoid decreasing ground cover below Forest Plan standards, so erosion would not be noteworthy.

Nutrients

Design measures would keep nutrient loss by displacement and erosion to a minimum, so it would be negligible. However, logging would remove nutrients and organic matter in logs, and fuel control would remove nutrients and organic matter during burning. The removal, especially removal of nitrogen, may decrease site productivity a few percent on some sites. Removing organic matter and nutrients by logging and fuel control likely would move many sites back toward their fertility status before European-Americans arrived, because nutrient and organic matter loss in fires was common then. Also, on many or most sites, productivity likely is not limited by nutrients or organic matter. A relatively small amount of nutrients is predicted to be removed because wood has a low concentration of nutrients (compared to foliage, small branches, and the remaining forest floor), a large amount (about 2100 lb/ac) of nitrogen is in mineral soil (Geist and Strickler 1978), and because many trees will be left. After logging and fuel control, woody fuel loads would be more similar to conditions before Euro-Americans arrived. Little dead wood existed before fire suppression became effective, because fires burned it up. The ecosystems persisted for thousands of years with low levels of dead wood, so removal of the excess dead wood would have only a small adverse effect. According to the Wildlife section of Chapter 3, design measures protect existing large down logs that would be counted in Forest Plan Standards, so only incidental loss would be expected.

Mycorrhizal Fungi and Other Soil Organisms

Logging and prescribed fire would reduce the abundance of mycorrhizal fungi. This reduction would not affect tree growth because enough mycorrhizal fungi would inhabit the remaining trees.

Logging, precommercial thinning, and prescribed fire would affect the community of other soil organisms. These effects are mostly unknown. No reason exists to believe these effects would have noticeable effects on productivity.

Cumulative Effects

Ongoing and foreseeable actions listed in Appendix D (grazing, firewood cutting, and ORV use) would continue to compact a negligible amount of soil, at about the same rate as in the past. This compaction would be counter-balanced by recovery from similar impacts in the past, so the level of detrimental impacts from these ongoing and foreseeable actions would remain at about current levels.

Detrimental impacts from the proposed operations (temporary road construction, harvest, subsoiling, activity fuels treatments, prescribed burning) add to past actions. The "Post Treatment Detrimental Soil Conditions" Table S-3 shows what the expected site-specific condition would be when proposed activities are added to past impacts. For Alternative 2, detrimental impacts would range from 9% to 20%, and average 16%. For Alternative 3, detrimental impacts would range from 0% to 20%, and average 13%, because logging is less extensive. Forest Plan soil protection standards would be met under all alternatives for all logging units.

If no wild fire occurs, ground cover standards would be met in all units under all alternatives, because the cumulative effects on ground cover are small.

Fuels treatment would decrease the hazard of a crown fire occurring. If a wildfire occurs, hazard of erosion would greatly increase on severely burned areas due to low ground cover and possibly hydrophobic soil. However, the proposed fuels treatments would decrease soil fire severity (Vihnanek & Ottmar 1993), and decrease the hazard of erosion, compared to Alternative 1.

Foreseeable actions listed in Appendix D do not include any additional harvest within the life of the project, so there would be no additional cumulative effect from additional harvest.

Alternative 4

Direct and Indirect Effects

Effects of Alternative 4 would be similar to the effects described under Alternative 1. One difference is that mechanical fuels treatment (grapple piling) would compact about 2% of the area where it is applied. The 2% is greater than the 1% for harvest units, because piling machines will not be able to use skid trails. This effect is discussed under Alternatives 2 and 3 above.

Road decommissioning would slowly increase the productivity of the former roads and prescribed burning would remove some ground cover, nutrients and mycorrhizal fungi, as described under Alternatives 2 and 3.

Cumulative Effects

See Alternative 1, Cumulative Effects section for a description of changes that would occur under all alternatives.

If no wild fire occurs, ground cover standards would be met in all units under all alternatives, because cumulative effects on ground cover are small.

Detrimental impacts from grapple piling would add to existing impacts, which are described under the Existing Condition section. The "Post Treatment Detrimental Soil Conditions" table shows what the expected site-specific condition would be. Detrimental impacts would range from 0% to 15%, and average 7%. Forest Plan soil protection standards would be met under all alternatives for all units.

Fuels treatment would decrease the hazard of a crown fire occurring and the resulting soil effects, similar to Alternatives 2 & 3.

Consistency with Direction and Regulations

All alternatives would be consistent with Forest Plan soil protection standards, because all the Forest-Wide Standards mentioned above under the "Regulatory Framework" section would be met, as explained in all the preceding sections.

Irreversible and Irretrievable Commitments of Resources

No irreversible or irretrievable commitment of soil resources would occur under any alternative.

Aquatics & Water Quality

Regulatory Framework

The Malheur National Forest Plan (USDA 1990), as amended, provides direction to protect and manage resources.

Forest Plan Goals for Aquatic Resources

- Assist in the identification, protection, and recovery of threatened, endangered and sensitive species (Forest Plan, Goal 15, p. IV-2).
- Provide improved fish habitat conditions to support increased populations of anadromous and resident fish (Forest Plan, Goal 18, p. IV-2).
- Provide a diversity of habitat sufficient to maintain viable populations of all species (Forest Plan, Goal 19, p. IV-2).
- Provide a favorable flow of water (quantity, quality, and timing) for off-Forest users by improving or maintaining all watersheds in a stable condition (Forest Plan, Goal 27, p. IV-2).
- Maintain or enhance water quality to meet State of Oregon standards, considering downstream uses and protection of other riparian and floodplain values (Forest Plan, Goal 28, p. IV-2).

Forest Plan Objectives for Aquatic Resources

Forest Plan Objectives state how resources will be managed under the Forest Plan:

Fish

- Manage fish habitat and riparian areas to achieve increases in fish habitat capability. This habitat improvement will be accomplished by a combination of the following:
 - (a) Implementation of livestock management strategies to achieve better distribution of livestock, and better control of forage utilization in riparian areas. This will help achieve a more diverse and abundant riparian vegetation condition and geomorphic recovery of the stream channel.
 - (b) Implementation of the riparian timber management prescriptions, which will provide improved stream shading and a better supply of large woody material to the stream channel.
 - (c) Implementation of watershed and fish habitat improvement structures, to improve habitat conditions and accelerate geomorphic recovery of the stream channel.

Riparian Areas

- All riparian areas will be managed to protect or enhance their value for water quality, fish habitat, and wildlife.

Water

- Manage water resources to maintain or enhance long-term productivity.
- Management activity will be directed toward improving those riparian areas which are in undesirable condition.
- Integrate mitigation into management activities.

Forest Plan Forest-Wide Standards

The following are summaries of the most applicable parts of the Standards. The whole Standard will be followed.

- 117. Comply with State requirements in accordance with the Clean Water Act
- 118. Select and design BMPs (Best Management Practices) based on site-specific conditions.
- 119. Implement the ... Memoranda of Understanding
- 120. Projects that will not meet Oregon water quality standards shall be redesigned, rescheduled, or dropped.
- 121. Conduct a watershed cumulative effects analysis
- 122. Rehabilitate disturbed areas that could contribute sediment to perennial streams.

Clean Water Act

Compliance with the "Memorandum of Understanding, between USDA Forest Service and Oregon Department of Environmental Quality, to meet State and Federal water quality rules and regulations" (2002) (hereafter, the MU), will meet State and Federal water quality rules and regulations. The MU identifies policies and practices that ensure attainment of Federal and State water quality laws and regulations, and implementation of the MU satisfies State and Federal point and nonpoint source pollution control requirements.

The MU states the Forest Service has several responsibilities. Two responsibilities apply to the Crawford Project.

One responsibility is that the Forest Service will develop and implement strategies to protect and restore water quality conditions when actions have the potential to affect 303(d) listed waters. The "FS/BLM Protocol for Addressing Clean Water Act Section 303(d) Listed Waters" (May 1999) is the guidance for meeting this responsibility. The Middle Fork John Day River, and Clear, Crawford, and Mill Creeks are on the 303(d) list for water quality-limited water bodies for high summer temperatures. The FS/BLM Protocol lists four ways to address impaired waters. One way is to implement sufficiently stringent management measures. Thus, if the Crawford Project has sufficiently stringent measures so that it does not increase temperatures above current temperatures, this responsibility would be met.

The second responsibility is that the Forest Service will implement site specific Best Management Practices as specified in the "Forest Service R6 General Water Quality Best Management Practices" (1988) document and in standards and guidelines in forest plans. The R6 BMP document contains methods and procedures that will be used to ensure compliance with the Clean Water Act (BMP document, p. 1).

Forest Plan Management Area 3B - Anadromous Riparian Areas

Riparian habitats are directly affected by water and exhibit either visible vegetation or physical characteristics reflecting influence from water. The following standards for MA 3B are applicable for the Crawford Project:

- Standard 5: Provide the necessary habitat to maintain or increase populations of management indicator species with special emphasis on steelhead.
- Standard 8: Manage the composition and productivity of key riparian vegetation to protect or enhance riparian-dependent resources. Emphasis will be on reestablishment of remnant hardwood shrub and tree communities.
- Standard 10: Improve the rate of recovery in riparian areas that are not in a condition to meet management objectives by eliminating or reducing impacts of management activities that may slow riparian recovery.
- Standard 34: Emphasize natural regeneration but plant when needed to meet riparian management objectives.
- Standard 41: Avoid locating roads in riparian areas while providing adequate local road access for management activities. Minimize the density of opens roads in this management area by obliterating, revegetating, or closing unnecessary roads or any roads causing significant resource damage.
- Standard 42: Design and maintain roads to protect fisheries values and riparian area habitat.
- Standard 43: Provide seasonal closures to reduce sedimentation.
- Standard 44: Leave stream channels of Class I to IV streams undisturbed by roads, except for crossings. Minimize adverse impacts to water and fisheries resources when designing necessary crossings.
- Standard 45: Apply erosion seeding on: (a) all disturbed soil that occurs within 100-200 feet of a Class I, II, III or IV stream where eroded material could reach a stream; and (b) on compacted skid trails with slopes greater than 20%.

Amendments to the Forest Plan

Amendment 29 (1994)

Amendment 29 amended the Forest Plan in 1994 to incorporate recommendations for managing and restoring aquatic habitat from the Columbia River Basin Anadromous Fish Habitat Management Policy and Implementation Guide (January 25, 1991). Amendment #29 of the Malheur National Forest Plan established numeric desired future conditions (DFCs) for aquatic habitat by modifying Forest Plan Standard 5 for MA 3B, anadromous riparian areas. Modification included incorporation of numeric DFCs for the following aquatic habitat elements: sediment/substrate, water quality, channel morphology and riparian vegetation. Numeric DFCs were designed to manage designated habitat elements within their natural ranges of variability on the Forest.

PACFISH (1995)

The Malheur National Forest Plan was amended in 1995 by direction of the Regional Forester with the Interim Strategy for Managing Fish-Producing Watersheds in Eastern Oregon and Washington, Idaho, Western Montana and Portions of Nevada (INFISH) and the Interim Strategy for Managing Anadromous Fish-Producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH). Activities in the Crawford Project area fall under direction of PACFISH because the project area is located within the range of anadromous fish.

PACFISH Riparian Goals

The PACFISH riparian goals establish an expectation of the characteristics of healthy, functioning watersheds, riparian areas, and associated fish habitats. The goals are to maintain or restore:

1. water quality to a degree that provides for stable and productive riparian and aquatic ecosystems;
2. stream channel integrity, channel processes, and the sediment regime (including the elements of timing, volume, and character of sediment input and transport) under which the riparian and aquatic ecosystems developed;
3. instream flows to support healthy riparian and aquatic habitats, the stability and effective function of stream channels, and the ability to route flood events;
4. natural timing and variability of the water table elevation in meadows and wetlands;
5. diversity and productivity of native and desired non-native plant communities in riparian zones;
6. riparian vegetation to:
 - a) provide an amount and distribution of large woody debris characteristic of natural aquatic and riparian ecosystems;
 - b) provide adequate summer and winter thermal regulation within the riparian and aquatic zones;
 - c) help achieve rates of surface erosion, bank erosion, and channel migration characteristic of those under which the communities developed.
- 7) riparian and aquatic habitats necessary to foster the unique genetic fish stocks that evolved within the specific geo-climatic region; and
- 8) habitat to support populations of well-distributed native and desired non-native plant, vertebrate, and invertebrate population that contribute to the viability of riparian-dependent communities

PACFISH Riparian Habitat Conservation Areas

PACFISH amended the Forest Plan by establishing riparian habitat conservation areas (RHCAs), establishing numeric riparian management objectives (RMOs), and establishing standards and guidelines for managing activities in RHCAs. PACFISH replaced existing direction contained in the Forest Plan except where the Plan provided more protection for anadromous fish habitat. Riparian-dependent resources receive primary emphasis in RHCAs, and management activities are subject to specific standards and guidelines.

RHCAs are differentiated by the following four categories (Table AW-1). PACFISH establishes default buffers for RHCAs on the Forest (USDA 1995a).

Table AW-1. PACFISH RHCA Buffer Widths.

RHCA Category	Description	RHCA Width (Feet)
1	Fish bearing streams that are either perennial or intermittent	300
2	Non-fish bearing streams that are perennial	150
3	Ponds, lakes, reservoirs, and wetlands > 1 acre	150
4	Non-fish bearing streams that are intermittent, ponds, lakes, or wetlands < 1 acre	100

Buffer widths for PACFISH RHCAs are based on slope distances. When the Malheur NF created the Forest GIS cover for RHCAs, RHCAs were delineated using an average slope of 35% which resulted in a buffer width of 283 ft for Category 1 RHCAs, 142 ft for Category 2 RHCA, and 93 ft for Category 4 RHCAs. These widths are used for planning purposes only. During layout of unit boundaries, RHCA buffer widths are based on actual slope distances. Where slopes are greater than 35% actual RHCA buffer widths will be narrower than displayed by the Forest's RHCA GIS cover and where slopes are less than 35% actual RHCA buffer widths will be greater than the Forest's RHCA GIS cover. Therefore, there will likely be slight differences in acreages between planning documents and actual implementation of projects for RHCAs and units adjacent to RHCAs.

PACFISH Standards and Guidelines

- Prohibit timber harvest, including fuelwood cutting, in RHCAs except where:
 - Catastrophic events such as fire, flooding, volcanic, wind, or insect damage result in degraded riparian conditions, allow salvage and fuelwood cutting in RHCAs only where present and future woody debris needs are met, where cutting would not retard or prevent attainment of other RMOs, where adverse effects on listed anadromous fish can be avoided. For watersheds with listed salmon or designated critical habitat, complete Watershed Analysis prior to cutting in RHCAs (PACFISH Standard TM-1a).
 - Apply silvicultural practices for RHCAs to acquire desired vegetation characteristics where needed to attain RMOs. Apply silvicultural practices in a manner that does not retard attainment of RMOs and that avoids adverse effects on listed anadromous fish (PACFISH Standard TM-1b).

- For each existing or planned road, meet RMOs and avoid adverse effects on listed anadromous fish by minimizing road and landing locations in RHCAs (PACFISH Standard RF-2b).
- For each existing or planned road, meet RMOs and avoid adverse effects on listed anadromous fish by avoiding sidecasting of soils or snow. Sidecasting of road material is prohibited on road segments within or abutting RHCAs in watersheds containing designated critical habitat for listed anadromous fish (PACFISH Standard RF-2f).
- Determine the influence of each road on RMOs. Meet RMOs and avoid adverse effects on listed anadromous fish by:
 - Reconstructing road and drainage features that do not meet design criteria or operation and maintenance standards, or that have been shown to be less effective than designed for controlling sediment delivery, or retard attainment of RMOs, or do not designated critical habitat for listed anadromous fish from increased sedimentation (PACFISH Standard RF-3a).
 - Prioritizing reconstruction based on the current and potential damage to listed anadromous fish and their designated critical habitat, the ecological value of the riparian resources affected, and the feasibility of options such as helicopter logging and road relocation out of RHCAs (PACFISH Standard RF-3b).
 - Closing and stabilizing or obliterating, and stabilizing roads not needed for future management activities. Prioritize these actions based on the current and potential damage to listed anadromous fish and their designated critical habitat, and the ecological value of the riparian resources affected (PACFISH Standard RF-3c).
- Trees may be felled in RHCAs when they pose a safety risk. Keep felled trees on site when needed to meet woody debris objectives (PACFISH Standard RA-2).
- Prohibit storage of fuels and other toxicants within RHCAs. Prohibit refueling within RHCAs unless there are no other alternatives. Refueling sites within a RHCA must be approved by the Forest Service and have an approved spill containment plan (PACFISH Standard RA-4).
- Locate water drafting sites to avoid adverse effects to listed anadromous fish and instream flows, and in a manner that does not retard or prevent attainment of RMOs (PACFISH Standard RA-5).
- Design fuel treatment and fire suppression strategies, practices, and actions so as not to prevent attainment of RMOs, and to minimize disturbance of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuel management actions could perpetuate or be damaging to log-term ecosystem function, listed anadromous fish, or designated critical habitat (PACFISH Standard FM-1).
- Design prescribed burn projects and prescriptions to contribute to the attainment of RMOs (PACFISH Standard FM-4).

PACFISH Key Watersheds

The intent of designating Key Watersheds is to provide to provide a pattern of protection across the landscape where habitat for anadromous fish would receive special attention and treatment. Priority within these watersheds would be to protect, or restore habitat for listed stocks, stocks of special interest or concern, or salmonid assemblages of critical value for productivity or biodiversity. Criteria considered to designate Key Watersheds are:

1. Watersheds with stocks listed pursuant to the Endangered Species Act (ESA), or stocks identified in the 1991 American Fisheries Society report as “at risk” or subsequent scientific stock status reviews; or
2. Watersheds that contain excellent habitat for mixed salmonid assemblages; or
3. Degraded watersheds with a high restoration potential.

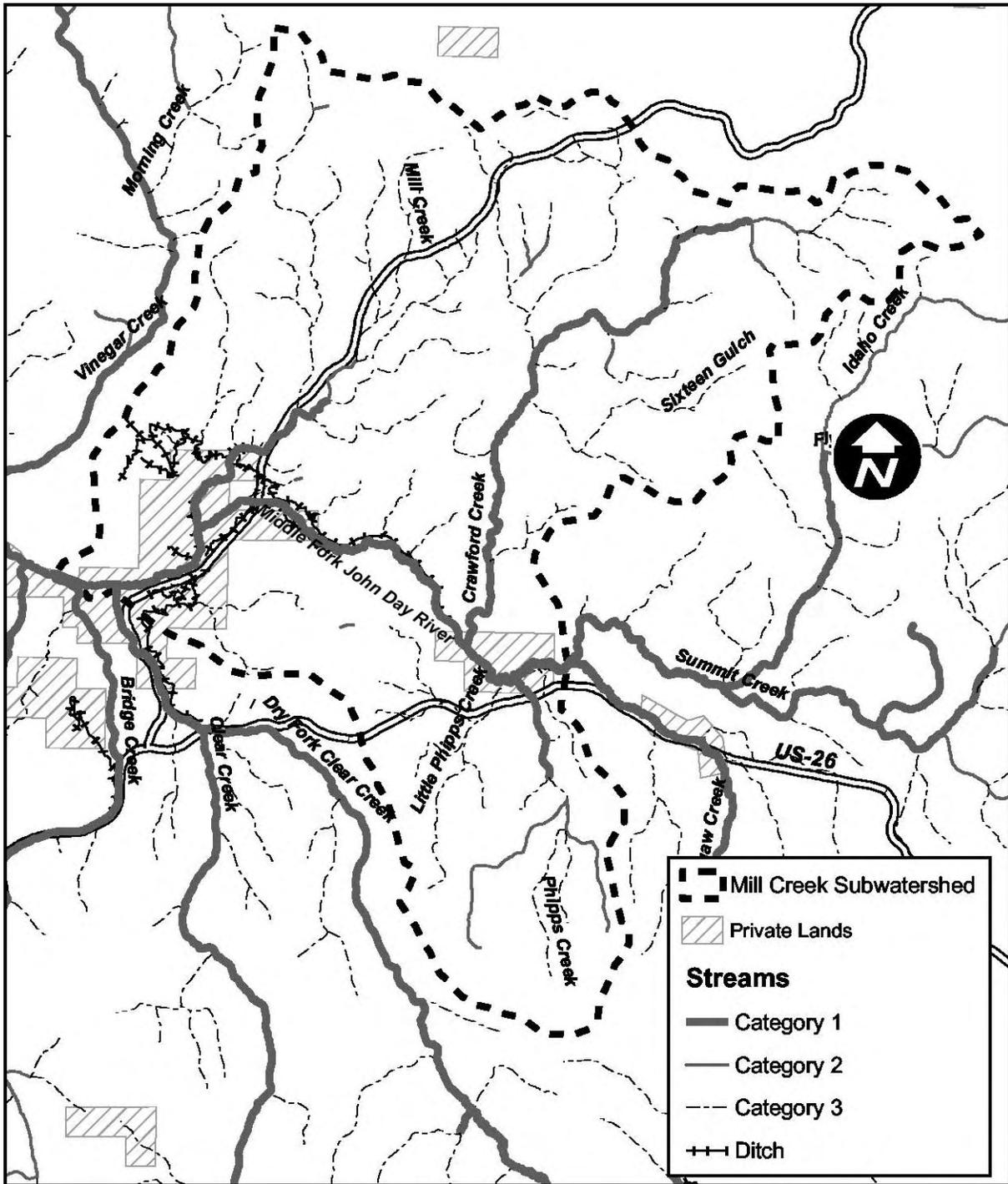
All subwatersheds in the Upper Middle Fork John Day watershed, including Mill Creek subwatershed, meet the three criteria for PACFISH Key Watersheds.

Analysis Methods

Aquatic Habitat & Water Quality Analysis Area

The analysis area encompasses all fish habitats that have the potential for effects from the Crawford Project. The analysis area includes the following streams: Mill Creek to its confluence with the M.F. John Day River (Middle Fork), Crawford Creek to its confluence with the Middle Fork, and the Middle Fork from the confluences of Summit Creek and Squaw Creek downstream to the confluence of Bridge Creek (Figure AW-1). Measurable effects from proposed activities are unlikely to extend downstream of this point. There will be no activities or associated effects in the upper elevations (south part) of the Mill Creek subwatershed that lies south of the Hwy 26 and drains into the project area

Figure AW-1. Aquatic analysis area for the Crawford Project.



Affected Environment- Effects of Past and Ongoing Actions

Timber Harvest Activities

Harvest

The majority of the Crawford project area was logged during the early 1900's. Based on old photos of the area it appears that the majority of the area was essentially clearcut with a few seed trees left for regeneration. From 1978 through 1994, 304 acres were harvested in current RHCAs, including about 63 acres in Category 1 RHCAs (Table AW-2). All 63 acres in Category 1 RHCAs occurred along Crawford Creek. These harvest activities likely reduced the amount of Large Woody Debris (LWD) currently in Crawford Creek.

Table AW-2. Acres of harvest in Category 1 RHCAs in the Crawford analysis area.

Project	Year	Stream	Acres
Meadow LP	1978	Crawford	16.2
Cogo	1981	Crawford	3.0
Tipton	1985	Crawford	5.6
WPM	1985	Crawford	2.7
Crawpole	1986	Crawford	8.5
Nippon	1987	Crawford	16.8
16 Gulch	1989	Crawford	8.0
Pitwood	1983	Phipps	2.0

Roads

Roads can account for most of the sediment problems in a watershed because they are a link between sediment source areas (skid trails, landings, and cut slopes, etc.) and stream channels. They directly affect the channel morphology of streams by accelerating erosion and sediment delivery and by increasing the magnitude of peak flow (Furniss et al. 1991). However, the Equivalent Roaded Area analysis described in the Cumulative Effects section below indicates this probably is not happening in Mill Creek subwatershed. Wemple (1994) focused on the interaction of forested roads with stream networks in Western Oregon and found that nearly 60% of the road network drained into streams and gullies, and are therefore, hydrologically connected with the stream network. However, the Mill Creek subwatershed is not as steep or wet as the area studied by Wemple (1994), so hydrological connection is not as high. From a qualitative standpoint, the following assumptions can be used as general indicators of sediment delivery risk associated with roads: 1) the higher the road density the higher the potential for sediment yield increases due to the larger acreage of exposed surfaces, 2) the more drainage ways that are crossed the higher probability that direct sediment introduction will occur, and 3) the greater the distance, or higher on the slope, that the road is from the drainage network, the less probability for delivered sediment to occur (erosion may occur but is less likely to be routed to the stream).

The road system in the Mill Creek SWS was constructed primarily in conjunction with timber harvest activities. The first transportation system in the area was the logging railroad network that was constructed in the area in the early 1900's. This network was primarily constructed up draw bottoms such as the Baker White Pine Company railroad grade up Crawford Creek. Construction of logging roads and conversion of railroad grades to roads occurred in the late 1940's when logging companies switched to trucks for log haul. The road system has had a major impact to aquatic habitat in the Mill Creek SWS due to a number of factors.

Road Surface Type

Surface erosion is highly dependant on soils, road surfacing and condition, road grade, traffic volumes, and the effectiveness and spacing of drainage structures. The greatest surface erosion problems occur in highly erodible terrain, particularly landscapes underlain by granitic soils, soils of the Clarno formation, and certain highly fractured or weathered rock types. Studies have found that sediment delivery to stream systems is highest in the initial years after road construction, although raw ditch-lines and road surfaces with little binder can remain chronic sources of sediment. Native surface roads (mostly Maintenance Level 1 and 2 roads) are generally greater chronic sediment sources than surfaced, higher standard roads.

Drainage structure, function, and spacing are keys to minimizing the amount of surface flow, which directly affects surface erosion. The spacing of drain or ditch relief structures depends on the road gradient, road surface and ditch soil types, runoff characteristics, and the effects of concentrated runoff on slopes below the road. Forest Service Handbooks and other manuals provide guidelines for drainage structure spacing. Drainage structures should be close together on silt-sand soils with little to no binder on steep slopes and further apart on gravel road surfaces with moderate binder and little to no fines on flat or minimum grades.

The majority of open and closed roads, 92%, that are located in RHCAs in the analysis area are native surface roads (Table AW-2). Native surface roads are more likely to contribute fine sediment to streams that can adversely affect aquatic habitat compared to roads with other surface types. Most native service roads, if used other than during dry or frozen conditions cannot tolerate much traffic without rutting causing other resource problems. Adverse affects are more likely to occur where native surface roads are located adjacent to Category 1 streams. About 86% of roads located in Category 1 RHCAs in the analysis area are native surface roads (Table AW-3). High densities of native surface roads in the Mill Creek subwatershed are likely sources for the high fine sediment levels in Mill Creek and Crawford Creek.

Table AW-3. Miles of open and closed roads in RHCAs by surface type in the analysis area

Surface Type	Miles in Cat 1 RHCAs	Miles in Cat 2 RHCAs	Miles in Cat 4 RHCAs	Total
Crushed Rock	0.0	0.0	0.0	0.0
Improved Native	2.7	0.0	2.1	4.8
Native Material	4.8	2.1	11.5	18.4
Asphalt	0.8	0.0	0.7	1.5
Total	8.3	2.1	14.3	24.7

Many of these roads located in RHCAs are used for recreation purposes. Elevated use of these roads occurs during hunting seasons. During dry periods typical of bow season, elevated use of native surface roads results in a breakdown of the road surface and creation of fine dust layers. During wet periods that are typical during the fall hunting seasons for deer and elk, rutting and breakdown of drainage structures (i.e. drain dips and water bars) occurs resulting in the transport of fine sediment to adjacent stream channels if effective filter strips (thick herbaceous vegetation, woody debris, etc.) are not present between the road surface and the stream channel.

Road Density

Storage and movement of water through the soil profile as subsurface flow regulates and sustains base flows. Roads expand the channel network, convert subsurface flow to surface flow, and reduce infiltration on the road surface. All of these factors affect the overall hydrology in a watershed, particularly the quantity and timing of flow.

When road ditches are constructed, they become artificial channels that expand the natural channel network. Road cuts also intercept subsurface flow and convert it to surface flow. An expanded channel network augments peak flows, since water traveling as concentrated surface flow reaches the channel faster than water traveling as subsurface flow (Wemple et al. 1996). Reduced infiltration contributes to additional surface flow, since water does not infiltrate for storage in the soil profile, but rather runs off as overland or surface flow. When roads disrupt these processes, more water becomes available during peak flows, and less water is available to sustain base flows. However, the gentle topography and dry climate of the Mill Creek subwatershed, compared to the area studied by Wemple et al. (1996), indicates these effects are negligible to small.

While the effects of roads on the hydrology of an area depend largely on local factors, road density is an indicator of the road system's relative potential for modifying surface and subsurface hydrology; the higher the road density, the greater the potential for the road system to affect the hydrology. Mid-slope and lower-slope roads generally have a greater potential to intercept subsurface flow than roads on the upper slope.

During the Forest Roads Analysis, GIS queries were used to determine total road density (maintenance Level 1-5) and the density of Maintenance Level 1 and 2 roads of each subwatershed. An assumption made was that Maintenance Level 3 through 5 roads receive more frequent maintenance and are generally a lower risk of significantly affecting aquatic resources, whereas, Level 1 and 2 roads receive less maintenance and generally less use, and are more likely to have inadequate or poorly maintained drainage. Many of the Level 1 and 2 roads were built between 1950 and 1980 and did not incorporate BMPs later developed to reduce impacts to streams. For this reason, it is assumed that the Level 1 and 2 roads have the greatest potential for affecting aquatic resources; this is consistent with road condition surveys across the Forest. *Mill Creek SWS was rated as high risk for road density during the Forest Roads Analysis process.*

Recent studies from eastern Washington (Schiess and Krogstad 2000) indicate that road density alone can be a poor indicator of sediment delivery to streams, and that other factors (e.g. road surfacing and use) may be far more important. 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. *Twenty six roads of concern were identified in the Crawford Roads*

Analysis (2001), and some of them contribute to impacts to aquatic resources due to fine sediment. Part or all of 18 of these roads are closed, and 2 are decommissioned.

Road Proximity to Stream Channels (200 ft)

Roads are disturbed areas that are a potential source of sediment to the stream system, especially when there is a pathway that connects water and sediment from the road system to the local stream network. This Forest Roads Analysis used the miles of road within 200 feet of stream courses (perennial and intermittent streams) to identify the potential for connected disturbed areas, other than road-stream crossings. The following assumptions were made:

- The closer the road is to a stream or channel the higher the probability that drainage structures connected to the stream system, especially during spring runoff or intense thunderstorm events.
- Where roads are located on flatter grades there is a possibility that dispersed campsites have developed between the road and the stream system, and that runoff from the dispersed sites reaches the stream network.
- On steeper slopes, water and sediment from drainage relief structures have a higher likelihood of reaching the stream system due to higher velocities.

Roads can directly affect physical channel dynamics when they encroach on floodplains or restrict channel migration. Floodplains help dissipate excess energy during high flows and recharge soil moisture and groundwater. Floodplain function is compromised when roads encroach on or isolate floodplains. This can increase peak flows. When peak flows increase, more water is available for in-channel erosion, which, in turn, affects channel stability. However, these effects are minor in Mill subwatershed, because the Crawford and Mill Creek flood plains are narrow - usually less than 30 feet from the stream centerline. Restricting channel migration can cause channel straightening which increases the stream energy available for channel erosion. This can also result in channel instability. These processes may have occurred during railroad construction. Altering channel pattern affects a stream's ability to transport materials, including wood and sediment. Although most roads in the Mill Creek SWS are more than 50 feet from the stream channel and are on relatively flat terrain, the SWS was rated as extreme risk for roads within 200 feet of stream channels during the Forest Roads Analysis process.

Road Crossings

Road-stream crossings have the potential to directly and indirectly affect local stream channels and water quality. Poorly designed crossings directly affect hydrologic function when they constrict the channel, when they are misaligned relative to the natural stream channel, or when improperly sized culverts are installed. Road-stream crossings also act as connected disturbed areas where water and sediment are delivered directly to the stream channel. Increasing peak flows through the extended channel network increases the energy available for in-channel erosion, which affects stream stability and increases sedimentation. However, increases in peak flows in Mill subwatershed are negligible to small. The biggest water quality concern associated with the road system is sediment delivered to the stream system through connected disturbed areas.

Road-stream crossings act as connected disturbed areas. Connected disturbed areas are defined as high runoff areas, like roads and other disturbed sites, which discharge surface runoff into a

stream. The higher the density of road-stream crossings, the higher the potential for increased sedimentation to the stream networks. Mill Creek SWS was rated as extreme risk for the number of road crossings during the Forest Roads Analysis process. However, the road and stream GIS layers that were used in the Forest Roads Analysis were not precise, and this resulted in an overestimate of the number of crossings in Mill subwatershed.

Roads cross Crawford Creek nine times in the lower 2.7 miles. Eight of the crossings are culverts of which four are rated as fish passage barriers. No culverts on Mill Creek were identified as passage barriers during the Forest culvert survey.

Of the nine crossings on Crawford Creek, seven are culverts located along FSR 2620. Four of the culverts are impassable to all life stages of salmonids. These culverts impede the movement of adult steelhead and redband trout attempting to spawn in Crawford Creek and prevent the movement of juvenile steelhead and redband trout.

Adverse impacts to aquatic habitat due to FSR 2620 have been documented in the past. These impacts include decreased fish passage, sediment production, possible temperature increases, and possible Large Woody Debris decreases. Forest aquatics specialists have recommended that the road be relocated. However, this road is a main thoroughfare and was identified to be retained during the Forest Roads Analysis. A viable alternative to this road was not identified and as a result the FSR 2620 will be maintained as a Level 2 road.

Overall Watershed/Aquatics Risk from Roads

A numerical system was used to determine the overall or cumulative watershed risk of the different factors such as road density, road proximity, etc. Each factor was given a numerical value, and the values for the individual factors were added together to come up with an overall watershed risk rating. The risk rating represents the road system's potential to degrade watershed function and aquatic habitat. *Mill Creek SWS was rated as High Risk for overall watershed risk and for overall aquatics risk.*

Livestock Grazing

Livestock grazing has occurred in the project area since the 1800's. Prior to the 1930s, grazing on public land was unregulated and occurred all season long, which resulted in adverse environmental consequences such as soil erosion, loss of vegetation and changes in species, and watershed modifications. Some impacts are still observable today. Some of these impacts, such as soil loss, have resulted in lands incapable of naturally restoring native vegetation communities.

During the mid 1900s, the Forest Service took significant action to regulate numbers, establish workable grazing seasons, and set up allotments. This action continued into the latter half of the 1900s when emphasis shifted to development of management systems and regulation of effects on specific resources.

In 1950, Congress enacted the Granger-Thye Act (P.L. 81-478) to establish controls and stewardship toward the public land grazing resource. The core of the Granger-Thye Act was to link the use of public land to an established private landowner who would bring stability to the community and produce a sustainable level of forage and wildlife habitat. This law established

the direction for National Forest System allotment management, including the authorization to issue grazing permits for terms up to 10 years; authorization to use grazing fee receipts for rangeland improvement; and the establishment of grazing advisory boards.

Improved grazing systems and pasture designs were implemented in the late 1970s and throughout the 1980s to accelerate riparian area recovery. There was also a reduction in allowable use in the 1970s. Implementation of the Forest Plan in the early 1990s again reduced the amount of allowable use by livestock grazing to accelerate the rate of recovery in riparian areas, and limited utilization of shrubs. The Forest Plan was amended by PACFISH in 1995 to further protect and restore aquatic habitat. In the mid to late 1990s, bull trout and Mid-Columbia River steelhead were listed as “Threatened” under the Endangered Species Act (ESA). Mitigation measures associated with ESA consultation for grazing activities were implemented in an effort to further protect riparian areas and associated aquatic species.

Incremental changes in management over the past several years have addressed many areas of past concern within the planning area. However, the existing conditions described in the Middle Fork John Day Grazing EIS show that in some years it has been difficult to meet Forest Plan standards or to reach desired conditions in some areas of the subbasin.

The analysis area east of Highway 7 is located in the Blue Mountain allotment. The Blue Mountain allotment is an active allotment but has not been grazed since 2002. Monitoring conducted in 2004 on the Middle Fork, Squaw Creek, and Summit Creek found that these streams were functioning at risk but with an upward trend in condition. Some areas of concern have been identified along Crawford Creek.

The analysis area west of the Highway 7 is located in the Upper Middle Fork allotment. This allotment has been rested at least seven of the last 15 years and has transferred between three different permit holders. There are no fish bearing streams in this allotment except for about 1000 feet of Mill creek.

Private lands in the analysis area are also used for livestock grazing. The Middle Fork in Phipps Meadow has been fenced to exclude livestock grazing. This reach of the Middle Fork exhibits stable stream banks with a high proportion of late seral vegetation. Grazing management practices along the Middle Fork in the vicinity of Bates and Austin is still impacting the river and aquatic habitat.

Past grazing management practices (prior to the adoption of the Forest Plan in 1990) likely impacted aquatic habitat and water quality due to reductions in shading, due to reductions in bank-stabilizing wetland vegetation, due to bank shear on stream banks, and due to increases in width-to-depth ratios and fine sediment levels. Improved management practices, on both private land (such as the corridor fence along the Middle Fork in Phipps Meadow) and Forest Service land, have resulted in improvement of aquatic conditions. Recent range monitoring indicates that there is an upward trend in channel and stream bank vegetation in the Upper Middle Fork John Day watershed.

General Existing Stream Conditions

Information used to summarize the current watershed conditions included stream surveys, visits to the project area, project files for the Flat Timber Sale and Crawford Timber Sale EA (2002), and information from the Upper Middle Fork John Day River Watershed Analysis (1998). There are three Category 1 streams in the analysis area: the Middle Fork, Mill Creek, and Crawford Creek. Stream surveys have been conducted on all three streams (Table AW-4).

Table AW-4. Stream Habitat Surveys Conducted in the Crawford Analysis Area

Stream	Survey Year	Agency	Reach No's in the Analysis Area	Survey Length (mi)
M.F. John Day River	1992/96	ODFW	11-16	6.4
Mill Creek	1993	USFS	1	1.1
Crawford Creek	1993	USFS	1, 2	3.8

1) ODFW=Oregon Dept. Fish and Wildlife, USFS=U.S. Forest Service

PACFISH RMOs and Forest Plan Amendment 29 DFCs

Important aquatic habitat elements as defined by PACFISH and/or Forest Plan Amendment 29 include: 1) pool frequency, 2) water temperature/stream shading, 3) large woody debris, 4) bank stability, 5) width to depth ratio, and 6) embeddedness. These habitat elements are important in maintaining aquatic habitat function and health. Stream survey information was analyzed to compare existing habitat conditions to Forest Plan RMOs/DFCs for aquatic habitat (Table AW-5)

Table AW-5. Fish habitat summary data for Category 1 streams in the Crawford Analysis Area.

Stream Name	Pools/Mile	Pieces LWD ¹ /Mile	% of Units Embedded	% of Particles < 2mm	Wetted W/D Ratio	% Stable Banks
Crawford Creek	17 ¹	13.6	100	--	7.9	99
Mill Creek	31 ¹	0.0	100	--	9.1	91
M.F. John Day River	17 ²	0.3	--	28	12.7	79
PACFISH RMO	96 ¹ 56 ²	20	--	--	<10	>80
Amend 29 DFC	75-132 ¹ 38-66 ²	80-120 ³	<20	--	<10	>90

Notes: 1) channels of <10 feet in width, 2) channels of >10 to 20 feet in width, 3) mixed conifer ecosystem.

Channel Types

Region 6 uses the Rosgen classification system (Rosgen 1996) to classify channel types. Fish-bearing streams in the analysis area are composed of B4/5 and C4 channel types. B channels are normally present where valley gradients are less than 4% and the valley floor is moderately constrained by valley sidewalls. B channels have step-pool channel morphology and a relatively narrow floodplain. Generally, B channels are considered one of the most stable channel types and one of the most resistant to management induced changes in channel morphology (Table AW-6). However, B4/5 channels may be more susceptible to management activities due to the finer material that can compose their bed and banks. Steelhead and redband trout are more typically found spawning and rearing in B channels.

Table AW-6. Sensitivity of channel type to disturbance, bank erosion potential and influence of vegetation for channel types present in the Crawford Project area.

Adapted from Rosgen 1996.

Channel Type	Sensitivity to Disturbance	Bank Erosion Potential	Vegetation Influence on Bank Stability
B4	Moderate	Low	Moderate
C4	Very High	Very High	Very High

C channels are normally present where valley gradients are relatively low with little to no constraint by valley sidewalls. C channels have pool-riffle morphology with a floodplain wide enough to accommodate meandering. C channels are less stable than B channels and vegetation is important for maintaining the stability of the bed and banks (Table AW-6). Spring Chinook salmon usually spawn and rear in C channels.

In the analysis area, Reaches 1 and 2 of Mill Creek and Crawford Creek would be expected to be B4/5 channel types based on their valley types (Table AW-7). Currently these reaches exhibit characteristics of Rosgen Fb channels and wider pool spacing (i.e. number of bankfull channel widths between pools) than would be expected, which indicates they have been altered by management activities, including grazing, channel modifications from railroad logging, riparian logging and riparian road construction. The F channel type probably is also partly due to the intermittent to very low perennial flows, which reduces the amount of bank stabilizing wetland vegetation in the channel and flood-prone-zones. Rosgen F channel types are undesirable in that their peak flows are more powerful than B types (making establishment of flood-prone-zone and channel vegetation more difficult), they have high bank erosion rates and produce more sediment than B types, and have high width/depth ratios (which lead to increased temperatures). The intermittent flow of Crawford Creek and very low flows in Mill Creek make establishment and growth of riparian vegetation even more difficult.

Table AW-7. Comparison of current channel features to expected channel characteristics.

Stream	Reach	Expected Reach Type	Current Width to Depth Ratio ¹	Current Pool Spacing ²	Expected Pool Spacing ²
Crawford Cr.	1	B4	8.4	23	4 to 6
	2	B5	--	137	4 to 6
Mill Cr.	1	B4	6.1	19	4 to 6
Middle Fork	11	C4	22.7	14	5 to 7
	12	C4	29.7	8	5 to 7
	13	C4	12.9	17	5 to 7
	14	C/B4	31.6	41	5 to 7
	15	C/E4	22.7	5	5 to 7
	16	C/E4	19.0	11	5 to 7

Notes: 1) bankfull, 2) Number of bankfull channel widths between pools

Reach 14 of the Middle Fork would be expected to be a C4 channel with some smaller areas of B4 channel type in the more confined areas of the valley based on its valley type (Table AW-7). Reaches 11 through 13 would be expected to be a C channels. Reaches 15 and 16 would be expected to be C or E channels. All reaches of the Middle Fork in the analysis area appear to have been altered by management activities as evidenced by wide width-to-depth ratios and wider than expected pool spacing for four of the six reaches.

Activities that have resulted directly in these changes in channel types are construction and use of logging railroad systems from the early 1900's to the late 1940's and the construction and use of the truck logging road system since the late 1940's. Livestock grazing along the Middle Fork has also likely contributed to the alteration of the channel.

Affected Environment and Environmental Effects – Aquatic Habitat and Water Quality

Pool Frequency - Affected Environment

Pool frequency is a gauge of aquatic habitat diversity, and is an indicator of the degree to which streams are capable of supporting a varied and complex community of fish species. Pools are important for providing rearing habitat for juvenile fish and cool-water refuge areas for adult fish during periods of low flow and elevated temperatures. Pool spacing varies by channel type (Rosgen 1996). Deep pools also provide important habitat for adult Chinook salmon, steelhead, and fluvial bull trout during migration and holding periods prior to spawning.

Pool habitat can be reduced where management activities result in reductions of pool forming elements (e.g. LWD), changes in bedload (e.g. large increases in fine sediment), or changes in

channel morphology (e.g. widening or straightening). Pool frequencies may have been lower in Crawford and Mill Creeks naturally than many other streams because the supply of LWD is probably naturally low.

Stream surveys indicate that the Forest Plan DFC/RMO for pool frequency is not being met in the Middle Fork, Mill Creek, and Crawford Creek (Table AW-5). Pool spacing is higher for most stream reaches compared to potential channel types in the analysis area (Table AW-7). This indicates a loss of pool habitat as a result of past management activities, especially riparian logging and channel modification during railroad logging and road building.

Pool Frequency - Environmental Consequences

Direct and Indirect Effects

Alternative 1 – No Action

Alternative 1 would maintain the current levels of pool habitat. Existing levels of pool habitat are below the potential levels for all streams in the analysis area (Tables AW-5 & AW-7) and limit important habitat for salmonids, especially for adults migrating prior to spawning.

Alternative 2 – Proposed Action

Timber Harvest Activities

Timber harvest units, grapple/hand piling areas, landings, and temporary roads will not be located in RHCAs under Alternative 2. Restricting these activities to areas outside of RHCAs will prevent adverse impacts to existing pool habitat and future pool habitat. RHCA widths for Category 1 streams are sufficient to prevent removal of trees that have the potential to fall into stream channels and create pool habitat.

Haul routes will occur on 5.6 miles of roads in RHCAs (Table AW-8). Felling of danger trees for human safety along haul routes in RHCAs has the potential to reduce the supply of LWD to stream channels and therefore reduce future levels of pool habitat. Under PACFISH, trees may be felled in RHCAs when they pose a safety risk (PACFISH Standard RA-2). Hazard trees cut for safety reasons will be felled into the stream channel or kept on site in accordance with PACFISH Standard RA-2 to meet woody debris objectives, since streams in the analysis area are deficient in LWD. If funding permits, trees that are not felled into the stream channel will be placed in stream channels at a later date, during the instream work period, using heavy equipment (e.g. excavator or backhoe) under the direction of a fish biologist or hydrologist.

Table AW-8. Miles of haul routes and maintenance/reconstruction activities in RHCAs proposed under Alternative 2.

Activity	Miles in Cat 1 RHCAs	Miles in Cat 2 RHCAs	Miles in Cat 3 RHCAs	Miles in Cat 4 RHCAs
Haul	2.4	<0.1	0.0	3.2
Maintenance	2.4	<0.1	0.0	2.5
Reconstruction	0.0	0.0	0.0	0.7

Road maintenance/reconstruction activities will occur along haul routes in RHCAs. Road maintenance/reconstruction activities will not result in removal of trees because existing road prisms will not be widened. Where danger trees need to be felled for safety reasons they will be kept on site to meet woody debris objectives in accordance with PACFISH Standard RA-2. Proposed road maintenance/reconstruction activities will not result in a reduction of existing or future pool habitat because LWD will not be reduced.

Prescribed Fire Activities

Prescribed fire activities in RHCAs will mimic low intensity fires that are characteristic of natural burning patterns that tend to occur in riparian areas. This will be accomplished by not actively lighting fires in RHCAs while allowing fires to back into RHCAs from adjacent upslope areas. This technique will result in a patchy distribution of burned and unburned areas in RHCAs based on the Forest's experience with past prescribe burning activities in RHCAs using the same technique. Using these techniques, mortality of understory trees will occur in burned patches but few overstory trees will be killed. Fire intensities will not be high enough to consume trees or downed wood large enough to function as LWD (> 20" diameter) in stream channels. Therefore, burning activities will not result in a reduction of pool habitat. The reduction in stocking densities following burning activities will increase the vigor of larger trees in the overstory for future LWD.

If fire intensity exceeds prescribed levels in RHCAs fire suppression activities will be initiated. The following mitigations measures would apply:

1. No chemicals or retardant will be used within 150 feet of water or wetlands.
2. Hand lines would be permitted within RHCAs but would not be built down draw bottoms or where water bars would be ineffective. To prevent erosion, fire lines would be rehabilitated by filling in cup trenches, removing berms, water barring and/or seeding as necessary, and scattering material over the fire line.
3. In the unlikely event of an escaped fire that results in significant adverse effects in the RHCA, a Burn Area Emergency Rehabilitation (BAER) team would be established immediately to develop a rehab plan to avoid adverse effects on listed species (PACFISH Standard FM-5). This would also result in the need for emergency consultation on the rehabilitation actions.

Road Closure/Decommissioning Activities

Road closure/decommissioning activities are proposed under Alternative 2. About 0.9 miles of road will be closed including <0.1 mile in a Category 4 RHCA. Closed roads are those roads on which motorized traffic has been excluded by regulation, barricade blockage, or by obscuring the entrance. A closed road is still an operating facility on which motorized traffic has been removed (year-long or seasonal) and remains on the Forest Road Transportation System. Roads would be closed using gates, signs or berms. Closed roads will be left in a stable condition and maintained.

Road decommissioning results in the removal of a road from the permanent transportation system of the Forest. The impacts of the road on the environment are eliminated or reduced to

an acceptable level; the goal is to leave the road in a “hydrologically disconnected” state and convert the former roadway to other resource use. The National Forest Management Act (NFMA) requires “re-establishing vegetative cover” on decommissioned roads within 10 years {16 USC 1608(b)}. To accomplish this, techniques such as posting and installing barriers and barricades, installing drainage structures (e.g., drain dips, waterbars), ripping/subsoiling and seeding, and converting the road to a trail, can be used.

Proposed decommissioning activities will consist of removal of one culvert on FSR 2620156, ripping/subsoiling and seeding herbaceous vegetation, spreading woody debris and slash over the former roadbed, and installing drainage structures to discourage unauthorized motorized vehicle use and ensure proper drainage occurs over time.

Road closure/decommissioning activities will include removal trees that could function as LWD in stream channels and therefore reductions in existing pool habitat will not occur. About 5.8 miles of road will be decommissioned within RHCAs including about 1.6 miles adjacent to Crawford Creek. Conifers will be planted in decommissioned road segments in RHCAs as part of the decommissioning process. Over the long-term (70 to 100 years) LWD will increase as planted conifers become established grow to a size that they will function as LWD and therefore increase pool habitat in the future.

Alternative 3

Timber Harvest Activities

Timber harvest units, grapple/hand piling areas, landings, and temporary roads will not be located in RHCAs under Alternative 3. Temporary roads would be limited to short segments (<500 ft) to access landings and would not be constructed in RHCAs. The miles of haul route in RHCAs, 5.4 miles under Alternative 3, would remain essentially the same compared to Alternative 2. Felling of danger trees along haul routes, number and locations will be the same as under Alternative 2.

Prescribed Fire Activities

Prescribed fire activities under Alternative 3 would be the same as Alternative 2.

Road Closure/Decommissioning Activities

Road closure/decommissioning activities under Alternative 3 would be the same as Alternative 2. See effects discussion for Alternative 2.

Alternative 4

Timber Harvest Activities

Timber harvesting would not occur under Alternative 4. This would eliminate the need for construction of landings and temporary roads. It would also eliminate the need for haul activities. There would be no effects from timber harvest activities on the pool frequency.

Prescribed Fire Activities

Prescribed fire activities under Alternative 4 would be the same as Alternative 2.

Road Closure/Decommissioning Activities

Road closure/decommissioning activities under Alternative 4 would be the same as Alternative 2.

Large Woody Debris - Affected Environment

LWD plays an important role in forested stream reaches. LWD aids in dissipating stream energy, trapping sediment, and the formation of pools and associated aquatic habitat. Stream surveys and field reconnaissance indicate that the Forest Plan DFC/RMO for LWD quantity is not being met in the Middle Fork, Mill Creek, or Crawford Creek (Table AW-5). Both Mill Creek and Crawford Creek were likely typical Rosgen B channel types prior to being altered by management activities. LWD and large rocks are the main components of fish habitat (e.g. pools, pocket pools, cover) in B channel types. Natural supply of LWD for the three streams is probably low, due to the stringer meadow vegetation that is common along them. Reduction of LWD in B channels can result in a decrease in pool frequencies and a reduction in cover.

Quantity of LWD in streams can be altered by removal of streamside trees for timber production or firewood, or salvage of instream pieces. Timber has been harvested from areas adjacent to streams in the analysis area (see Effects of Past and Ongoing Action section above). In the past, firewood could be taken from streamside areas. Illegal cutting of snags or down wood for firewood may still be taking place. In extreme cases, large increases in peak flows and/or large increases in channel width can result in destabilization of instream pieces and subsequent transport downstream thus resulting in a decrease in LWD. However, increases in peak flows in Mill subwatershed are negligible to small.

Large Wood Debris - Environmental Consequences

Direct and Indirect Effects

Alternative 1 – No Action

Alternative 1 would maintain the current levels of large wood debris (LWD). Current levels of LWD are below desired levels in Crawford Creek, Mill Creek, and the Middle Fork (Table A-5) and are likely resulting in decreases in pool habitat. Replacement LWD will be recruited into stream channels as conifers die and fall into streams. Large trees (21” to 32” diameter) accounted for 15% of floodplain vegetation along Mill Creek. Over the long term, LWD will likely increase over current levels in Mill Creek because large trees are present in the floodplain. No large trees were present along the floodplain of Reach 1 of Crawford Creek. Only large trees were present in the floodplain along Reach 2 of Crawford Creek. In the short term it is unlikely that LWD levels will increase over current levels in Crawford Creek due to the lack of large trees near the creek. FSR 2620 is located near Crawford Creek - about 1.4 miles is located within 50’ of the channel.

Alternative 2

Timber Harvest Activities

Timber harvest units, grapple/hand piling areas, landings, and temporary roads will not be located in RHCAs under Alternative 2. Restricting these activities to areas outside of RHCAs will prevent adverse impacts to LWD supply and future pool habitat.

Haul routes will occur in RHCAs. Felling of danger trees for human safety along haul routes in RHCAs has the potential to reduce the supply of LWD to stream channels and therefore pool habitat. Under PACFISH, trees may be felled in RHCAs when they pose a safety risk (PACFISH Standard RA-2). All trees felled for safety reasons will be kept on site in accordance with PACFISH Standard RA-2 to meet woody debris objectives. If funding permits, felled danger trees will be placed in or along stream channels under the direction of a fish biologist or hydrologist to meet woody debris objectives.

Prescribed Fire Activities

Prescribed fire activities will occur in RHCAs to a limited degree. Burning activities will mimic low intensity fires that are characteristic of natural burning patterns in riparian areas. This will be accomplished by not actively lighting fires in RHCAs while allowing fires to back into RHCAs from adjacent upslope areas. This technique will result in a patchy distribution of burned and unburned areas in RHCAs. Using these techniques, mortality of understory trees will occur in burned patches but few overstory trees will be killed. Fire intensities will not be high enough to consume trees or downed wood large enough to function as LWD (> 20” dbh) in stream channels therefore burning activities will not result in a reduction of pool habitat. The reduction in stocking densities following burning activities will increase the vigor of larger trees in the overstory.

Road Closure/Decommissioning Activities

Road closure/decommissioning activities will not result in removal trees that could function as LWD. About 5.8 miles of road will be decommissioned within RHCAs including about 1.6 miles adjacent to Crawford Creek (Table AW-9). Conifers will be planted in decommissioned road segments as part of the decommissioning process. Over the long-term (50 to 70 years) the supply of LWD will increase as planted conifers become established and grow to a size that where they would provide LWD to stream channels.

Table AW-9. Miles of roads proposed for decommissioning in RHCAs

Miles in Cat 1 RHCAs	Miles in Cat 2 RHCAs	Miles in Cat 3 RHCAs	Miles in Cat 4 RHCAs
1.6	0.2	0.0	4.0

Alternative 3

Timber Harvest Activities

Timber harvest units, grapple/hand piling areas, landings, and temporary roads will not be located in RHCAs under Alternative 3. Timber harvest activities would be reduced under Alternative 3 compared to Alternative 2.

Prescribed Fire Activities

Prescribed fire activities under Alternative 3 would be the same as Alternative 2. See effects discussion for Alternative 2.

Road Closure/Decommissioning Activities

Road closure/decommissioning activities under Alternative 3 would be the same as Alternative 2. See effects discussion for Alternative 2.

Alternative 4

Timber Harvest Activities

Timber harvesting would not occur under Alternative 4. This would eliminate the need for construction of landings and temporary roads. It would also eliminate the need for haul activities. There would be no effects from timber harvest activities on LWD.

Prescribed Fire Activities

Prescribed fire activities under Alternative 4 would be the same as Alternative 2.

Road Closure/Decommissioning Activities

Road closure/decommissioning activities under Alternative 4 would be the same as Alternative 2.

Bank Stability - Affected Environment

The Forest Plan DFC for stream bank stability is for 90% of the banks to be stable. Channel types differ in their sensitivity to management activities due to differences in bank erosion potential and the influence of streamside vegetation on bank stability (Table AW-6). Mill Creek and Crawford Creek are meeting the Forest Plan DFC for bank stability (Table AW-5). However, since these creeks exhibit characteristics of Rosgen F channel types, they may not be as stable as the fish habitat surveys indicate. The Middle Fork has areas of low bank stability, primarily the Forest Service portion of Phipps Meadow and on private land downstream of Highway 7. Bank stability can be directly affected by mechanical damage to banks or indirectly through changes in bank vegetation.

Bank Stability - Environmental Consequences

Direct and Indirect Effects

Alternative 1 – No Action

Alternative 1 would maintain the current levels of bank stability. Bank stability is generally high in the analysis area. Range allotment monitoring in the Blue Mountain allotment indicates that bank stability is on an upward trend. This trend is expected to continue under current grazing levels.

Alternative 2 – Proposed Action

Timber Harvest Activities

Timber harvest units, grapple/hand piling areas, landings, and temporary roads will not be located in RHCAs under Alternative 2. Restricting these activities to areas outside of RHCAs will prevent adverse impacts to bank stability. Therefore, direct and indirect impacts to banks and bank stability from logging activities will not occur.

Existing bank vegetation will be protected during road maintenance/reconstruction activities in RHCAs. Road reconstruction activities will not extend outside of existing road prisms in RHCAs. Therefore, road maintenance/reconstruction activities will not result in a decrease in current bank stability levels.

Prescribed Fire Activities

Prescribed fire activities will occur in RHCAs to a limited degree. Burning activities will mimic low intensity fires that are characteristic of natural burning patterns in riparian areas. This will be accomplished by not actively lighting fires in RHCAs while allowing fires to back into RHCAs from adjacent upslope areas. This technique will result in a patchy distribution of burned and unburned areas in RHCAs. Using these techniques, some stream bank vegetation burned but herbaceous plants should recover in the second year following the burning activities. Shrubs in burned areas will likely be top killed but fire intensities will be low enough not to result in complete mortality of shrubs. Stream bank stability will be decreased in burned areas until vegetation recovers. However, it is unlikely that burned patches along stream banks will be in sufficient sizes or quantity to result in an overall decrease in bank stability.

Road Closure/Decommissioning Activities

Existing bank vegetation will be protected during road closure/decommissioning activities in RHCAs. Road closure/decommissioning activities will not extend outside of existing road prisms in RHCAs. Therefore, road closure/decommissioning activities will not result in a decrease in current bank stability levels. Where decommissioned road segments are directly adjacent to stream channels, bank will be strengthened in the long term as planted conifers mature.

Alternative 3*Timber Harvest Activities*

Timber harvest activities and effects would be the same as alternative 3.

Existing bank vegetation will be protected during road maintenance/reconstruction activities in RHCAs. Road reconstruction activities will not extend outside of existing road prisms in RHCAs. Therefore, road maintenance/reconstruction activities will not result in a decrease in current bank stability levels.

Prescribed Fire Activities

Prescribed fire activities and effects would be the same as Alternative 2.

Road Closure/Decommissioning Activities

Road closure/decommissioning activities under Alternative 3 would be the same as Alternative 2, so impacts to bank stability would not occur.

Alternative 4*Timber Harvest Activities*

Timber harvesting would not occur under Alternative 4. This would eliminate the need for construction of landings and temporary roads. It would also eliminate the need for haul activities. Impacts to bank stability would not occur.

Prescribed Fire Activities

Prescribed fire activities and effects would be the same as Alternative 2.

Road Closure/Decommissioning Activities

Road closure/decommissioning activities under Alternative 4 would be the same as Alternative 2. See effects discussion for Alternative 2.

Embeddedness/Fine Sediment - Affected Environment

Composition of the stream substrate is an important feature of aquatic habitat. Cobble and gravel substrates provide habitat for a diverse assemblage of benthic macroinvertebrates as well as eggs and early life stages of numerous fish species. Macroinvertebrates represent a substantial portion of the diet available to various fish species.

Filling of interstitial spaces (i.e. the gaps between rocks on the stream bottom) with fine sediment (particles < 2 mm in size) eliminates habitat for many macroinvertebrates. Fish eggs and early life stages can also be buried and smothered when interstitial spaces are embedded with fine sediment. Winter habitat for juvenile salmonids is also lost as interstitial spaces are embedded with fine sediment.

Embeddedness data is no longer collected during Region 6 stream surveys. Instead, stream substrate data is collected using pebble count procedures. Either methodology can be used to estimate the amount of fine sediment in streams. Adverse impacts to macroinvertebrates and fish can occur where fine sediment exceeds 20% of the surface area of the streambed or embeddedness exceeds 20%. However, newer science indicates cobble embeddedness estimations may not be repeatable, and so embeddedness data may be in error.

Fine sediment in streams is a normal component of salmonid habitat; however, major disruption of the system occurs when sediment levels substantially exceed natural levels. Deposition of fine sediment can eliminate habitat for aquatic insects; reduce density, biomass, and diversity of aquatic insects; reduce permeability of spawning gravels; and reduce emergence of fry from redds (Nelson et al. 1991). Studies have shown that an increase in 1-3mm size sand from 20% to 30% can decrease emergent survival of salmonid species from 65% down to 40% (Phillips et al. 1975). Fine sediments are known to impact fry emergence and survival, and fine sediment (<6.5mm in size) levels above 40% can effectively eliminate salmonid populations and many macroinvertebrate species (Everest and Harr 1982).

Increases in fine sediment can occur from both increased transport of fine sediment from upland areas and from destabilized stream banks. Increases can result from both episodic sources such as wildfires or from chronic sources such as roads. Episodic sources normally result in short-term increases that return to pre-disturbance levels through recovery processes. Chronic sources can result in long-term changes of stream channels and aquatic habitat.

Both Mill Creek and Crawford Creek were embedded greater than 20% and did not meet the Forest Plan DFC in 1992 (Table AW-5). These conditions persist. The likely sources for fine sediment in Mill Creek and Crawford Creek are activities in riparian areas, including channel modifications from railroad logging, channel erosion, livestock grazing, and roads. Numerous roads in the project area have been identified as potential sources of fine sediment.

FSR 2620 is the most problematic road in the project area for effects to aquatic resources. FSR 2620 is currently a Level 3 road, but due to budget restraints, has received very little

maintenance in recent years. A little of the aggregate is eroding into Crawford Creek, leaving exposed cobbles in the subgrade. Erosion of the road surface is contributing a small amount of sediment into Crawford Creek during periods of intensive run-off. The lack of dust control measures also increases sediment during periods of high use during dry periods, such as during bow season; this also shortens the life of the road surface (leading to rutting during wet periods, which also contributes to sediment run-off).

The Middle Fork also has high fine sediment levels. Overall, fine sediment (< 2 mm) made up 28% of the streambed (Table A-5). Highest levels of fine sediment were in Reach 15 (59%) and Reach 16 (76%). These two reaches are directly below Phipps Meadow where a series of beaver dams failed and a subsequent downcutting event occurred in the early 90's.

Embeddedness/Fine Sediment - Environmental Consequences

Direct and Indirect Effects

Alternative 1 – No Action

Alternative 1 would maintain the current levels of fine sediment/embeddedness over much of the analysis area. Existing fine sediment levels are likely having adverse impacts to aquatic habitat. These adverse effects include reduced spawning success for salmonids and reduced quality of winter habitat for juvenile salmonids. Fine sediment levels in Mill Creek and Crawford Creek would slowly decrease as channels stabilize from past grazing and road building. However native surface roads that are contributing fine sediment would stay in their current condition. The extremely high fine sediment levels in the upper reaches of the Middle Fork in the analysis area will decline through time as the channel adjusts and recovers from the downcutting event that occurred in the early 90's.

Alternative 2

Timber Harvest Activities

Timber harvest units, grapple/hand piling areas, landings, and temporary roads will not be located in RHCAs under Alternative 2. Restricting these ground disturbing activities to areas outside of RHCAs, along with erosion control design measures for skidding, roads, and temporary roads, will prevent additional increases in existing levels of fine sediment from these activities. PACFISH RHCA buffer widths were designed to provide an area to trap fine sediment generated from upslope activities such as timber harvest. .

Haul routes will occur in RHCAs. There will be about 5.6 miles of haul route along RHCA roads (Table AW-8). The estimated number of log truck loads will be 1,789 under Alternative 2. Road maintenance/reconstruction activities will occur on all 5.6 miles of road in RHCAs (Table AW-8). Road maintenance/reconstruction would occur in existing roads prisms, not in streams. Road maintenance activities will consist of:

- blading and shaping road surfaces,
- repairing damaged ditch-relief culverts,
- rocking existing drain dips and grade sags where needed,
- rocking wet areas of road,
- brushing,

- removal of danger trees,
- dust abatement.

Road reconstruction activities will consist of:

- Constructing new drainage dips and waterbars,
- Constructing new outlet ditches,
- Placing geotextile material on existing road surfaces,
- Repair or replacement of existing cattleguards,
- Tree and stump removal.

Use of haul routes in RHCAs probably would result in creation and transport of a negligible amount of fine sediment to stream channels, due to loosening of sediment particles and destruction of ground cover by maintenance/reconstruction and by traffic. However, maintenance/reconstruction of road segments **prior to haul** and dust abatement **during haul activities** would keep the amount of fine sediment resulting to a minimum. Blading and reshaping road surfaces, repairing damaged ditch-relief culverts, applying rocking, constructing new drain dips and waterbars, and constructing new outlet ditches, and placing geotextiles would all reduce erosion. Machinery will be kept on the road prism. In addition, haul activities will only occur on dry or frozen roads to prevent damage to roads and drainage structures. These design measures, along with fairly level, well vegetated ground between the roads and the streams, would keep sediment increases due to haul negligible, compared to sediment from channel erosion.

Dust abatement is the application of a product, which either bonds dust particles and fines to larger matter or makes them heavier so they tend not to rise with the passage of vehicles. The purpose of dust abatement is to prevent loss of surface fines, enhance vehicle safety, and in some cases, prevent pollution and provide vehicle occupant comfort. Water is the only agent that will be used for dust abatement for proposed haul activities. Even with dust abatement, there will be some creation of fine sediment during haul activities.

Water will be drafted from designated water sources. Water drafting could potentially decrease stream flow and thus the amount of water available for fish. Water drafting could also remove fish from the stream or hurt them if it holds them against screens. Designated water sources for the Crawford Project are the developed water drafting site on Clear Creek (located near the Blue Mountain Work Center) and the rock pit at Taylor Flat. Water drafting can occur only as long as supply is adequate to provide for both fish and withdrawal. Approved screens will be attached to intake hoses to prevent adverse impacts to fish. NMFS developed criteria for pump intake screens will be used on all water pump intakes as described in the attached "Appendix B, Juvenile Fish Screen Criteria For Pump Intakes" (NMFS, May 9, 1996). Screen mesh openings shall not exceed 3/32 inch for woven wire or perforated plate screens, or 0.0689 inch for profile wire screens, with a minimum 27% open area. Trucks will be maintained to prevent oil leaks. Loading is done in a manner to minimize overflowing and discharge of wash into stream. The maximum withdrawal from one site in an 8-hour period will be 18,000 gallons of water. Water drafting guidelines from the 2005 Forest Road Maintenance BA will be followed during drafting activities. These guidelines will prevent the potential harm to fish.

Prescribed Fire Activities

Prescribed fire activities will occur in RHCAs to a limited degree in addition to upland areas. Burning activities will mimic low intensity fires that are characteristic of natural burning patterns in riparian areas. This will be accomplished by not actively lighting fires in RHCAs while allowing fires to back into RHCAs from adjacent upslope areas. This technique will result in a patchy distribution of burned and unburned areas in RHCAs. Using these techniques, fire intensities will not be high enough to consume downed wood large that plays a role in trapping fine sediment. Some ground cover will be consumed but will be quickly replaced as litter fall occurs in the first year following burning and herbaceous plants recover in the second year following burning. Mill Creek SWS was rated as at low risk for erosion potential during the Forest Roads Analysis due to the geology, soils, and topography of the subwatershed. A measurable increase in fine sediment in stream channels as a result of burning activities is unlikely due to the combination of a patchy, low intensity burn in RHCAs, typical recovery of ground cover within two years of burning, and the low erosion potential for the subwatershed

Road Closure/Decommissioning Activities

Closed roads are those roads on which motorized traffic has been excluded by regulation, barricade blockage, or by obscuring the entrance. A closed road is still an operating facility on which motorized traffic has been removed (year-long or seasonal) and remains on the Forest Road Transportation System. Closed roads will be left in a stable condition and maintained. About 0.9 miles of existing road will be closed within the Mill Creek subwatershed. Drainage structures will be self-maintaining after closure. Closure of these roads poses a negligible risk of sedimentation to fish bearing streams. However, since these roads are being kept as part of the Forest road system, the benefits of the closures would likely not be "permanent."

The longer-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.

The procedure for decommissioning a road would include removing all culverts and reshaping the immediate area. In addition, cross ditches would be constructed to maintain drainage and reduce the potential for surface erosion. These measures would be implemented during decommissioning to "hydrologically disconnect" road from streams, to reduce sediment entering streams and affecting fish habitat.

Additional soil stabilization measures that may be used include:

- Scarification or sub-soiling to increase infiltration and facilitate vegetative recovery.
- Seeding with native grass to stabilize soils.
- Planting conifers on decommissioned road segments located in RHCAs where conditions will support establishment and growth.

Road decommissioning activities may result in increases in fine sediment, especially where RHCA road segments are decommissioned. About 5.8 miles of road will be decommissioned within RHCAs including about 1.6 miles adjacent to Crawford Creek (Table AW-9).

Decommissioning of FSR 2620156 will involve the removal of one culvert on Crawford Creek and may result in a short-term increase in fine sediment while the culvert is being removed. Removal of the culvert will follow procedures approved by NMFS and USFWS that minimize downstream sediment flows.

There is a short-term risk of generating sediment during and shortly after decommissioning activities which could reach streams, and could affect fish and fish habitat in those streams. This risk is primarily associated with removing culverts, and with the scarification, or subsoiling which may be needed on some road segments to discourage vehicle use and improve infiltration. Design criteria include culvert removal guidelines, 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.

Due to the proximity of the work to stream channels, there is still a low level of risk of affecting rearing juvenile steelhead, or steelhead habitat. The potential to transfer this effect downstream to Chinook salmon or bull trout migratory habitat is negligible.

The longer-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.

Alternative 3

Timber Harvest Activities

Timber harvest units, grapple/hand piling areas, landings, and temporary roads will not be located in RHCAs under Alternative 3. Restricting these ground disturbing activities to areas outside of RHCAs will prevent additional increases in existing levels of fine sediment from these activities.

Haul routes and haul frequency would be reduced compared to Alternative 2. Under Alternative 3, there will be 5.4 miles of haul route located in RHCAs (Table AW-10). The estimated number of log truck loads will be 1,219 under Alternative 3, a reduction of 570 loads from Alternative 2. The miles of maintenance/reconstruction activities in RHCAs, 5.5 miles under Alternative 3 (Table AW-10), would be essentially the same as under Alternative 2. Use of haul routes in RHCAs would result in creation and transport of fine sediment to stream channels. Design measures, along with fairly level, well vegetated ground between the roads and the streams, would keep sediment increases due to haul negligible, compared to sediment from channel erosion. Effects under this alternative would be less than under Alternative 2.

Table AW-10. Miles of haul routes and maintenance/reconstruction activities in RHCAs proposed under Alternative 3.

Activity	Miles in Cat 1 RHCAs	Miles in Cat 2 RHCAs	Miles in Cat 3 RHCAs	Miles in Cat 4 RHCAs
Haul	2.4	0.0	0.0	3.1
Maintenance	2.4	0.0	0.0	2.4
Reconstruction	0.0	0.0	0.0	0.7

Prescribed Fire Activities

Prescribed fire activities under Alternative 3 would be the same as Alternative 2

Road Closure/Decommissioning Activities

Road closure/decommissioning activities under Alternative 3 would be the same as Alternative 2.

Alternative 4

Timber Harvest Activities

Timber harvesting would not occur under Alternative 4. This would eliminate the need for construction of landings and temporary roads. It would also eliminate the need for haul activities.

Prescribed Fire Activities

Prescribed fire activities under Alternative 4 would be the same as Alternative 2.

Road Closure/Decommissioning Activities

Road closure/decommissioning activities under Alternative 4 would be the same as Alternative 2.

Width-to-Depth Ratio - Affected Environment

The Forest Plan Desired Future Condition/Riparian Management Objective (DFC/RMO) for width-to-depth ratio is based on wetted width and depth. A large wetted width-to-depth ratio indicates wide shallow stream channel morphology. Wide shallow streams are prone to increases in stream temperatures due to their high surface area to volume ratio. Shallow streams also provide little habitat for fish, especially adult redband trout, due to the lack of water depth.

Wetted width to depth ratios can be increased by increases in peak flows, decreases in low flows, direct bank alteration, or increases in sediment or a combination of these factors. Conversely, reductions in these factors can lead to reductions in width to depth ratios. Increases in peak flows in Mill subwatershed are negligible to small. The intermittent to very low perennial flows in Crawford and Mill Creeks mean that less bank-stabilizing wetland vegetation occurs on these creeks than typical fish-bearing streams; this situation probably contributes to the high width/depth ratio. Water withdrawals from the Middle Fork John Day River for irrigation (see Appendix D) probably decrease summer low flow a small amount. The effect of domestic withdrawals is negligible. The irrigation withdrawals may be increasing the wetted width to depth ratio in the Middle Fork

The Middle Fork John Day River is exceeding the Forest Plan DFC/RMO for width-to-depth ratio (Table AW-5). Mill Creek and Crawford Creek were meeting the width-to-depth ratio RMO/DFC in 1993. Recent observations suggest that the width-to-depth ratios may exceed 10 and therefore not meet the DFC/RMO.

Width-to-Depth Ratio - Environmental Consequences

Direct and Indirect Effects

Alternative 1 – No Action

Alternative 1 likely would maintain the current width-to-depth ratios in Mill Creek and Crawford Creek because adjacent roads are influencing the channel morphology of these streams. The intermittent flow of Crawford Creek and very low flows in Mill Creek make establishment and growth of riparian vegetation even more difficult. Width-to-depth ratios for the Middle Fork on the Forest would likely decrease as bank stability increases.

Alternative 2

Timber Harvest Activities

Timber harvest units, grapple/hand piling areas, landings, and temporary roads will not be located in RHCAs under Alternative 2. Proposed timber harvest activities will not result in increases in width to depth ratios since heavy equipment associated with felling and yarding activities will not be operated in RHCAs and therefore will not result in alteration of banks or bank vegetation. Increases in fine sediment of a magnitude that would result in destabilization of stream channels from ground disturbing activities associated with timber harvest activities are unlikely to occur because RHCA buffers are sufficient to trap the majority of fine sediment produced by these activities.

Prescribed Fire Activities

Minor impacts to stream bank stability will occur as a result of prescribe burning activities in RHCAs (see Bank Stability discussion). However, these impacts will not be of a scale that will result in destabilization of stream channels or result in increased width/depth ratios.

Road Closure/Decommissioning Activities

Road closure/decommissioning activities will not result in reductions in bank stability (see Bank Stability discussion). Fine sediment from decommissioning activities is unlikely to result in destabilization of stream channels (see Fine Sediment/Embeddedness discussion). Therefore, proposed road closure/decommissioning activities will not result in increases in current width-to-depth ratios.

Alternative 3

Timber Harvest Activities

Timber harvest units, grapple/hand piling areas, landings, and temporary roads will not be located in RHCAs under Alternative 3. Timber harvest activities would be reduced under Alternative 3 compared to Alternative 2.

Prescribed Fire Activities

Prescribed fire activities under Alternative 3 would be the same as Alternative 2.

Road Closure/Decommissioning Activities

Road closure/decommissioning activities under Alternative 3 would be the same as Alternative 2

Alternative 4*Timber Harvest Activities*

Timber harvesting would not occur under Alternative 4. This would eliminate the need for construction of landings and temporary roads. It would also eliminate the need for haul activities. There would be no effects from timber harvest activities on width to depth ratios.

Prescribed Fire Activities

Prescribed fire activities under Alternative 4 would be the same as Alternative 2.

Road Closure/Decommissioning Activities

Road closure/decommissioning activities under Alternative 4 would be the same as Alternative 2.

Water Temperature/Stream Shading - Affected Environment

Water temperature influences the metabolism, behavior, and health of fish and other aquatic organisms. Fish can survive at temperatures near extremes of suitable temperature ranges. However, growth is reduced at low temperatures because all metabolic processes are slowed. At the opposite extreme, growth is reduced at high temperatures because most or all energy from food must be used for maintenance needs. Fish are also more susceptible to diseases near the extremes of a species suitable temperature ranges.

The Forest Plan water temperature standard is for no measurable increase in maximum water temperature, and maximum water temperatures below 64°F within migration and rearing habitat and below 60°F within spawning habitats (PACFISH RMO). In general, juvenile and Chinook salmon and redband trout, and juvenile steelhead will occupy water that is from 55 to 64°F. Upper lethal temperatures range from about 75°F for steelhead to about 80°F for Chinook salmon. Mean maximum water temperatures are above the suitable range for salmonid species present during summer months in the Crawford analysis area (Table AW-11).

Table AW-11. Average maximum stream temperatures in the Crawford analysis area.

Stream	Location	Years Analyzed	Mean 7 Day Mean Max Temp (°F)
Crawford Cr.	Upper	1995-2000	66.5
	Middle	1995-2001	74.6
	Lower	1995-2001, 2005	76.3
Mill Cr.	Hwy 7	1995-2001	67.4
Middle Fork	Below Phipps Mdw	1995-2005	71.7
	Near Austin	1995-2005	75.2

In addition to meeting the Forest Plan standard, the Forest must meet Oregon water quality standards under the Clean Water Act. EPA approved new water quality standards for Oregon in March 2004. All fish bearing streams in the analysis area are considered spawning and rearing habitat for bull trout for water temperature purposes. The following water temperature standards apply:

- (f) The seven-day-average maximum temperature of a stream identified as having bull trout spawning and juvenile rearing use on subbasin maps set out at OAR 340-041-0101 to 340-041-0340: Figures 130B, 151B, 160B, 170B (John Day Basin), 180A, 201A, 260A, 310B, and 340B, may not exceed 12.0 degrees Celsius (53.6 degrees Fahrenheit)

The Middle Fork John Day River, Crawford Creek, and Mill Creek are on the Oregon 303(d) list for water quality-limited water bodies for high summer temperatures. Factors that contribute to the high temperatures in Crawford and Mill Creeks include the high wetted width/depth ratio, the intermittent to very low perennial flow, and the stringer meadow vegetation. Past riparian logging may contribute to the high temperatures. The 2620 road probably raises the temperature of Crawford Creek (a seasonally flowing, fish bearing stream), by decreasing shade. Water withdrawals from the Middle Fork for irrigation may increase summer temperatures a small amount, by decreasing flow and increasing wetted width/depth ratios.

Water Temperature/Stream Shading - Environmental Consequences

Direct and Indirect Effects

Alternative 1 – No Action

Alternative 1 would maintain the current levels of stream shading. Current water temperatures exceed the riparian management objective (RMO) for water temperature in the analysis area. Mean maximum water temperatures are above the suitable range for Chinook salmon, redband trout, and juvenile steelhead which are present in the Crawford analysis area during summer months.

Water temperatures in Crawford Creek would likely not change over time due to the influence of FSR 2620 on streamside vegetation. About 1.5 miles of FSR 2620 are located within 50 ft of Crawford Creek. Water temperatures are also unlikely to change in Mill Creek because most of the perennial portion is present on private land where water withdrawals for irrigation occur.

Water temperatures in the Middle Fork may improve over the long term as streamside vegetation responds to improvements in range management activities. Recent range monitoring indicates that there is an upward trend in channel and stream bank vegetation in the Upper Middle Fork John Day watershed.

Alternative 2

Timber Harvest Activities

Timber harvest units, grapple/hand piling areas, landings, and temporary roads will not be located in RHCAs under Alternative 2. Restricting these activities to areas outside of RHCAs will prevent adverse impacts to existing stream shading. RHCA widths are sufficient for Category 1 and 2 streams to prevent removal of trees that provide stream shading. Felling of danger trees may occur along 5 miles of haul routes in RHCAs and field observations indicate 1-2 trees per mile may be felled for a total of 5-10 trees over 5 miles. Danger trees are usually dead and provide little shade especially when surrounded by live trees. Therefore, measurable increases in stream temperatures will not result from proposed harvest activities.

Water withdrawals for dust abatement during haul activities will occur. Water withdrawals will be in accordance with the 2005 Malheur N.F. Road Maintenance BA and NMFS guidance. Use of these procedures will insure that water withdrawals do not result in a measurable increase in water temperatures.

Water drafting can occur only as long as supply is adequate to provide for both fish and withdrawal. Approved screens will be attached to intake hoses to prevent adverse impacts to fish. NMFS developed criteria for pump intake screens will be used on all water pump intakes as described in the attached "Appendix B, Juvenile Fish Screen Criteria For Pump Intakes" (NMFS, May 9, 1996). Screen mesh openings shall not exceed 3/32 inch for woven wire or perforated plate screens, or 0.0689 inch for profile wire screens, with a minimum 27% open area. Trucks will be maintained to prevent oil leaks. Loading is done in a manner to minimize overflowing and discharge of wash into stream. The maximum withdrawal from one site in an 8-hour period will be 18,000 gallons of water. Water drafting guidelines from the 2005 Forest Road Maintenance BA will be followed during drafting activities. These guidelines will prevent the potential harm to fish in Clear Creek.

Prescribed Fire Activities

Ignition is not planned within RHCAs. Fire from upslope burning units, which is within prescription, would be allowed to back into RHCAs. Design criteria include retention of at least 95% of stream shade. The prescribed burning would occur when moisture and climate conditions will minimize the potential for a high intensity burn. With a low intensity burn, very little stream vegetation providing shade is expected to be consumed under the more moist conditions encountered in riparian areas associated with perennial streams. There is not expected to be any loss of shade, which could affect stream temperature.

Road Closure/Decommissioning Activities

Road decommissioning and closure actions would not have any direct effect on shade in the short term. Removal of hazard trees in RHCAs for closure/decommissioning activities is not anticipated. About 5.8 miles of road will be decommissioned within RHCAs including about 1.6 miles adjacent to Crawford Creek. Conifers will be planted in decommissioned road segments as

part of the decommissioning process. Over the long-term (50 to 70 years) shading will increase as planted conifers become established and grow to a size that where they provide shading.

Alternative 3

Timber Harvest Activities

Timber harvest units, grapple/hand piling areas, landings, and temporary roads will not be located in RHCAs under Alternative 3. Timber harvest activities would be reduced under Alternative 3 compared to Alternative 2. This would result in a reduction of haul activities including a reduced need for water withdrawals for dust abatement and felling of danger trees. There is not expected to be any loss of shade, which could affect stream temperature.

Prescribed Fire Activities

Prescribed fire activities under Alternative 3 would be the same as Alternative 2.

Road Closure/Decommissioning Activities

Road closure/decommissioning activities under Alternative 3 would be the same as Alternative 2.

Alternative 4

Timber Harvest Activities

Timber harvesting would not occur under Alternative 4. This would eliminate the need for construction of landings, temporary roads and felling of danger trees. It would also eliminate the need for haul activities including water withdrawals for dust abatement. There would be no effects from timber harvest activities on water temperature and stream shade.

Prescribed Fire Activities

Prescribed fire activities under Alternative 4 would be the same as Alternative 2.

Road Closure/Decommissioning Activities

Road closure/decommissioning activities under Alternative 4 would be the same as Alternative 2.

Aquatic Habitat - Summary of Affected Environment and Direct and Indirect Environmental Consequences

Fish habitat in the analysis area generally does not meet Forest Plan Desired Future Conditions/Riparian Management Objectives (DFCs/RMOs) for pool frequency, Large Woody Debris, sediment, width/depth frequency (Table AW-5). In part this is due to naturally low flows and to stringer meadow vegetation along Crawford and Mill Creeks. Although bank stability does meet the Riparian Management Objectives, Crawford and Mill Creeks exhibit characteristics of Rosgen F channels, so channel erosion is probably the most significant factor in sediment budgets in these creeks. Crawford Creek and Mill Creek are highly altered streams with poor habitat conditions for salmonids. Intermittent flow in Crawford Creek and very low flow in the perennial reach of Mill Creek are also strongly limiting factors for fish habitat. The Middle Fork, on the Forest, is also in a highly altered state but appears to be on an upward trend.

Under Alternatives 2 and 3, use of riparian roads for haul would result in short-term increases in fine sediment. The design measures (described in "Chapter 2, Alternatives Considered in Detail, Alternative 2-Proposed Action" section, "Activity Descriptions, Road Use During Harvest" and "Management Requirements, Constraints, and Design Measures, Table 2.6" sub-sections), along with fairly level, well vegetated ground between the roads and the streams, would keep sediment increases due to haul negligible. Since all commercial thinning units are outside RHCAs, there would be no effects to fish habitat from activities inside the harvest units.

Under Alternatives 2, 3, and 4 road decommissioning would result in short-term increases in fine sediment, especially from the removal of a culvert. It is unlikely that the increases would be measurable by pebble count methods. The negligible quantity of increase results from the design measures (described in "Chapter 2, Alternatives Considered in Detail, Alternative 2-Proposed Action" section, "Activity Descriptions, Road Closures and Decommissioning" and "Management Requirements, Constraints, and Design Measures, Table 2.7" sub-sections), along with fairly level, well vegetated ground between the roads and the streams (except for the culvert removal). The proposed road decommissioning activities will result in a long-term decrease in fine sediment levels in the analysis area. Because road decommissioning activities are the same for all action alternatives it is unlikely that there will be measurable differences among action alternatives.

Parts of 4 roads (2600235, 2600237, 7000015, 7000255, see Appendix B, ATM west) consisting of 1.7 miles, located outside the RHCAs would be reopened due to ineffective closures and the creation persistent use of unofficial side roads by the public. These roads were originally closed under previous projects. Some of these unofficial roads serve as detours thru RHCAs around the closed roads. Reopening segments of the closed roads and restoring the footprint of the unofficial roads would eliminate negative impacts to the RHCA and aquatic habitat.

Proposed activities (logging, road use, road maintenance, road reconstruction, road watering, road decommissioning, road re-opening, prescribed fire, precommercial thinning, activity fuels treatment) are unlikely to result in changes in water temperatures, pool frequencies, width/depth ratios, Large Woody Debris, or bank stability.

Alternative 1 proposes no new activities, resulting in no activity related long term benefits or impacts to aquatic species and their habitat. However, the lack of road treatments and no culvert removal would allow sediment sources to continue from roads; and there would be accelerated water flows from the undersized culvert on FSR 2620156. This culvert is also a fish barrier, limiting upstream movement of fish and their prey base.

Aquatic Habitat & Water Quality – Cumulative Effects

Cumulative Effects Common to All Alternatives

Past and ongoing actions and the effects of them are described in the Affected Environment sections above:

- Effects of Past and Ongoing Actions
- General Existing Stream Conditions

- Sub-sections & the Affected Environment; sub-sections for "Pool Frequency", "Large Woody Debris," "Bank Stability," "Embeddedness/Fine Sediment," "Width-to-Depth Ratio," & "Water Temperature/Stream Shading"

Higher level effects are mostly due to roads (including former logging railroads), past grazing, and past riparian harvest (see the "Aquatic Habitat - Summary of Affected Environment and Direct and Indirect Environmental Consequences" section immediately above). Lesser effects may be due to irrigation withdrawals (temperature), riparian firewood cutting (Large Woody Debris), and US 26 culvert replacements (sediment).

The aquatic habitat and water quality effects of future activities described in Appendix D are negligible, except for the ongoing actions mentioned in the preceding sentence. The effects of use and maintenance of roads which are not decommissioned would remain about the same as at present. The effects of US 26 culvert replacements will start to decrease when work finishes in 2006, and will be negligible by 2010.

All alternatives would permit natural slow, partial recovery from effects of past grazing, past riparian road construction, and past riparian harvest. This recovery would occur as riparian trees grow larger, as large wood falls into the streams, as channel types change to more stable, narrow configurations, as sediment from past actions is washed out, and as riparian shrubs and herbs recover and contribute to more stable stream banks.

Where current grazing standards are being met there is little likelihood of affects to aquatic habitat and hence cumulative effects since these standards are designed to allow a near natural rate of recovery of aquatic habitat and riparian vegetation. The current grazing standards are designed to eliminate any effects on aquatic habitats that could carry over to the following year. All alternatives in the Middle Fork John Day Range EIS (Appendix D) are designed to continue to meet current grazing standards.

If a sever crown fire occurs, shade would be reduced, and water temperatures would increase. Sediment would increase from channel and upland sources. A pulse of woody debris would fall into the streams. Both low flows and peak flows would increase for perhaps 10 years, until evapotranspiration recovers.

Alternative 1 - No Action

Under Alternative 1, recovery of sediment would be slightly slower, and not progress quite as far as under Alternatives 2, 3, and 4, because of the effects of the roads which would not be decommissioned.

Under Alternative 1 the hazard of a severe crown fire is higher, as described in the Fire and Fuels section of Chapter 3.

Alternatives 2, 3, and 4

Alternatives 2, 3, and 4 would reduce and eliminate some of the road sediment related impacts to aquatic habitat. About 5.8 miles of native surface roads would be decommissioned in RHCAs. This would leave about 11 miles of native surface roads in RHCAs in the analysis area; a reduction of 34%. Of the sixteen roads identified in the Crawford Roads Analysis (2001) as

impacting aquatic habitat, eight would be decommissioned under Alternatives 2, 3, and 4. Parts of 4 roads consisting of 1.7 miles, located outside the RHCAs would be reopened due to ineffective closures and the creation and persistent use of unofficial side roads by the public. These roads were originally closed under previous projects. Some of these unofficial roads serve as detours through RHCAs around the closed roads. Reopening segments of the closed roads and restoring the footprint of the unofficial roads would eliminate risk of sediment impacts to the RHCA and aquatic habitat.

Activities proposed under Alternative 2 (timber harvest, burning, road decommissioning), Alternative 3 (reduced timber harvest, burning, road decommissioning), and Alternative 4 (burning, road decommissioning) may result in short-term cumulative effects. The proposed activities will likely result in short-term increases in fine sediment. However, the increases are unlikely to result in a measurable change in fine sediment levels in streams in the analysis area. The increases may add to adverse effects because streams in the analysis area already exceed thresholds for adverse impacts to aquatic habitat and salmonids.

The proposed road decommissioning activities will lead to a long-term reduction in fine sediment levels and therefore will have beneficial impacts to aquatic habitat and fish. Removal of a culvert on Crawford Creek when FSR 2620156 is decommissioned will reduce the number of culverts that are fish passage barriers from four to three.

Log haul under Alternatives 2 and 3, and road decommissioning proposed under Alternatives 2, 3, and 4 may result in short-term increases in fine sediment. However, since impacts to aquatic habitat from the proposed activities are limited to negligible increases in fine sediment, it is unlikely that these increases would result in cumulative adverse effects when combined with other past, ongoing, or future actions.

Under Alternative 2, 3, and 4 the hazard of a severe crown fire is lower than under Alternative 1, as described in the Fire and Fuels section of Chapter 3.

Cumulative Effects - Equivalent Roaded Area

The USDA Forest Service (1990) anticipated that "A harvest effects model will be applied which converts a range of harvest activities to a common factor and applies a recovery rate to simulate hydrologic or watershed recovery over time." (p. IV-48) for the Crawford Project, an Equivalent Roaded Area (ERA) model was used. The analysis area is the Mill subwatershed. This model is explained in the soils report of the project record. The Threshold of Concern (TOC) was calculated as the average of the three old subwatersheds, weighted by their area. The TOC is 14.5%.

Table AW- 12. Equivalent Roaded Area (% of Mill subwatershed)

Year	Alt. 1 & 4	Alt. 2	Alt. 3
2006	7.6	9.3	8.9
2011	6.5	8.0	7.6

Under all alternatives, the ERA is well below the TOC. This indicates that the addition of the Crawford Project to past, ongoing, and future activities (described in Appendix D) would not be expected to produce significant effects on peak flow, channel erosion, or water yield.

Affected Environment and Environmental Effects – Aquatic Species

This aquatic specialist report satisfies requirements of Forest Service Manual 2672.4 requiring the Forest Service to review all its planned, funded, executed or permitted programs and activities for possible effects on proposed, endangered, threatened or sensitive species by completing a Biological Evaluation (BE). The BE process is intended to review the Crawford Project in sufficient detail to determine effects of alternatives on species in this evaluation and ensure proposed management actions would not:

- likely jeopardize the continued existence, or cause adverse modification of habitat, for a species that is proposed (P) or listed as endangered (E) or threatened (T) by the USDI Fish and Wildlife Service or NOAA National Marine Fisheries Service;
- Or
- contribute to the loss of viability for species listed as sensitive (S) by USDA Forest Service, Region 6, or any native or desired, non-native species; nor cause any species to move toward federal listing (FSM 2672.4).

The following sources were used during the prefield review phase to determine the presence or absence of aquatic PETS species in the Crawford Fisheries analysis area:

1. Malheur N.F. GIS database
2. Regional Forester's (R6) sensitive animal list (1989, updated 11/15/2000)
3. ODFW stream survey and fish survey reports
4. Forest Service stream survey reports, Blue Mountain Ranger District, John Day, OR
5. Oregon Natural Heritage Program (ORNHP) database
6. Natural Heritage Conservation database (Biosource)
7. Bull Trout (*Salvelinus confluentus*) Draft Recovery Plan: John Day Recovery Unit
8. Oregon Native Fish Report (2005 Public Review Draft)
9. Biological Evaluation for the Crawford Timber Sale EA (2002)
10. Biological Assessment for the Crawford Timber Sale EA (2002)

Analysis Area

The analysis area for aquatic species is the same as used for aquatic habitat. There will be no activities or associated direct and indirect effects in the upper part of the Mill Creek subwatershed that lies south of the Hwy 26 and drains into the project area. The term fisheries analysis in this report refers to the water drainages in the remaining part of the sub-watershed where activities are proposed. The cumulative effects section does address the entire sub-watershed.

Aquatic Species with Special Management Status Present in the Analysis Area

Management Indicator Species

Management Indicator Species (MIS) are species of vertebrates and invertebrates whose population changes are believed to best indicate effects of land management activities. Through the MIS concept, the total number of species found within a project area is reduced to a subset of species that collectively represent habitats, species and associated management concerns. MIS are used to assess the maintenance of populations (the ability of a population to sustain itself naturally) and biological diversity (which includes genetic diversity, species diversity, and habitat diversity), and to assess effects on species in public demand. The Malheur Forest Plan directs analyses to focus on MIS. Aquatic MIS in the analysis area for the Crawford Project are: steelhead (*Oncorhynchus mykiss*), redband trout (*Oncorhynchus mykiss gairdneri*), and bull trout (*Salvelinus confluentus*) (Table AW-13).

Table AW-13. Fish species with special management status present or suspected to be in the project area.

Fish Species (Status ¹)	Stream	Migration Habitat	Spawning Habitat	Summer Rearing Habitat
Bull trout (ESA -T, MIS)	M.F. John Day R.	Present	Not Present	Not Present
	Mill Creek	Not Present	Not Present	Not Present
	Crawford Creek	Not Present	Not Present	Not Present
Steelhead (ESA -T, MIS)	M.F. John Day R.	Present	Present	Present
	Mill Creek	Present	Not Present	Present
	Crawford Creek	Present	Present	Present
Redband trout (R6S, MIS)	M.F. John Day R.	Present	Present	Present
	Mill Creek	Present	Present	Present
	Crawford Creek	Present	Present	Present
Spring Chinook salmon (R6S)	M.F. John Day R.	Present	Present	Present
	Mill Creek	Not Present	Not Present	Not Present ²
	Crawford Creek	Not Present	Not Present	Not Present ²

1) ESA-T = Listed as Threatened under the Endangered Species Act, MIS = Malheur National Forest management indicator species, R6S = Region 6 sensitive species

2) Winter rearing habitat for juvenile spring Chinook salmon may be present.

Threatened, Endangered, and Sensitive Species

An endangered species is an animal or plant species listed under the ESA that is in danger of extinction throughout all or a significant portion of its range. A threatened species is an animal or plant species listed under the ESA likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

A sensitive species is an animal or plant species identified by the Regional Forester for which species viability is a concern either a) because of current or predicted downward trend in population numbers or density, or b) because of current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

Threatened, endangered, and sensitive (TES) aquatic species in the analysis area for the Crawford Project are: threatened - bull trout (*Salvelinus confluentus*), steelhead (*Oncorhynchus mykiss*); sensitive - redband trout (*Oncorhynchus mykiss gairdneri*), spring Chinook salmon (*Oncorhynchus tshawytscha*) (Table A-13). The Columbia spotted frog (*Rana luteiventris*), a Region 6 sensitive species, is also present in the analysis area. A summary of determinations is found in Table AW-14.

Westslope cutthroat trout (*Oncorhynchus clarki*) are not present in the Middle Fork subbasin. Therefore, the Crawford Project will have no impact on westslope cutthroat trout and will not be considered further in the Aquatics analysis.

Malheur mottled sculpin (*Cottus bendirei*), a Region 6 sensitive species, are not present in the Middle Fork subbasin. Therefore, the Crawford Project will have no impact on Malheur mottled sculpin and will not be considered further in the Aquatics analysis, except in Table AW-14.

There are no aquatic species in the project area that are listed by the state of Oregon as threatened or endangered.

Environmental Consequences, Rational and Determination by Species Based on Direct, Indirect and Cumulative Effects of Alternatives

Table AW-14. Summary of Determinations

(Rationale for conclusion of determinations is contained in this section of the document)

Species	No Action Alternative 1	Proposed Action Alternative 2	Alternative 3	Alternatives 4
Redband trout (S)	(MIIH)	MIIH (BI)	MIIH (BI)	MIIH (BI)
Malheur mottled sculpin (S)*	NI	NI	NI	NI
Columbia spotted frog (S)	NI	MIIH (BI)	MIIH (BI)	MIIH (BI)
Westslope cutthroat trout (S)	NI	NI	NI	NI
Columbia River Basin Bull Trout(T)	NLAA	NLAA	NLAA	NLAA
Mid Columbia River Steelhead (T)	LAA	LAA (BE)	LAA (BE)	LAA (BE)
Steelhead Designated Critical Habitat (T)	LAA	LAA(BE)	LAA(BE)	LAA(BE)
Spring Chinook Salmon (S)	MIIH	MIIH (BI)	MIIH (BI)	MIIH (BI)
Spring Chinook Salmon EFH	MIIH	MIIH (BI)	MIIH (BI)	MIIH (BI)

P = Proposed, E = Endangered, T = Threatened, S = Sensitive

NE =No Effect, NLAA =May Effect, Not Likely to Adversely Affect, LAA =May Effect, Likely to Adversely Affect, BE =Beneficial Effect, BI=Beneficial Impact, 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 (Effects in parentheses are long term effects) *not present in the Middle Fork subbasin.

Bull Trout - Affected Environment

Bull trout were listed by the U.S. Fish and Wildlife Service (USFWS) as threatened under the federal ESA on June 10, 1998 (63 FR 31647). Critical habitat for bull trout was not designated in the analysis area by USFWS (70 FR 56212). Bull trout are also a Malheur National Forest management indicator species. The Crawford Project area is located in the John Day bull trout subpopulation area.

Population Status

M.F. John Day Subbasin

Bull trout in the Middle Fork John Day River subbasin persist at low abundance levels. In 1999, population surveys were conducted by ODFW, the Malheur N.F. and others in Clear Creek, Big Creek, Deadwood Creek, and Granite Boulder Creek to estimate abundance. Total numbers of bull trout consisting of primarily juvenile and subadult fish, were estimated to be 1,950 individuals in Big Creek, 640 individuals in Clear Creek, and 368 individuals in Granite Boulder Creek (Hemmingsen 1999).

Crawford Fisheries Analysis Area

Bull trout are only seasonally present in the Fisheries Analysis area when utilizing the Middle Fork as a migration corridor.

Distribution and Habitat

M.F. John Day Subbasin

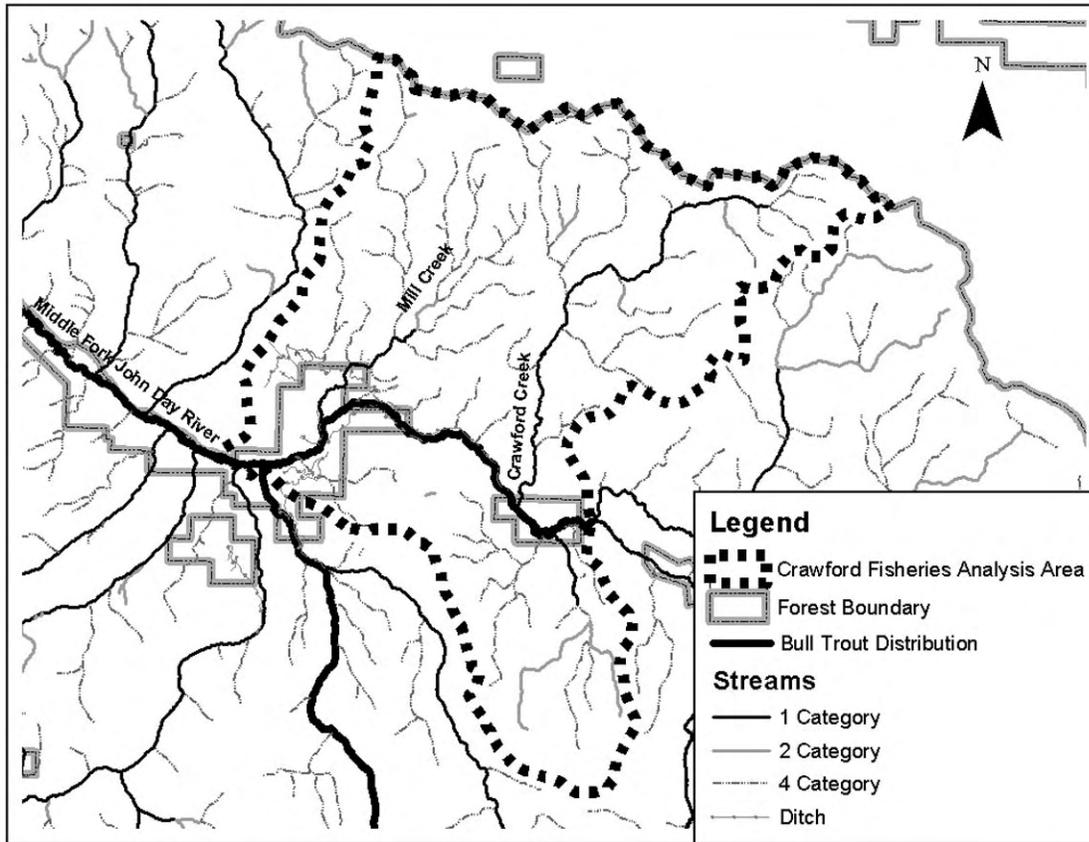
Four local populations currently exist within the Middle Fork John Day River subbasin. Local populations include Clear Creek, Granite Boulder Creek, Deadwood and Big Creek (Buchanan et al. 1997). The Malheur National Forest identifies upper Big Boulder Creek, Badger Creek, Indian Creek, and Vinegar Creek as potential habitat for bull trout local populations (potential local populations).

Current distribution in the Middle Fork John Day River subbasin is based on isolated sightings with the primary distribution restricted to tributaries and limited to 22 percent of stream miles previously known to support bull trout (Claire and Gray 1993, Buchanan et al. 1997). Summer distribution of bull trout, based on the 1990 and 1992 ODFW Aquatic Inventory Project, indicated bull trout occupy approximately 16 miles of stream in the Middle Fork John Day River subbasin, including: 5.5 miles in Big Creek, 2.5 miles in Deadwood Creek (a tributary to Big Creek), 4 miles in Granite Boulder Creek; and 4 miles in Clear Creek. Bull trout migration from these tributary streams during the summer is highly unlikely due to high water temperatures and habitat modifications in the Middle Fork. Aquatic inventory surveys conducted by the ODFW in 1990 and 1991 detected 60 bull trout in the Middle Fork John Day River subbasin; two fish were measured at 260 millimeters (10 inches) and 360 millimeters (14 inches), all others were less than 210 millimeters (8 inches) in length (Buchanan et al. 1997). In the 1999 and 2000 surveys of Clear Creek, eight redds were observed each year (Prairie City RD redd survey data).

Crawford Fisheries Analysis Area

Bull trout are seasonally present in the Middle Fork. Bull trout use the river as a migration corridor and for winter rearing habitat (Figure AW-2). Bull trout are not present in Mill Creek or Crawford Creek where habitat is unsuitable. Spawning and rearing habitat for bull trout is not present in the Crawford Fisheries Analysis area.

Figure AW-2. Distribution of bull trout in the Crawford fisheries analysis area.



Bull Trout – Environmental Consequences

Alternative 1 – No Action

Determination

Columbia River Basin Bull Trout (T): May Affect, Not Likely to Adversely Affect (NLAA)

Rationale

Current migration habitat for bull trout in the Fisheries Analysis area is in a degraded state. The reduced number of large deep pools in the Middle Fork limits the number of resting pools available for migrating fluvial bull trout. The lack of road treatments and no culvert removal would allow sediment sources to continue from roads; and there would be accelerated water flows from the undersized culvert on FSR 2620156. This culvert is also a fish barrier, limiting upstream movement of fish and their prey base.

Alternative 2

Determination

Columbia River Basin Bull Trout (T): May Affect, Not Likely to Adversely Affect (NLAA).

Rationale

Proposed activities will not result in impacts to habitat for migrating bull trout. Expected short-term increase in fine sediment from tributaries will not be of a magnitude to result in a loss of

deep pool habitat in the Middle Fork. The water drafting site on Clear Creek for dust abatement is below summer rearing habitat for bull trout and would have no affect.

Alternative 3

Determination

Columbia River Basin Bull Trout (T): May Affect, Not Likely to Adversely Affect (NLAA).

Rationale

Same as Alternative 2

Alternative 4

Determination

Columbia River Basin Bull Trout (T): May Affect, Not Likely to Adversely Affect (NLAA).

Rationale

Same as Alternative 2

Steelhead – Affected Environment

Steelhead (Mid-Columbia ESU, MCR steelhead) was listed by the National Marine Fisheries Service (NMFS) as threatened under the federal ESA on March 25, 1999 (64 FR 15417). MCR steelhead is also a Malheur National Forest management indicator species. Critical habitat for MCR steelhead was designated on September 2, 2005 (70 FR 52630). Critical habitat is present in the fisheries analysis area.

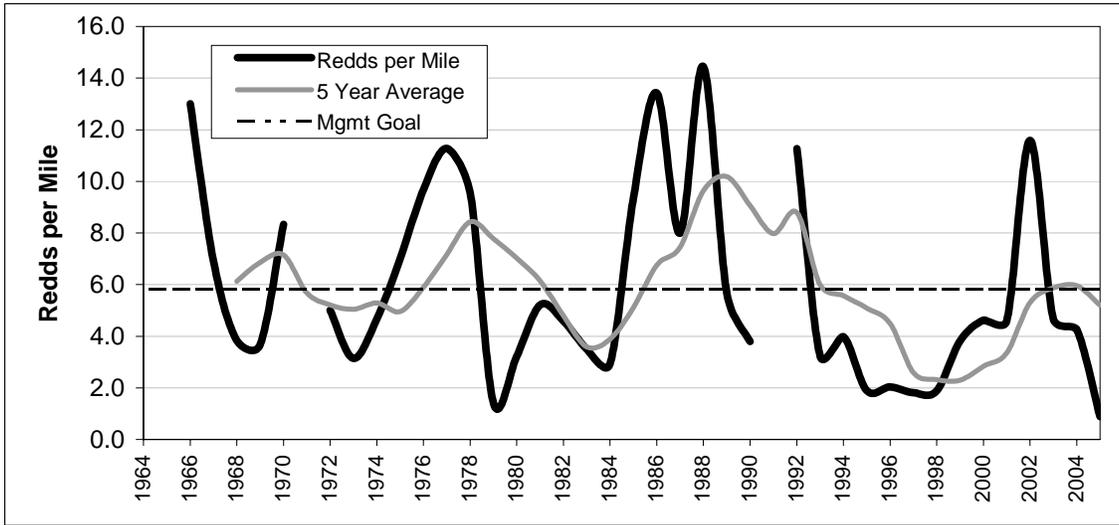
Steelhead trout are the anadromous form of *O. mykiss*. Adult summer steelhead return to freshwater from June through September. Adults overwinter in large rivers while sexually maturing. Adults resume migration to spawning streams in early spring. Spawning takes place from March through May. Eggs incubate during the spring and emergence occurs from April through July depending on water temperatures. Juveniles typically spend two to three years in freshwater. Juvenile steelhead generally utilizes habitats with higher water velocities than juvenile Chinook salmon. In winter, juveniles utilize deep pools with abundant cover. Juveniles may reside in their natal stream for their entire freshwater rearing phase or may migrate to other streams within a watershed. Smoltification occurs during late winter and emigration to the ocean occurs during spring. Summer steelhead adults normally rear for 1 to 2 years in the ocean.

Population Status

M.F. John Day Subbasin

MCR steelhead runs in the John Day River basin are composed entirely of native stocks. However, hatchery fish do stray into the John Day basin from the Columbia River (John Day Subbasin Plan). MCR steelhead is present in eight streams in the Upper Middle Fork watershed. The Middle Fork John Day River subbasin contributes approximately 22% of the total run for the basin (John Day Subbasin Plan). Redds counts have displayed wide variability since 1964. Redds per mile have been below ODFW management objectives (5.8 redds/mile) since 2003 (Figure AW-3).

Figure AW-3. Number of redds per mile for MCR steelhead in the Middle Fork John Day River subbasin, 1964 to 2005.



Crawford Fisheries Analysis Area

ODFW does not conduct redd counts for MCR steelhead in the Fisheries Analysis area. Due to the limited flow in Crawford Creek, the potential for steelhead spawning and rearing is limited in this stream. Some spawning does occur during years when water conditions are favorable. There is no known steelhead spawning in Mill Creek.

Distribution and Habitat

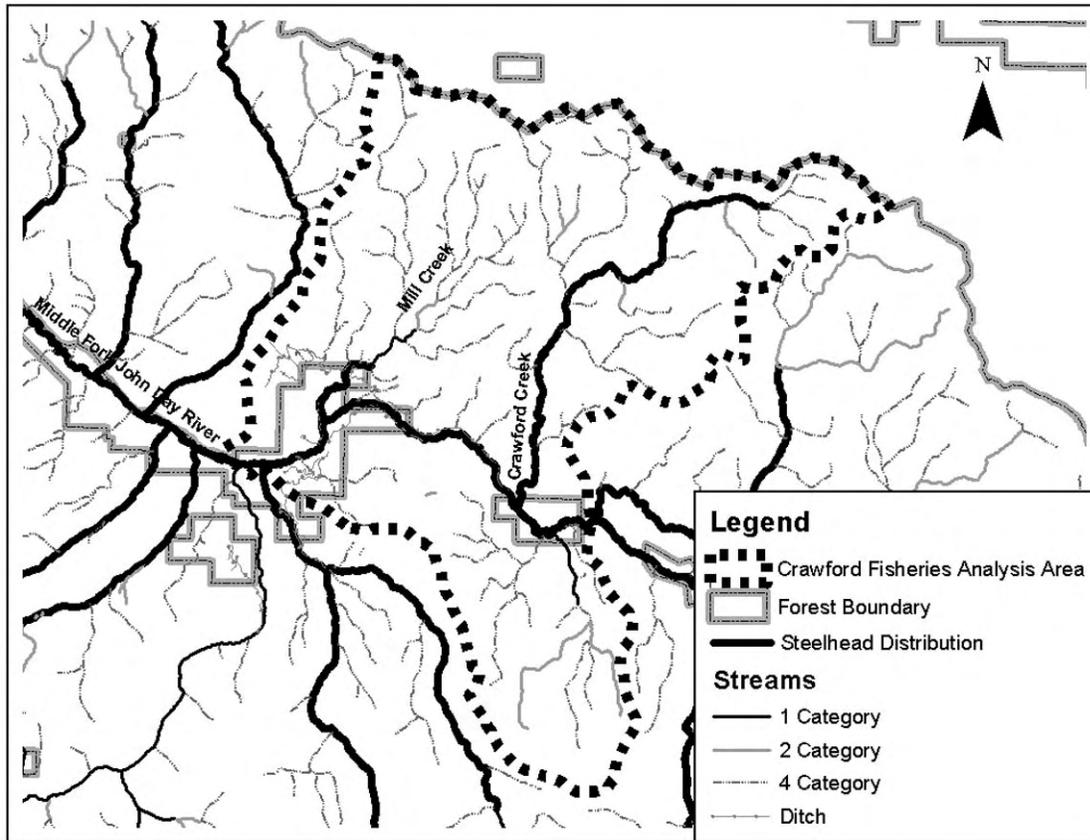
M.F. John Day Subbasin

MCR steelhead is widely distributed in the Middle Fork subbasin. Spawning and rearing takes place in all major tributaries of the Middle Fork.

Crawford Fisheries Analysis Area

There are about 12.3 miles of steelhead habitat in the Fisheries Analysis area (Figure AW-4). MCR steelhead utilize the Middle Fork for migration, (during years when water conditions are favorable), spawning and juvenile rearing habitat (4.7 mi). Spawning and juvenile rearing habitat are present in Crawford Creek (6.3 mi). Rearing habitat is present in Mill Creek (1.3 mi).

Figure AW-4. Distribution of MCR steelhead in the Crawford fisheries analysis area.



Critical Habitat

Critical habitat was designated for the MCR steelhead on February 16, 2000 (65 FR 7764). Critical habitat for MCR steelhead under the 2000 rule encompassed the major Columbia River tributaries known to support the ESU, including the Deschutes, John Day, Klickitat, Umatilla, Walla Walla, and Yakima Rivers, as well as the Columbia River and estuary. Critical habitat consisted of all waterways below long-standing (100 years or more), naturally impassable barriers, including the Middle Fork. The adjacent riparian zone was also considered critical habitat. This zone was defined as the area that provides the following functions: Shade, sediment, nutrient/chemical regulation, streambank stability, and input of large woody debris (LWD)/organic matter. Protective regulations for MCR steelhead were issued under section 4(d) of the ESA on July 10, 2000 (65 FR 42423).

In late 2000, a lawsuit was filed challenging the NOAA Fisheries Service's February 2000 final designation of critical habitat for ESUs of Pacific salmon and steelhead listed under the ESA. A federal court ruled that the agency did not adequately consider the economic impacts of the critical habitat designations. In April 2002, NOAA Fisheries Service withdrew its 2000 critical habitat designations.

Critical habitat for MCR steelhead was redesignated on September 2, 2005 (70 FR 52630). Under the 2005 rule, Mill Creek, Crawford Creek, and the Middle Fork have been designated as critical habitat for MCR steelhead. DCH includes the stream channels within the designated

stream reaches, and includes a lateral extent as defined by the ordinary high-water line (33 CFR 319.11). In areas where ordinary high-water line has not been defined, the lateral extent will be defined by the bankfull elevation. Bankfull elevation is the level at which water begins to leave the channel and move into the floodplain and is reached at a discharge which generally has a recurrence interval of 1 to 2 years on the annual flood series.

The primary constituent elements (PCEs) that are essential for the conservation of listed ESUs on the Malheur Forest are those sites and habitat components that support one or more life stages, including:

- (1) Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development;
- (2) Freshwater rearing sites with:
 - (i) Water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility;
 - (ii) Water quality and forage supporting juvenile development; and
 - (iii) Natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.
- (3) Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival;

Steelhead – Environmental Consequences

Alternative 1

Determination

Mid-Columbia Summer Steelhead (T): May Affect, Likely to Adversely Affect (LAA).

Steelhead Designated Critical Habitat: May Affect, Likely to Adversely Affect (LAA).

Rationale

Habitat for MCR steelhead in the Fisheries Analysis area is currently in a degraded state. High water temperatures, high fine sediment levels, and altered stream channels have reduced the habitat capability of streams in the Fisheries Analysis area to support MCR steelhead. Based on fine sediment levels the likelihood of successful spawning in Crawford Creek is low even during favorable water conditions. Roads cross Crawford Creek nine times in the lower 2.7 miles. Of the nine crossings, seven are culverts located along FSR 2620. Four of the culverts are rated as impassable to all life stages of salmonids. These culverts impede the movement of adult steelhead and redband trout attempting to spawn in Crawford Creek and prevent the movement of juvenile steelhead and redband trout. The lack of road treatments and no culvert removal would allow sediment sources to continue from roads; and there would be accelerated water flows from the undersized culvert on FSR 2620156. This culvert is also a fish barrier, limiting upstream movement of fish and their prey base. These conditions would persist under Alternative 1.

Alternative 2

Determination

Mid-Columbia Summer Steelhead (T): May Affect, Likely to Adversely Affect (LAA) in the short term. Beneficial Effect (BE) in the long term.

Steelhead Designated Critical Habitat: May Affect, Likely to Adversely Affect (LAA) in the short term. Beneficial Effect (BE) in the long term.

Rationale

Habitat for MCR steelhead in the Fisheries Analysis area is currently in a degraded state. High water temperatures, high fine sediment levels, and altered stream channels have reduced the habitat capability of streams in the Fisheries Analysis area to support MCR steelhead. Based on fine sediment levels the likelihood of successful spawning in Crawford Creek is low even during favorable water conditions. These conditions currently persist.

Short-term increases in fine sediment from proposed activities (timber harvest, prescribed burning, and road decommissioning) are unlikely to result in measurable increases in fine sediment in stream channels. Decommissioning activities may result in a short-term increase in fine sediment due to disturbance of road surfaces. However, the increases may add to adverse effects because streams in the Fisheries Analysis area already exceed thresholds for adverse impacts to aquatic habitat and salmonids. Short-term concentrated pulses of fine sediment during the removal of the culvert on Crawford Creek (FSR 2620156) may result in adverse effects to juvenile MCR steelhead.

In the long-term, Alternative 2 would reduce fine sediment levels in the Fisheries Analysis area as a result of the proposed road decommissioning activities. About 17.8 miles of native surface roads would be decommissioned including about 5.8 miles located in RHCAs. One culvert that is a fish barrier on Crawford Creek would be removed when FSR 2620156 is decommissioned. These actions would result in an incremental improvement in habitat conditions for MCR steelhead in the Fisheries Analysis area. However, high water temperatures and altered stream channel conditions will likely persist.

Alternative 3

Determination

Mid-Columbia Summer Steelhead (T): May Affect, Likely to Adversely Affect (LAA) in the short term. Beneficial Effect (BE) in the long term.

Steelhead Designated Critical Habitat: May Affect, Likely to Adversely Affect (LAA) in the short term. Beneficial Effect (BE) in the long term.

Rationale

Same as Alternative 2.

Alternative 4

Determination

Mid-Columbia Summer Steelhead (T): May Affect, Likely to Adversely Affect (LAA) in the short term. Beneficial Effect (BE) in the long term.

Steelhead Designated Critical Habitat: May Affect, Likely to Adversely Affect (LAA) in the short term. Beneficial Effect (BE) in the long term.

Rationale

Same as Alternative 2.

Redband Trout – Affected Environment

Redband trout are a Region 6 sensitive species and a Malheur National Forest management indicator species. Redband trout are the resident form of *O. mykiss*. Redband trout may or may not be reproductively isolated from steelhead. Redband and steelhead trout from the same geographic area may share a common gene pool.

Redband trout are sensitive to changes in water quality and habitat. Adult redband trout are generally associated with pool habitats, although various life stages require a wide array of habitats for rearing, hiding, feeding, and resting. Pool habitat functions as important refugia during low water periods. An increase in sediment lowers spawning success and reduces the quantity and quality of pool and interstitial habitat. Other important habitat features include healthy riparian vegetation, undercut banks and LWD.

Redband trout may reside in their natal stream or may migrate to other streams within a watershed to rear. Habitat requirements are similar for redband trout and juvenile steelhead.

Spawning occurs during the spring, generally from March to June. Redds tend to be located where velocity, depth and bottom configuration induce water flow through the stream substrate, generally in gravels at the tailout area of pools. Water temperatures influence emergence of fry, which is typically from June through July.

Population Status

M.F. John Day Subbasin

Neither ODFW nor the Forest Service routinely monitors abundance and distribution of redband trout in the John Day basin. Juvenile *O. mykiss* with resident (redband trout) and anadromous (steelhead) life history types are difficult to differentiate where the two populations coexist, making independent monitoring difficult. At this time, abundance of John Day trout redband populations is unknown.

Redband trout are present in all fish bearing streams in the analysis area. Relative abundance surveys were completed during the 1993 stream surveys on Mill Creek and Crawford Creek. Few adult redband ($\geq 5''$ in length) were found in either Mill Creek or Crawford Creek (Table AW-15). No juvenile redband trout ($< 5''$ in length) were found in Mill Creek and only two were found in Crawford Creek during the relative abundance surveys. The normal pattern for age

class distribution in salmonid populations is for a decreasing abundance in ages classes. However, this was not the case for Crawford and Mill creeks, which would indicate that little if any reproduction was occurring in these streams. No fish sampling, either population or relative abundance surveys, for redband trout have occurred on the Middle Fork.

Table AW-15. Relative abundance estimates of redband trout for streams in the Crawford Fisheries Analysis Area.

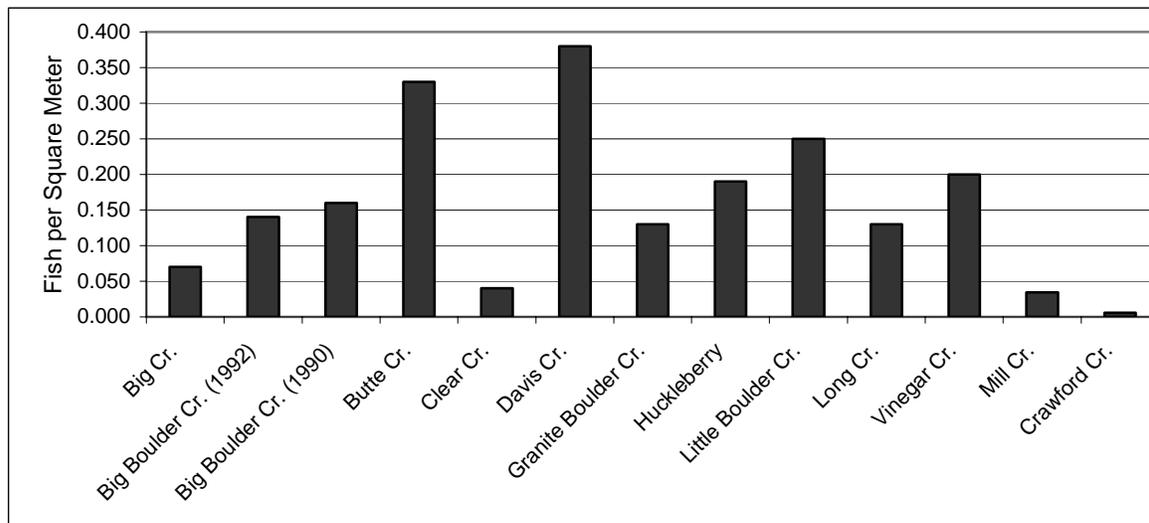
Stream	Number of Adults Observed	Number of Juveniles Observed	Density (#/m ²) (All age classes)	Source/Year
M.F. John Day River	---	---	---	---
Mill Creek	10	0	0.034	USFS, 1993
Crawford Creek	6	2	0.008	USFS, 1993

1) No population estimate

In contrast to the relative abundance estimates for Mill and Crawford creeks, ODFW estimated the mean relative abundance for redband trout in the Middle Fork subbasin on streams with better habitat was 0.184 fish per square meter (Figure AW-5).

Figure AW-5. Comparison of relative abundance (#/m²) of redband trout (redband and juvenile steelhead) in Mill Creek and Crawford Creek to other streams in the Middle Fork John Day subbasin.

Mean density for redband trout in comparison streams is 0.184 fish per m². Streams were sampled from 1990 to 1993. Data for Mill Creek and Crawford Creek from USFS surveys. Data for other streams from ODFW surveys.



Distribution and Habitat

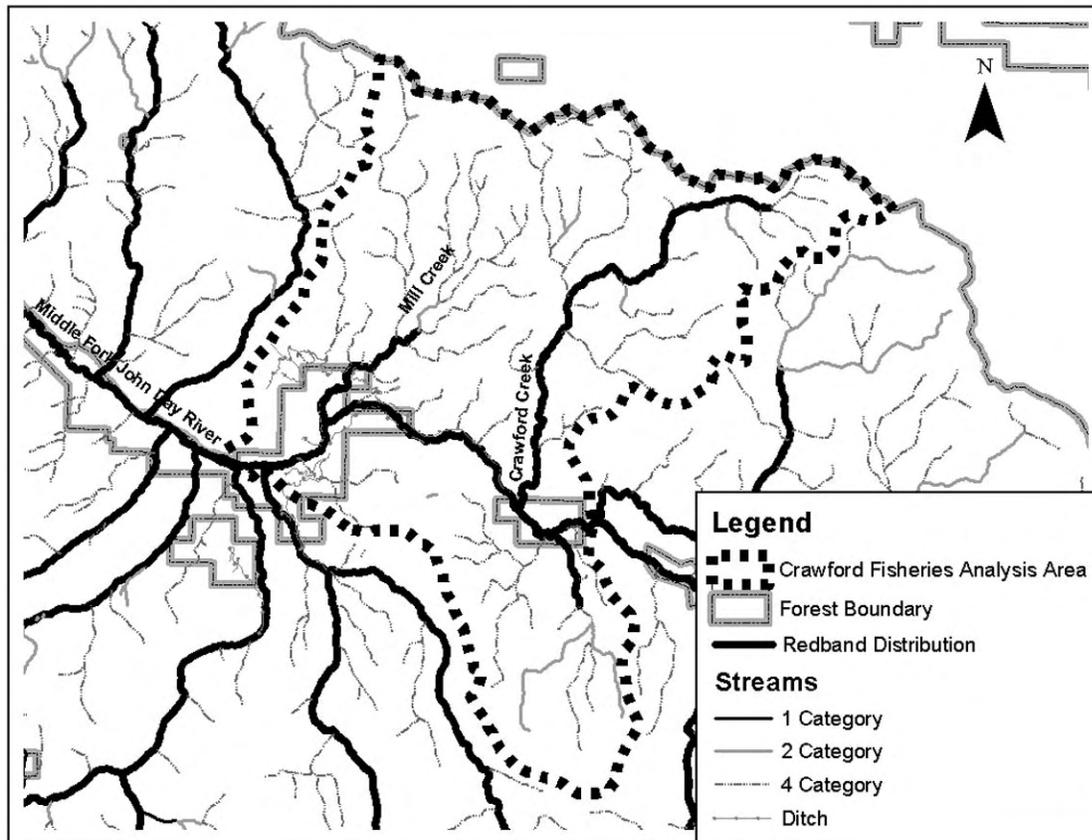
M.F. John Day Subbasin

Currently in the John Day basin, redband trout are present in the North Fork, Middle Fork, Main stem, and South Fork John Day rivers and their tributaries. Redband trout are present in all fish-bearing streams in the Middle Fork John Day subbasin. Summer distribution of redband trout is generally limited to headwater areas.

Crawford Fisheries Analysis Area

There are about 13.1 miles of redband trout habitat in the Fisheries Analysis area (Figure AW-6). Spawning and rearing habitat is present in Mill Creek (2.1 mi) and Crawford Creek (6.3 mi). Spawning, rearing and migration habitat is present in the Middle Fork (4.7 mi).

Figure AW-6. Distribution of redband trout in the Crawford fisheries analysis area.



Red Band Trout – Environmental Consequences

Alternative 1 – No Action

Determination

Interior Redband Trout (S): Risk of May Impact Individuals or Habitat, but will not likely contribute toward federal listing or loss of viability to the population or species (MIIH).

Rationale

Habitat for redband trout in the Fisheries Analysis area is currently in a degraded state. High water temperatures, high fine sediment levels, and altered stream channels have reduced the habitat capability of streams in the Fisheries Analysis area to support redband trout. Based on fine sediment levels the likelihood of successful spawning in Mill Creek and Crawford Creek is low. This is born out by the low numbers of redband trout present in these streams in 1993. These conditions persist. The lack of road treatments and no culvert removal would allow sediment sources to continue from roads; and there would be accelerated water flows from the undersized culvert on FSR 2620156. This culvert is also a fish barrier, limiting upstream

movement of fish and their prey base. Alternative 1 would maintain the current degraded habitat conditions for redband trout.

Alternative 2

Determination

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 (MIIH) in the short term. Beneficial Impact (BI) in the long term.

Rationale

Habitat for redband trout in the Fisheries Analysis area is currently in a degraded state. High water temperatures, high fine sediment levels, and altered stream channels have reduced the habitat capability of streams in the Fisheries Analysis area to support redband trout. Based on fine sediment levels the likelihood of successful spawning in Mill Creek and Crawford Creek is low. This is born out by the low number of redband present in these streams in 1993. These conditions persist.

Short-term increases in fine sediment from proposed activities (timber harvest, prescribed burning, and road decommissioning) are unlikely to result in measurable increases in fine sediment in stream channels. Decommissioning activities may result in a short-term increase in fine sediment due to disturbance of road surfaces. However, the increases may add to adverse effects because streams in the Fisheries Analysis area already exceed thresholds for adverse impacts to aquatic habitat and salmonids. Short-term concentrated pulses of fine sediment during the removal of the culvert on Crawford Creek (FSR 2620156) may result in adverse effects to juvenile redband trout.

In the long-term, Alternative 2 would reduce fine sediment levels in the Fisheries Analysis area as a result of the proposed road decommissioning activities. About 17.8 miles of native surface roads would be decommissioned including about 5.8 miles located in RHCAs. One culvert that is a fish barrier on Crawford Creek would be removed when FSR 2620156 is decommissioned. These actions would result in an incremental improvement in habitat conditions for redband trout in the Fisheries Analysis area. However, high water temperatures and altered stream channel conditions will likely persist.

Alternative 3

Determination

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 (MIIH) in the short term. Beneficial Impact (BI) in the long term.

Rationale

Same as Alternative 2

Alternative 4

Determination

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 (MIIH) in the short term. Beneficial Impact (BI) in the long term.

Rationale

Same as Alternative 2

Spring Chinook Salmon – Affected Environment

Spring Chinook salmon are a Region 6 sensitive species. Essential Fish Habitat (EFH) for spring Chinook salmon has been designated by NMFS in the Fisheries Analysis area. Salmon are sensitive to changes in water quality and habitat. Juvenile Chinook salmon are generally associated with pool habitats. An increase in sediment lowers spawning success and reduces the quantity and quality of pool and interstitial habitat. Other important habitat features include healthy riparian vegetation, undercut banks and LWD.

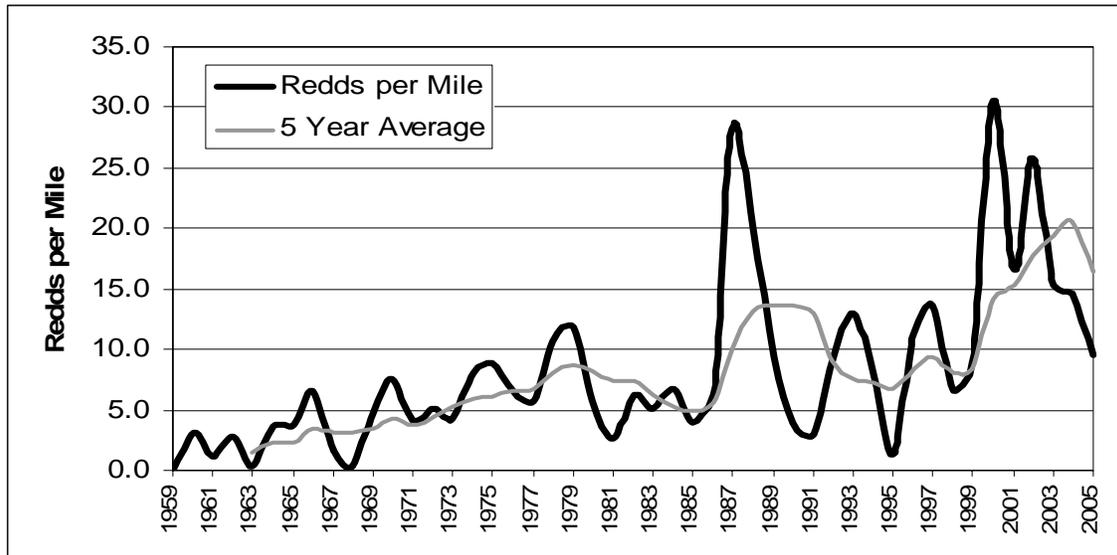
Adult spring Chinook salmon return to the Middle Fork during the spring. Adults hold in deep pools during the summer while sexually maturing. Spawning occurs during fall, generally from August through September. Embryos incubate over the winter and emergence occurs the following spring. Juveniles generally rear for one year in freshwater. Juveniles use habitats with slower water velocities (pools, glides, and side channels). Juveniles overwinter in deep pools with abundant cover. Smoltification and emigration to the ocean occurs in the spring of their second year. The ocean rearing phase lasts from one to three years.

Population Status

M.F. John Day Subbasin

Spring Chinook salmon runs in the John Day River basin are composed entirely of native stocks. Spring Chinook salmon are present in three streams in the Upper Middle Fork watershed. The Middle Fork subbasin has historically contributed approximately 12% of the total run for the basin (USFWS and NMFS 1981). The population has been generally increasing since 1959 but has been declining since 2002 (Figure AW-7). However, due to the low population size (< 500) and current habitat conditions, the Middle Fork population would be at risk during any future periods of adverse environmental conditions (John Day Subbasin Plan).

Figure AW-7. Number of spring Chinook salmon redds per mile in the Middle Fork John Day subbasin, 1959 to 2005.



Crawford Fisheries Analysis Area

Separate estimates of abundance of Chinook salmon are not available for the Fisheries Analysis area.

Distribution and Habitat

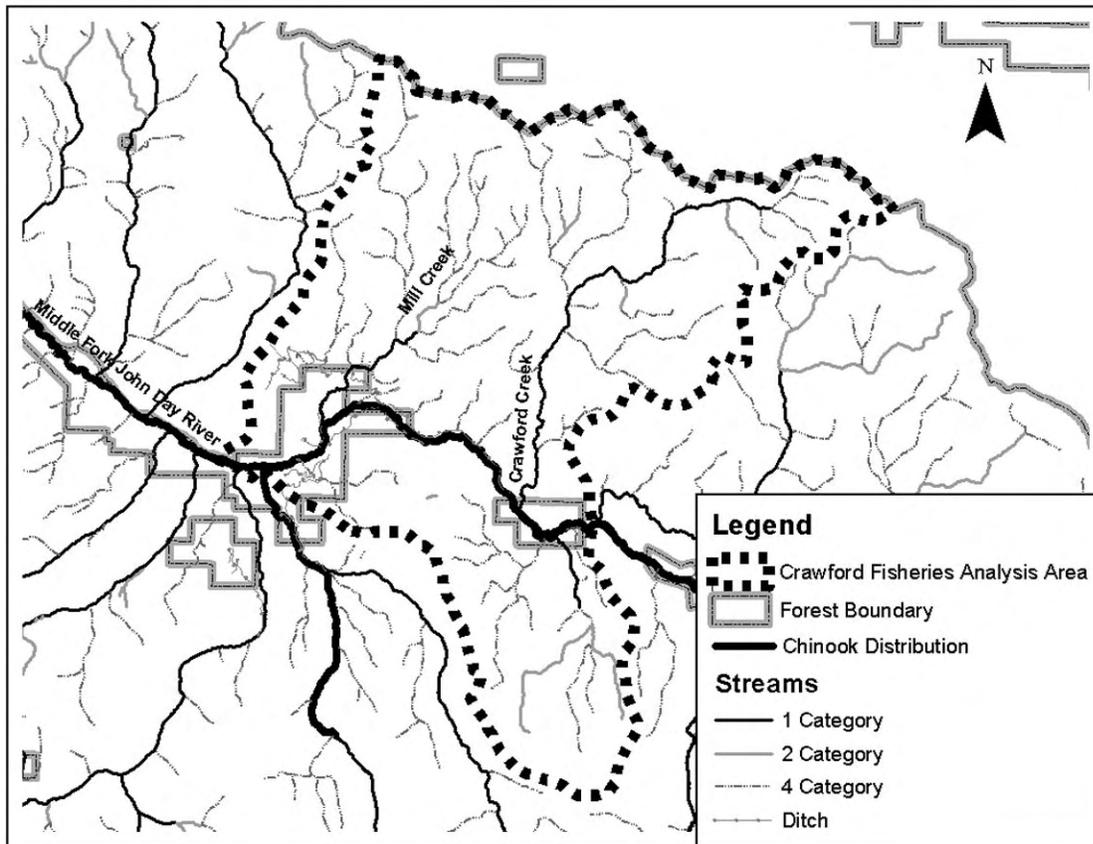
M.F. John Day Subbasin

Spawning habitat for the Middle Fork spring Chinook is present in the Big Creek, Camp Creek, and Upper MF JDR watersheds. Main spawning areas are located along the Middle Fork with minor amounts of spawning occurring in Clear Creek. Juvenile rearing primarily occurs in Squaw Creek, Clear Creek, Granite Boulder Creek, Camp Creek, and the Middle Fork downstream to the confluence with the N.F. John Day River.

Crawford Fisheries Analysis Area

There are about 4.7 miles of spring Chinook spawning and rearing habitat within the Middle Fork (4.7 mi) Fisheries Analysis area (Figure AW-8). Juveniles may also utilize the lower portions of Mill Creek and Crawford Creek for winter rearing habitat.

Figure AW-8. Distribution of spring Chinook salmon in the Crawford fisheries analysis area.



Essential Fish Habitat (EFH)

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires the inclusion of EFH descriptions in Federal fishery management plans. In addition, the MSA requires Federal agencies to consult with NMFS on activities that may adversely affect EFH. EFH determinations and rationale are included in this section by alternative.

Congress defined EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The EFH guidelines further interpret the EFH definition as:

1. Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate
2. substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities
3. necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem
4. and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle.

Spring Chinook Salmon – Environmental Effects

Alternative 1

Determination

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 (MIIH).

Rationale

Habitat for Chinook salmon in the Fisheries Analysis area is currently in a degraded state. High water temperatures, high fine sediment levels, and altered stream channels have reduced the habitat capability of the Middle Fork in the Fisheries Analysis area to support Chinook salmon. Fine sediment levels in the upper reaches of the Middle Fork below Phipps Meadow (Reaches 15 and 16) are reducing the likelihood of successful spawning of Chinook salmon. Reductions in pool habitat in the Middle Fork has reduced migration and holding habitat for adult Chinook salmon. The lack of road treatments and no culvert removal would allow sediment sources to continue from roads; and there would be accelerated water flows from the undersized culvert on FSR 2620156. This culvert is also a fish barrier, limiting upstream movement of fish and their prey base. Alternative 1 would maintain the current degraded habitat conditions for Chinook salmon.

Despite the degraded habitat conditions in the Crawford Fisheries Analysis area, Chinook population levels in the Middle Fork subbasin appear to be stable though high variability makes it difficult to determine the long-term viability of the population. This uncertainty is evident in the fact that NMFS chose not to list the population as threatened as part of the Mid-Columbia ESU in 1998 (63 FR 11482) while ODFW is concerned that the population would at risk during future periods of adverse environmental conditions (John Day Subbasin Plan).

Alternative 1

EFH Determination

Chinook Salmon Essential Fish Habitat: May Affect, Unlikely to Adversely Affect (UAA).

Rationale

EFH for Chinook salmon in the Fisheries Analysis area is currently in a degraded state. High water temperatures, high fine sediment levels, and altered stream channels have reduced the habitat capability of the Middle Fork in the Fisheries Analysis area to support Chinook salmon. The lack of road treatments and no culvert removal would allow sediment sources to continue from roads; and there would be accelerated water flows from the undersized culvert on FSR 2620156. This culvert is also a fish barrier, limiting upstream movement of fish and their prey base. These conditions would persist under Alternative 1.

Alternative 2

Determination

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 (MIIH) in the short term. Beneficial Impact (BI) in the long term.

Rationale

Habitat for Chinook salmon in the Fisheries Analysis area is currently in a degraded state. High water temperatures, high fine sediment levels, and altered stream channels have reduced the habitat capability of the Middle Fork in the Fisheries Analysis area to support Chinook salmon. Fine sediment levels in the upper reaches of the Middle Fork below Phipps Meadow (Reaches 15 and 16) are reducing the likelihood of successful spawning of Chinook salmon. Reductions in pool habitat in the Middle Fork has reduced migration and holding habitat for adult Chinook salmon.

Timber harvest and prescribed burning activities proposed under Alternative 2 would result in short-term increases in fine sediment. These increases will likely not be measurable but may add to adverse impacts already occurring due to current levels of fine sediment in the Fisheries Analysis area.

Proposed road decommissioning activities will also result in short-term increases in fine sediment. However, fine sediment levels in the Analysis area will decline in the long-term due to the reduction in native surface roads located in RHCAs; about 34%. This will likely result in a both a measurable and meaningful reduction in fine sediment in the future thus improving rearing and spawning habitat for Chinook salmon.

Alternative 2

EFH Determination

Chinook Salmon Essential Fish Habitat: May Affect, Unlikely to Adversely Affect (UAA).

Rationale

Timber harvest and prescribed burning activities proposed under Alternative 2 will result in short-term increases in fine sediment. These increases are unlikely to be measurable but will add to already high levels of fine sediment in EFH for Chinook salmon in the Fisheries Analysis area.

Proposed road decommissioning activities will also result in short-term increases in fine sediment. However, fine sediment levels in the Analysis area will decline in the long-term due to the reduction in native surface roads located in RHCAs; about 34%. This will likely result in a both a measurable and meaningful reduction in fine sediment in the future thus improving rearing and spawning EFH for Chinook salmon.

Alternative 3

Determination

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 (MIIH) in the short term. Beneficial Impact (BI) in the long term.

Rationale

Same as Alternative 2.

Alternative 3

EFH Determination

Chinook Salmon Essential Fish Habitat: May Affect, Unlikely to Adversely Affect (UAA).

Rationale

Same as Alternative 2.

Alternative 4

Determination

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 (MIIH) in the short term.

Beneficial Impact (BI) in the long term.

Rationale

Habitat for Chinook salmon in the Fisheries Analysis area is currently in a degraded state. High water temperatures, high fine sediment levels, and altered stream channels have reduced the habitat capability of the Middle Fork in the Fisheries Analysis area to support Chinook salmon. Fine sediment levels in the upper reaches of the Middle Fork below Phipps Meadow (Reaches 15 and 16) are reducing the likelihood of successful spawning of Chinook salmon. Reductions in pool habitat in the Middle Fork has reduced migration and holding habitat for adult Chinook salmon.

Prescribed burning activities proposed under Alternative 4 would result in short-term increases in fine sediment. These increases will likely not be measurable but will be less compared to Alternative 2 because of the elimination of timber harvest and related activities. Increase would likely add to adverse impacts already occurring due to current levels of fine sediment in the Fisheries Analysis area.

Proposed road decommissioning activities will also result in short-term increases in fine sediment. However, fine sediment levels in the Fisheries Analysis area will decline in the long-term due to the reduction in native surface roads located in RHCAs; about 34%. This will likely result in a both a measurable and meaningful reduction in fine sediment in the future thus improving rearing and spawning habitat for Chinook salmon.

Alternative 4

EFH Determination

Chinook Salmon Essential Fish Habitat: May Affect, Unlikely to Adversely Affect (UAA).

Rationale

Prescribed burning activities proposed under Alternative 4 will result in short-term increases in fine sediment. These increases are unlikely to be measurable but will add to already high levels of fine sediment in EFH for Chinook salmon in the Fisheries Analysis area.

Proposed road decommissioning activities will also result in short-term increases in fine sediment. However, fine sediment levels in the Fisheries Analysis area will decline in the long-term due to the reduction in native surface roads located in RHCAs; about 34%. This will likely

result in a both a measurable and meaningful reduction in fine sediment in the future thus improving rearing and spawning EFH for Chinook salmon.

Columbia Spotted Frog – Affected Environment

Spotted frogs are highly aquatic and are rarely found far from permanent water. They are usually found along the grassy margins of low gradient streams, lakes, ponds, springs, and marshes. Spotted frogs are normally found along low gradient reaches of streams.

During winter, spotted frogs burrow into banks adjacent to streams, ponds, and springs. Breeding occurs in the spring varying with elevation. In the Columbia basin of Washington, breeding occurs from March to April in lower elevations, and from May to June in the higher elevations. Breeding habitat is usually found 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.

Population Status

Condition and Trend of Population

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.

USFWS lists livestock grazing and introduction of nonnative fish (salmonids and bass) as threats to the Great Basin population of Columbia spotted frogs (66 FR 1295).

The spotted frog is considered present in all subbasins on the Malheur National Forest. It is assumed this species is widely distributed in the Middle Fork Subbasin. Limited habitat surveys have been conducted specifically for spotted frogs; however, habitat probably exists along low gradient perennial streams. Fish surveys records incidental sightings of frogs but most do not differentiate species. During 1996 fish surveys, spotted frogs were reported in the Davis/Placer subwatershed; along Davis and Placer Creeks.

Spotted frogs have also been documented in the Middle Fork, Crawford Creek, and Squaw Creek. In 2003 and 2004, Forest Service personnel conducted spotted frog surveys and spotted frogs were found near the mouth of Camp Creek, in the Middle Fork near Camp Creek, and Crawford Creek. Egg masses of spotted frogs were also found in a pond adjacent to Bridge Creek and Highway 26 near Austin Junction.

Habitat in the Analysis Area

Spotted frogs have been documented in the Middle Fork and Crawford Creek in the Fisheries Analysis area.

Columbia Spotted Frog - Environmental Consequences

Alternative 1 – No Action

Determination

Columbia Spotted Frog (S): No Impact (NI).

Rationale

Alternative would maintain current habitat conditions for spotted frogs. Riparian habitat appears to be improving for spotted frogs based on the upward trend of riparian areas documented during range allotment monitoring in 2004.

Alternatives 2, 3, and 4

Determination

Columbia Spotted Frog (S): May Impact Individuals or Habitat, but will not likely contribute toward federal listing or loss of viability to the population or species (MIIH) in the short term. Beneficial Impact (BI) in the long term.

Rationale

Spotted frog habitat in riparian areas will be protected by limiting proposed timber harvest activities to areas outside of RHCAs (alternatives 2 and 3). The Malheur NF requires a 100 ft buffer around springs (Forest Plan Standard 56). Spotted frogs utilize springs for winter habitat. Forest Plan Standard 56 protects springs from disturbance from logging activities in upland areas.

Proposed burning activities may result in impacts to adult frogs that are dispersed through the project area and frog habitat in riparian areas. Vegetative cover in riparian areas will be decreased in the short-term where shrubs and tall herbaceous vegetation is consumed during burning activities in RHCAs.

Decommissioning road segments in RHCAs will pose short-term risks to adult frogs yet will result in improved riparian areas in the long-term and should result in improvement of habitat for spotted frogs.

Cumulative Effects Common to all Aquatic Species by Alternative

All of the activities in Appendix D, Cumulative Effects (past activities, past wildfires, present activities and foreseeable activities) and the current project proposal have been considered for their cumulative effects on aquatic habitat and associated aquatic species. The following discussion focuses on the past, ongoing and foreseeable future activities that may contribute positive or negative effects. The effects determination and rationale by species and alternative are discussed in the previous section and summarized in Table AW-14.

Effects Common to all Alternatives

During the past 100 years livestock grazing, weed infestations, timber harvesting activities, stream dewatering, firewood cutting, fire suppression, road construction, road density, lack of road maintenance, and general road use on public and private lands have contributed to landscape changes in overland flows, channel development and riparian and fish habitat within the drainage associated with this project. These past management activities continue to have negative affects on water quality, and aquatic habitat in the project area and downstream of the project area. However, during the past 30 years successful efforts have been made to limit resource degradation by conducting restoration projects that have stabilized and improved water quality and aquatic habitat.

Stream reaches on the Middle Fork John Day River, downstream of the project area have improved dramatically due to riparian fencing on Nature Conservancy, Confederated Tribes of Warm Springs and private lands that have restricted riparian livestock use. Additionally recent grazing management on riparian areas within the project area has allowed stream reaches to improve and develop an upward trend. Although, this process may require decades to restore natural drainage systems to meet INFISH/FOREST RMOs, including pool frequency, water temperature, large woody debris, bank stability, lower bank angle, and width depth ratios, these objectives will be met first in these fenced and restored areas.

Potential effects from the alternatives would be cumulative with effects from non-federal activities within the project area and all activities outside the project area on federal, state and private lands but within the Middle Fork John Day River drainage. Aside from this project, other non restoration (aquatic) activities that may contribute to cumulative effects include; timber harvest activities, wildfires, livestock grazing, road use, flood irrigation/water diversion, and vegetation alteration. These activities occur on an annual basis with the exception of timber harvest and wildfire and are known contributors of stream dewatering and sediment input affecting water quality and aquatic species.

This cumulative component and future recovery of riparian areas within the project area depends on the level of livestock use and achievement of grazing standards within the RHCAs. The outcome would influence some of the positive benefits for fisheries from this project. This analysis will assume that Forest Service grazing standards would be achieved or exceeded in the future. Under these conditions riparian vegetation would stabilize stream banks in about 3-5 years, and produce stream shade in 5-10 years. Narrowing of stream channels requires the longest recovery period, between 10 to 50 years. Where current grazing standards are being met there is little likelihood of affects to aquatic habitat and hence cumulative effects since these standards are designed to allow a near natural rate of recovery of aquatic habitat and riparian vegetation. The current grazing standards are designed to eliminate any effects on aquatic habitats that could carry over to the following year.

The combined negative effects from a possible stand replacement fire, weed infestations, road use and recreational use could result in shade reductions and increased sediment that could temporarily alter fisheries habitat. The magnitude and timing of these potential impacts are unpredictable, but they would have short term (1-3 years) negative effects on fisheries habitat in this watershed.

The effects of other foreseeable activities described in Appendix D on aquatic species are negligible with the exception of irrigation withdrawals which is a stream temperature concern. The effects of use and maintenance of roads which are not decommissioned would remain the same as at present. The effects of culvert replacements will start to decrease when work finishes in 2006, and will be negligible by 2010.

All alternatives would permit a natural slow, partial recovery from effects of past grazing, past riparian road construction, and past riparian harvest. This recovery would occur as riparian trees grow larger, as large wood falls into the streams, as channel types change to more stable, narrow configurations, as sediment from past actions is washed out, and as riparian shrubs and herbs recover and contribute to more stable stream banks. Recovery would be only partial because some ongoing impacts from some existing roads would not permit full recovery. Under Alternative 1, recovery of aquatic habitat and water quality would be slightly slower, and not progress quite as far as under alternatives 2, 3, and 4, because of the effects of the roads which would not be decommissioned in RHCAs.

If a severe crown fire occurs (See Fire and Fuels section of Chapter 3) shade would be reduced, and water temperatures would increase. Sediment would increase from channel and upland sources. A pulse of woody debris would fall into the streams. Both low flows and peak flows would increase for perhaps 10 years, until evapotranspiration recovers. .

Alternative 1 – No Action

Under the No Action Alternative, there would be no management activities associated with the timber harvest in the project area; therefore, there would be no direct effects to aquatic species. However there would be cumulative effects as described below. Roads would not be treated in this alternative, which would allow about 17.8 miles of roads to continue acting as potential sediment sources, affecting aquatic species habitat within the project area and downstream reaches. The lack of road treatments and no culvert removal would allow sediment sources to continue from roads; and there would be accelerated water flows from the undersized culvert on FSR 2620156. This culvert is also a fish barrier, limiting upstream movement of fish and their prey base.

The hazard of a severe crown fire is higher, as described in the Fire and Fuels section of Chapter 3. Most of the forested stands in the project area are identified as moderate to high risk for stocking induced mortality and related infestation of pests or disease. Without silvicultural treatment and/or the controlled re-introduction of fire into the project area, current stand conditions would worsen and increase the chance of a stand replacement fire. A stand replacement wildfire would result in the loss of shading along stream channels, loss of instream wood structures, and short-term (3-5 years) loss of streamside vegetation. This could adversely affect fish habitat. In addition, localized extirpation of these fish could occur as the result of severe wildfires (Rinne 1996).

The recovery of aquatic habitat and water quality would be slightly slower, and not progress quite as far as under alternatives 2, 3, and 4, because of the effects of the roads which would not be decommissioned in RHCAs.

Alternatives 2, 3, and 4

Alternatives 2, 3, and 4 would reduce and eliminate some of the road related impacts to aquatic habitat. About 5.8 miles of native surface roads would be decommissioned in RHCAs. This would leave about 11 miles of native surface roads in RHCAs in the analysis area; a reduction of 34%. Of the sixteen roads identified in the Crawford Roads Analysis (2001) as impacting aquatic habitat, eight would be decommissioned under Alternatives 2, 3, and 4. Parts of 4 roads consisting of 1.7 miles, located outside the RHCAs would be reopened due to ineffective closures and the creation and persistent use of unofficial side roads by the public. These roads were originally closed under previous projects. Some of these unofficial roads serve as detours through RHCAs around the closed roads. Reopening segments of the closed roads and restoration of the unofficial roads would eliminate impacts to the RHCA and aquatic habitat.

Activities proposed under Alternative 2 (timber harvest, burning, road decommissioning), Alternative 3 (reduced timber harvest, burning, road decommissioning), and Alternative 4 (burning, road decommissioning) may result in short-term cumulative effects. The proposed activities will likely result in short-term increases in fine sediment. However, the increases are unlikely to result in a measurable change in fine sediment levels in streams in the analysis area. The increases may add to adverse effects because streams in the analysis area already exceed thresholds for adverse impacts to aquatic habitat and salmonids.

The proposed road decommissioning activities will lead to a long-term reduction in fine sediment levels and therefore will have beneficial impacts to aquatic habitat and fish. Removal of a culvert on Crawford Creek when FSR 2620156 is decommissioned will reduce the number of culverts that are fish passage barriers from four to three.

Under Alternative 2, 3, and 4 the hazard of a severe crown fire is lower than under Alternative 1, as described in the Fire and Fuels section of Chapter 3.

Since impacts to aquatic habitat from the proposed vegetation and burning activities are limited to negligible increases in fine sediment it is unlikely that these increase would result in cumulative effects from range management activities. Road decommissioning activities proposed under Alternatives 2, 3, and 4 may result in short-term increases in fine sediment. However, the level of these cumulative effects with grazing management activities is not likely to reach a point where measurable adverse affects will occur where grazing standards are met.

Alternative 4

Timber harvesting would not occur under Alternative 4. This would eliminate the need for construction of landings, temporary roads and felling of danger trees. It would also eliminate the need for haul activities including water withdrawals for dust abatement. About 807 acres would be precommercially thinned resulting in grapple piles on 655 acres and hand piles on 146 acres. Alternative 4 would still result in short term ground disturbing negative effects but at a smaller scale and magnitude compared to alternatives 3 and 4. The hazard of a severe crown fire is lower than under Alternative 1, but higher then alternatives 2 and 3 where different amounts and types of vegetation treatment would occur, as described in the Fire and Fuels section of Chapter 3.

Short-term increases in fine sediment from proposed activities (prescribed burning, and road decommissioning) are unlikely to result in measurable increases in fine sediment in stream channels. Decommissioning activities may result in a short-term increase in fine sediment due to disturbance of road surfaces. However, the increases may add to adverse effects because streams in the Fisheries Analysis area already exceed thresholds for adverse impacts to aquatic habitat and salmonids. Short-term concentrated pulses of fine sediment during the removal of the culvert on Crawford Creek will likely result in adverse effects to juvenile MCR steelhead. No temporary roads, reconstructed or road maintenance activities would occur in alternative 4, reducing the chance of sediment input to streams.

In the long-term, Alternative 4 would reduce fine sediment levels in the Fisheries Analysis area as a result of the proposed road decommissioning activities. About 17.8 miles of native surface roads would be decommissioned including about 5.8 miles located in RHCAs. One culvert that is a fish barrier on Crawford Creek would be removed when FSR 2620156 is decommissioned. These actions would result in an incremental improvement in habitat conditions for MCR steelhead in the Fisheries Analysis area. However, high water temperatures and altered stream channel conditions will likely persist until riparian shade producing vegetation recovers.

Consistency with Direction and Regulations

Malheur Forest Plan

Alternative 1 - No Action

Alternative 1 would not be consistent with: MA 3B standards, and PACFISH standards and guidelines. Alternative 1 is not consistent with the following Forest Plan Standards:

- MA 3B Standard 41: "...Minimize the density of opens roads in this management area by obliterating, revegetating, or closing unnecessary roads or any roads causing significant resource damage."
- PACFISH Standard RF-3c: Determine the influence of each road on RMOs. Meet RMOs and avoid adverse effects on inland native fish by:
 - Closing and stabilizing or obliterating, and stabilizing roads not needed for future management activities. Prioritize these actions based on the current and potential damage to anadromous native fish in priority watersheds, and the ecological value of the riparian resources affected.
 -

Roads that are having known adverse impacts to aquatic resources would remain in their current condition under Alternative 1 (see Crawford Roads Analysis).

Alternatives 2 and 3

Alternatives 2 and 3 are consistent with MA 3B standards, Amendment 29, and the PACFISH amendment.

- MA 3B Standard 41: Roads that are causing resource damage to aquatic habitats are proposed for closing or decommissioning. However, FSR 2620, which has had an adverse impact to Crawford Creek, will be left open.
- PACFISH RF-2b: Proposed temporary roads and landings are located outside of RHCAs.

- PACFISH RF-3a & b: Roads that will be used for proposed vegetation management activities will have drainage problems repaired and will be brought up to standards prior to haul.
- PACFISH RF-3c: Roads not need for future management activities and old skid trails that have been identified as sources of fine sediment will be closed, decommissioned, or obliterated.
- PACFISH RA-2: Hazard trees felled in RHCAs will be left on site where woody debris objectives are not being met.
- Forest Plan DFCs/RMOs: Activities proposed under Alternatives 2 and 3 would not retard the attainment of Forest Plan RMOs for aquatic habitat (LWD, replacement LWD, pool frequency, bank stability, width-to-depth ratio, sediment/substrate, shading, and water temperature). Alternatives 2 and 3 may result in short-term increases in fine sediment in Crawford Creek and Mill Creek due to road decommissioning activities. However, design measures will be used to minimize the amount of fine sediment resulting from these activities. These activities will result in long-term decreases in fine sediment in these streams, which should result in the attainment of the DFC/RMO for fine sediment.

Alternative 4

Alternative 4 is consistent with MA 3B standards, Amendment 29, and the PACFISH amendment.

- MA 3B Standard 41: Roads that are causing resource damage to aquatic habitats are proposed for closing or decommissioning. However, FSR 2620, which has had an adverse impact to Crawford Creek, will be left open.
- PACFISH RF-3c: Roads not need for future management activities and old skid trails that have been identified as sources of fine sediment will be closed, decommissioned, or obliterated.
- Forest Plan DFCs/RMOs: Activities proposed under Alternative 4 would not retard the attainment of Forest Plan RMOs for aquatic habitat (LWD, replacement LWD, pool frequency, bank stability, width-to-depth ratio, sediment/substrate, shading, and water temperature). Alternative 4 may result in short-term increases in fine sediment in Crawford Creek and Mill Creek due to road decommissioning activities. However, design measures will be used to minimize the amount of fine sediment resulting from these activities. These activities will result in long-term decreases in fine sediment in these streams, which should result in the attainment of the DFC/RMO for fine sediment.

Clean Water Act

All Alternatives comply with the Clean Water Act and the Forest Plan, because none raise water temperatures, and because all follow Best Management Practices (BMPs) as specified in "Forest Service R6 General Water Quality Best Management Practices" (1988), and in standards and guidelines in the Forest Plan. These BMPs are listed in the "Design Measures" section of Chapter 2.

Endangered Species Act

Alternatives 2, 3, and 4 are consistent with the Endangered Species Act. Consultation has been initiated with U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service.

Magnuson-Stevens Act

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires the inclusion of EFH descriptions in Federal fishery management plans. In addition, the MSA requires Federal agencies to consult with NMFS on activities that may adversely affect EFH.

NMFS concluded that the proposed action for the 2002 Crawford Timber Sale EA may adversely affect the EFH for Chinook salmon. Pursuant to Section 305(b)(4)(A) of the Magnuson-Stevens Act, NMFS was required to provide EFH conservation recommendations to the Malheur N.F. In addition to conservation measures proposed for the project by the Malheur N.F., all of the Reasonable and Prudent Measures and the Terms and Conditions contained in Section 2.4 of the ESA portion of the 2002 Opinion were applicable to salmon EFH. Therefore, NMFS incorporated each of those measures as EFH conservation recommendations. Note: NMFS had no additional conservation recommendations regarding the action addressed in 2002 Biological Opinion.

Recreational Fisheries

Alternative 1 – No Action

Alternative 1 would maintain the current degraded aquatic habitat conditions. The current aquatic habitat conditions are resulting in reduced recreational fishing opportunities.

Alternatives 2, 3, and 4

Alternatives 2, 3, and 4 include decommissioning and reopening roads. About 34% of native surface roads in RHCAs will be decommissioned. This aquatic conservation and restoration action will improve quantity, function, sustainable productivity, and distribution of recreational fisheries by reducing impacts from elevated levels of fine sediment as directed under Executive Order 12962, Recreational Fisheries.

Irreversible/Irretrievable Commitments of Resources

Irreversible effects are not expected. Reduced population viability for MCR steelhead, bull trout, redband trout, spring Chinook salmon, and Columbia spotted frog is not expected. PACFISH established explicit goals and objectives for anadromous fish habitat condition and function. By following PACFISH standards and guidelines as well as design criteria specific to this project, it is believed that irretrievable commitment of this resource can be avoided. The goal is to achieve a high level of habitat diversity and complexity through a combination of habitat features.

Terrestrial Wildlife

Introduction

This section describes the terrestrial wildlife species found in the project area and the effects of the alternatives on these species. Rather than addressing all wildlife species, discussions focus on Forest Plan management indicator species (MIS), threatened, endangered and sensitive (TES) species, Forest Plan featured species, and landbirds (see individual species lists below). TES species effects are analyzed in more detail in the Crawford Biological Evaluation located in the Project Record.

The existing condition is described for each species, group of species, or habitat. Direct, indirect, and cumulative effects of alternatives are identified and discussed.

Regulatory Framework

The three principle laws relevant to wildlife management are the National Forest Management Act of 1976 (NFMA), the Endangered Species Act of 1973 (ESA), and the Migratory Bird Treaty Act (MBTA) of 1918. The direction relative to wildlife is as follows:

NFMA requires the Forest Service to manage fish and wildlife habitat to maintain viable populations of all native and desirable non-native wildlife species and conserve all listed threatened or endangered species populations (36CFR219.19).

ESA requires the Forest Service to manage for the recovery of threatened and endangered species and the ecosystems upon which they depend. Forests are required to consult with the US Fish and Wildlife Service if a proposed activity may affect the population or habitat of a listed species.

MBTA established an international framework for the protection and conservation of migratory birds. This Act makes it illegal, unless permitted by regulations, to “pursue, hunt, take, capture, purchase, deliver for shipment, ship, cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird . . .”

Forest Service Manual Direction provides additional guidance: identify and prescribe measures to prevent adverse modifications or destruction of critical habitat and other habitats essential for the conservation of endangered, threatened, and proposed species (FSM2670.31 (6)). The Forest Service Manual directs the Regional Forester to identify sensitive species for each National Forest where species viability may be a concern.

The principle policy document relevant to wildlife management on the Malheur National Forest is the 1990 Malheur National Forest Land and Resource Management Plan, referred to as the Forest Plan for the remainder of this section. The Forest Plan provides standards and guidelines for management of wildlife species and habitats. Standards and guidelines are presented at the Forest level (LRMP, pp. IV-26 to IV-33) or Management Area level (LRMP pp. IV-50, IV-53, IV-56 to IV-57, IV-105 to IV-107, and IV-108). Management Areas include General Forest

(MA-1), Rangeland (MA-2), Anadromous Riparian Area (MA-3B), Old Growth (MA-13) and Visual Corridors (MA-14).

The 1995 Regional Forester's Eastside Forest Plans Amendment #2 amended Forest Plans for the National Forests in Eastern Oregon and Eastern Washington, including the Malheur National Forest. Amendment # 2 established interim wildlife standards for old growth, old growth connectivity, snags, large down logs, and northern goshawks. The Regional Forester has periodically distributed letters clarifying direction in Amendment #2 (Regional Forester, October 2, 1997; October 23, 1997; June 11, 2003).

Additional management direction is provided for migratory landbirds. Concern for declines in population trends has led to the creation of an International Partners in Flight (PIF) network and program. In 1992, an Oregon-Washington Chapter of PIF formed, with a separate Oregon subcommittee for assessing conservation needs at the state level. In 1994, the Forest Service, Region 6, signed a Memorandum of Agreement with 14 other agencies and non-agency entities to develop a program for the conservation, management, inventory, and monitoring of neotropical migratory birds. Executive Order 13186 (66 FR 3853, January 17, 2001) directs the Forest Service to consider the conservation of landbird species in the design, analysis and implementation of activities on federal lands administered by the US Forest Service.

Analysis Methods

Effects on wildlife will be assessed for National Forest land in the Mill Creek Subwatershed, focusing on effects of activities within proposed treatment units. Direct, indirect, and cumulative effects of alternatives are identified and discussed.

Rather than addressing all wildlife species, the Forest Plan focuses on three categories of wildlife: management indicator species (MIS); threatened, endangered and sensitive (TES) species; and featured species. In addition, interest has been raised for neotropical migratory birds. Categories and wildlife species are summarized below:

- **Management Indicator Species (MIS)**

The Forest Plan identifies 15 MIS and their associated habitat requirements. MIS habitat requirements are presumed to represent those of a larger group of wildlife species, and act as a barometer for the health of their various habitats. Pine marten, pileated woodpecker, and northern three-toed woodpecker represent old growth habitats, Rocky Mountain elk represent big game species, and primary cavity excavators (most woodpeckers) represent dead wood habitats. Effects to MIS species will be discussed in the Old Growth Forest, Big Game Habitat, and Primary Cavity Excavator sections respectively.

- **Threatened, Endangered and Sensitive (TES) Species**

An endangered species is 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. A threatened species is 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. A sensitive species is an animal or plant species identified by the Forest Service Regional Forester for which species viability is a concern either a) because of significant current or predicted downward trend 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. Threatened, endangered, and sensitive species effects are summarized in this section by TES status and species. The Crawford Biological Evaluation in the Project Record provides more detailed information.

▪ **Featured Species**

The Malheur Forest Plan defines a featured species as a wildlife species of high public interest or demand. The featured species associated with the project area are northern goshawk and blue grouse. Effects to northern goshawk and blue grouse will be discussed in the Featured Species – Northern Goshawk and the Featured Species – Blue Grouse sections, respectively.

▪ **Landbirds including Neotropical Migratory Birds (NTMB)**

Landbirds, including Neotropical migratory birds, are discussed because many species are experiencing downward population trends. Discussion can be found in the section Species of Concern – Landbirds including Neotropical Migratory Birds (NTMB).

Species presence/absence determinations were based on habitat presence, wildlife surveys, recorded wildlife sightings, and status/trend and source habitat trend documented for the Interior Columbia Basin. Formal wildlife surveys were not conducted for most species. Effects on habitats are discussed, with the assumption that if appropriate habitat is available for a species, then that species occupies or could occupy the habitat. This strategy is based upon science that demonstrates connections between species populations and viability and the quantity and condition of habitat at appropriate scales of analysis (USDA Forest Service 2001). There is a high confidence level that species discussed in this document are currently present in the area.

Effects on species will be determined by assessing how alternatives affect the structure and function of vegetation relative to current and historical distributions. The Forest Vegetation section of this document defines the historical vegetation patterns and structure within the Upper Middle Fork John Day River Watershed. Field reconnaissance information, aerial photos, and Geographic Information System databases provided additional information.

Some wildlife habitats require a detailed analysis and discussion to determine potential effects on a particular species. Other habitats may either not be impacted or are impacted at a level which does not influence the species or their occurrence. The level of analysis depends on the existing habitat conditions, the magnitude and intensity of the proposed actions, and the risk to the resources.

The following definitions for short-term, mid-term, and long-term are used to facilitate discussion of effects.

- Short-term – 0-5 years
- Mid-term 5 – 25 years
- Long-term 25+ years

Old growth habitat was analyzed using the District's GIS old growth map layer, vegetation and management activity layers, stand exams extrapolated using most similar neighbor analysis, Dedicated and Replacement Old Growth surveys, and field reconnaissance.

Elk habitat was evaluated using the Habitat Effectiveness Index (HEI) (Thomas et al. 1988), marginal and satisfactory cover percentages, and open road densities. Big game cover was designated using stand exams, most similar neighbor analysis, aerial photographs and ground

reconnaissance. Open road densities were calculated using the District access travel management database. Values were estimated for National Forest lands at the subwatershed level.

Snag densities and sizes were estimated using data obtained through stand exams, most similar neighbor analysis and field reconnaissance. This EIS uses the DecAID 2.0 analysis tool (Mellen et al. 2006) to evaluate alternative effects on dead wood habitats. DecAID is an internet-based computer program developed as an advisory tool to help federal land managers evaluate effects of management activities on wildlife species that use snags and large, down logs. The tool synthesizes published literature, research data, wildlife databases, and expert judgment and experience. Woodpecker use data was used in this analysis.

Effects to threatened, endangered and sensitive (TES) species are summarized in this Chapter and then described in more detail in the Wildlife Biological Evaluation located in the Project Record.

Landbirds, including neotropical migratory birds (NTMB), were analyzed based on high priority habitats identified in the Oregon-Washington Chapter of Partners in Flight, Northern Rocky Mountains Bird Conservation Plan (Altman 2000). While the Malheur Forest has not conducted official NTMB surveys in the project area, the Oregon Breeding Bird Atlas (Adamus et al. 2001) includes observational data for this area. Much of the data for the Malheur Forest was obtained from local biologists and ornithologists. Most NTMB species that are expected in the project area were recorded within the atlas' hexagons for the area. Based on a review of the District's wildlife database and observations made during reconnaissance of the fire area, there is a high confidence level that species discussed in this report are currently present in the area.

Cumulative effects analyzed in respect to past, ongoing and foreseeable future activities are listed in Appendix D. These effects were first analyzed within the context of the Mill Creek subwatershed. If there were no contributions to negative or positive cumulative effects at that scale, then no further analysis was conducted. If there were contributions to effects at that scale, then the analysis scale was broadened to a larger land base scale, usually adjacent subwatersheds.

Alternative 1, the No Action alternative, is required by NEPA. It is used as a benchmark to compare and describe the differences and effects between taking no action and implementing action alternatives. The No Action alternative is designed to represent the existing condition; resource conditions are then projected forward in time to estimate resource changes expected in the absence of the proposed management activities.

Affected Environment – Old Growth

Old growth habitat was analyzed using the District's GIS old growth map layer, vegetation and management activity layers, stand exams extrapolated using most nearest neighbor analysis, Dedicated and Replacement Old Growth surveys, and field reconnaissance.

The following terms for old growth are used interchangeably throughout this section. Nuances in the vocabulary are defined throughout the section.

- Old Growth
- Late and Old structure (LOS)
- Dedicated Old Growth (DOG)

- Replacement Old Growth (ROG)
- Old Forest Multi-strata (OFMS)
- Old Forest Single Stratum (OFSS)

Old Growth Management Direction

The Forest 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). The Forest Plan identifies three MIS for old growth habitat: pileated woodpecker, pine marten, and three-toed woodpecker. By providing old growth habitat for these species, it is assumed that habitat for old-growth obligate species will be provided as well.

Forest Plan, Management Area 13 (MA-13) provides for the management of old growth through a network of Dedicated Old Growth (DOG) and Replacement Old Growth (ROG) areas. Each DOG/ROG is specifically managed for one of two Management Indicator Species (MIS) for OFMS: pileated woodpecker or pine marten. ROGs are established to counter possible catastrophic damage or deterioration of the DOGs. Replacement areas may not have all the characteristics of old growth, but are managed to achieve those characteristics so that when a DOG area no longer meets the needed habitat requirements, the ROG can take its place.

The Forest Plan directs continued review of DOG/ROG areas, with adjustments to boundaries as appropriate, to ensure suitable levels of old growth habitat are provided for species dependent upon them and to ensure those areas meet Forest Plan Standards and Guidelines. The Forest Plan and its corresponding Final Environmental Impact Statement identifies the process and direction to identify Replacement Old Growth (ROG) and Pileated Woodpecker Feeding Areas (PWFA) for each DOG area.

In addition to the DOG/ROG network, Forest-wide Standard 59 (Forest Plan, pg. IV-31) directs Forest managers to delineate areas of old growth lodgepole pine. These old growth areas are specifically managed for three-toed woodpeckers, a MIS for old growth lodgepole pine. These areas are not considered part of the MA-13 network.

Regional Forester's Eastside Forest Plans Amendment #2 (USDA 1995) amended the Forest Plan to manage late and old structure (LOS) stands within the Historic Range of Variability (HRV). HRV is a landscape level assessment of structural stage; Amendment #2 direction applies to LOS stands both inside and outside of the DOG/ROG network. In addition, Amendment #2 directs land managers to maintain connectivity between LOS habitats to allow the free movement of old growth wildlife species.

Old Growth Management Indicator Species (MIS)

Pileated Woodpecker (Dryocopus pileatus)

Pileated woodpeckers prefer mature and old growth forests with at least 60% canopy cover (Bull and Holthausen 1993). This species relies heavily on snags and downed wood material for foraging. Nests are built in cavities excavated in large (> 21 inches dbh) dead or decadent ponderosa pine, western larch or grand fir trees. Pileated woodpeckers forage mainly by excavating insects (most notably carpenter ants) 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). 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 Forest Plan.

Habitat trend information derived from Interior Columbia Basin studies (Wisdom et al. 2000) indicated that about 60% of the watersheds in the Blue Mountains showed a decreasing trend in pileated woodpecker habitat and 30% showed an increasing trend. Declines in source habitat are primarily attributed to a reduction in late seral forest. Breeding Bird Survey (BBS) data indicated a 7.8% annual decline in populations in Oregon and Washington from 1966 through 1994 (Wisdom et al. 2000).

The Forest Plan directs that pileated woodpecker DOGs are to be at least 300 acres of mature and old growth habitat; ROGs are intended to be half the size of the DOG, i.e., about 150 acres. In addition, 300 acres are managed as a Pileated Woodpecker Feeding Area (PWFA); the ROG and PWFA are permitted to overlap. Pileated woodpecker DOGs were delineated Forest-wide to provide an even distribution of habitat areas, one DOG every 12,000 acres, or approximately 5 miles apart. Management requirements were derived from the US Forest Service 1986 Minimum Management Requirements.

American Marten (Martes americana)

Martens prefer mature old growth forest with a well-developed multi-storied canopy. Cover and prey species largely determine their distribution and abundance. Snags and downed woody material are important for winter and summer dens, resting sites, and cover for prey species. Martens show a strong avoidance of open areas, possibly for predator avoidance (Hawley and Newbry 1957). 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). Home range for a breeding pair has been identified by different sources as ranging from 160 acres (Campbell 1979) to 1,400 acres (Freel 1991).

Habitat trend information derived from Interior Columbia Basin studies (Wisdom et al. 2000) indicated that about 50% of the watersheds in the Blue Mountains showed a decreasing trend in marten habitat and 35% showed an increasing trend. The distribution of marten within the Interior Columbia Basin has been fairly stable, but population changes are not known (Wisdom et al. 2000).

The Forest Plan directs that pine marten DOGs are to be 160 acres and ROGs are to be 80 acres. Pine marten DOGs were delineated every 4,000 to 5,000 acres, or approximately 3 miles apart. Management requirements were derived from the US Forest Service 1986 Minimum Management Requirements.

American Three-Toed Woodpecker (Picoides dorsalis)

Source habitats for three-toed woodpeckers are old forests of lodgepole pine, grand fir-white fire, Engelmann spruce and subalpine fir. The three-toed woodpecker 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). 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 trend information derived from Interior Columbia Basin studies (Wisdom et al. 2000) indicated that about 70% of the watersheds in the Blue Mountains showed an increasing trend in three-toed woodpecker habitat and 30% showed a decreasing trend. Breeding Bird Survey (BBS) data is insufficient to determine population trends in the Interior Columbia Basin, but data summarized across the West indicates a 0.7% annual decline in populations from 1966 through 1994 (Wisdom et al. 2000). North American Breeding Bird Survey (BBS) data for 1980–1998 indicate a significant annual decrease in three-toed woodpecker populations of 15.0% (n = 12 survey routes) and 13.4% (n = 18) in the U.S. and across the species' range in North America, respectively (Sauer et al. 1997). These data, however, should be viewed with caution given the low number of routes and low abundance of three-toed woodpeckers/route (Leonard, D.L. Jr., 2001).

The Forest Plan standards require identification of potential or existing old growth lodgepole pine habitat for three toed woodpeckers. In the Minimum Management Requirement analysis, the assumption was that a breeding female can be supported on 75 acres of quality habitat and that one home range approximately every 2,000 – 2,500 acres was a suitable maximum dispersal distance to assure population viability. There are no designated habitat areas for northern three-toed woodpecker in the project area and there is insufficient old growth lodgepole pine habitat to designate any areas. Effects to three-toed woodpeckers will be discussed in the Snags and Down Wood Section of this document.

Dedicated and Replacement Old Growth

Three Dedicated Old Growth (DOG) areas are located within the project area. Table WL-1 below lists each DOG, its associated MIS, total acres, and structural stage percentage. Existing DOGs do not always meet minimum size requirements, and they are not always tied to logical stand or topographical boundaries. Replacement Old Growth (ROG) areas have not been established for the three DOGS in the project area. Pileated Woodpecker Feeding Areas (PWFAs) have not been established for the two DOGs designated for pileated woodpecker management.

Table WL-1. Dedicated Old Growth Area Existing Condition

Dedicated Old Growth (DOG) Area	MIS Species	Total Acres	Structural Stages
DOG 134	Pileated Woodpecker	382	61% – YFMS 27% – UR 7% – SEOC 4% – SECC 1% – OFMS
DOG 241	American Marten	169	90% – UR 6% – OFMS 4% – SECC
DOG 335	Pileated Woodpecker American Marten	273	95% – UR 5% – YFMS
DOG = Dedicated Old Growth MIS = Management Indicator Species OFMS = Old Forest Multi-strata, YFMS = Young Forest Multi-strata, UR = Understory Reinitiation, SECC = Stem Exclusion Closed Canopy, SEOC = Stem Exclusion Open Canopy			

To maintain an even distribution of old growth across the Forest, DOGs were designated in all biophysical environments of forest types. Attempts were made to identify some of the best habitat available, while maintaining the old growth grid system. Generally, dry forest types provide lower quality habitat for pileated woodpeckers and American marten than moist forest types. Historically, dry forest types were maintained under a low intensity, frequent fire regime; historic stand structure was likely Old Forest Single Stratum (OFSS). Due to fire suppression, tree stocking and canopy closure are greater than they were under historic conditions. Although many of the stands in the DOGs currently do not meet old growth definitions, they do contain habitat components that can support pileated woodpeckers and martens in the short- to mid-term.

In the early- to mid-1990s, informal old growth surveys were conducted. In 2005, taped pileated woodpecker calls were broadcasted. The DOGs have periodically been visited to record presence of pileated woodpeckers, marten and other wildlife species.

DOG 134 – Pileated Woodpecker

DOG 134 is primarily within the warm-dry biophysical environment, and varies in tree composition from mixed conifers stands of grand fir, ponderosa pine, Douglas-fir and western larch to pure ponderosa pine stands. Stands are in a mid-seral condition, primarily Young Forest Multi-strata (YFMS) and Understory Reinitiation (UR). The YFMS stands often provide adequate canopy complexity and canopy closure, but the number of large diameter trees fall short of quantities required for Old Forest Multi-strata (OFMS) classification. Stands are deficient in large diameter trees and snags. Past timber harvest is evident. Generally, stands on warm-dry sites are considered marginal habitat for pileated woodpeckers. In this DOG, however, overstocked stand conditions support a higher canopy cover, and therefore, provides woodpeckers with greater security from predation and increased insect prey activity for foraging. Therefore, this DOG does provide woodpecker habitat in the short- to mid-term. Habitat quality is better in the north in stands above the Middle Fork John Day River and less so in pure ponderosa pine stands on the southern bench. Snags are below Forest Plan standards, estimated

at about 2.7 snags per acre 10 inches dbh and greater with very few over 21" dbh. In 2005, taped calls did not solicit responses from pileated woodpeckers but foraging signs were evident.

DOG 241 - American Marten

DOG 241 is 169 acres in size. About 50% of DOG 241 is within the cool dry and cold dry biophysical environments, forest types which are capable of providing good marten habitat. The remaining 50% of the DOG is in the warm-dry biophysical environment which is considered a marginal forest type for supporting marten. The DOG is comprised of mixed conifer stands of grand fir, Douglas-fir, and ponderosa pine, with western larch and lodgepole pine in the draws. As with DOG 134, overstocked stand conditions currently provide the higher canopy covers that marten select. Stands are considered mature, but the number of large diameter trees fall short of quantities required for Old Forest Multi-strata (OFMS) classification. Snags are below Forest Plan standards, estimated at 6 snags per acre, 10 inches dbh and greater with very few over 21 inches dbh. Past harvest has occurred. There have been sightings of marten reported near DOG 241. In 2005, taped calls solicited responses from pileated woodpeckers. Signs of past woodpecker foraging is evident.

DOG 335 – Pileated Woodpecker and American Marten

DOG 335 is 273 acres in size; it does not meet the minimum Forest Plan standard for territory size (300 acres). The DOG is within the cold dry and warm-dry biophysical environments and is primarily in the Understory Reinitiation (UR) structural stage. Although this area does not classify as Old Forest Multi-strata (OFMS), there are areas with large diameter grand fir and sufficient canopy closure to provide habitat for pileated woodpeckers and pine martens. The DOG is comprised of mixed conifer stands of grand fir, Douglas-fir, ponderosa pine, western larch, and lodgepole pine. The grand fir are providing roost and foraging strata that is not available in most of the project area due to past management or site capability. Snags are below Forest Plan standards, estimated at about 3.8 snags per acre 10 inches dbh and greater with very few over 21" dbh. There were no pileated woodpecker sightings in the 2005 survey, but pileated woodpeckers have nested in the DOG in past years and foraging sign is abundant in the more mesic portions of the DOG.

Old Growth within the Project Area

Regional Forester's Eastside Forest Plans Amendment #2 (USDA 1995) amended the Forest Plan to manage late and old structure (LOS) stands within the Historic Range of Variability (HRV). Stand classified as Old Forest Multi-strata (OFMS) and Old Forest Single-Stratum (OFSS) would be considered late and old structure (LOS) habitat. Refer to the Vegetation Section of this DEIS for the HRV Analysis.

The following sections describe the existing condition of OFMS and OFSS in the Mill Creek subwatershed. Amendment #2 direction applies to OFMS/OFSS stands both inside and outside of the DOG/ROG network. Discussions will also address Management Indicator Species for OFMS (pileated woodpecker and pine marten) and OFSS (white-headed woodpecker).

Old Forest Single Stratum (OFSS) Habitat

The Upper Middle Fork John Day Watershed Analysis (WA) identifies the need for the development of OFSS structure ponderosa pine-dominated stands (USFS 1998). Historic accounts show a strong presence of this habitat condition, structure, and tree composition across

much of the project area and the watershed as a whole. The majority of the warm-dry and hot-dry biophysical environment habitats occurred in this or similar conditions. Chapter 1 of this document identified a need to develop historic levels of OFSS structure habitat in the project area.

White-headed Woodpecker (*Picoides albolarvatus*)

The white-headed woodpecker differs from many of the other primary cavity excavators identified as MIS in the Forest Plan in its near exclusive selection of mature, single-stratum ponderosa pine dominated habitats. This species relies almost exclusively upon the seeds from large ponderosa pine cones for its foraging needs as well as utilizing insects gleaned off ponderosa pine trees. Large ponderosa pine snags are utilized for nesting purposes. Because of its more limited need and use of snags as foraging sites, the species snag requirements are less than those required by other primary cavity excavators such as the pileated, downy, and hairy woodpeckers.

Habitat trend information derived from Interior Columbia Basin studies (Wisdom et al. 2000) indicated that about 70% of the watersheds in the Blue Mountains showed a decreasing trend in white-woodpecker habitat and 30% showed a static or increasing trend. Basin-wide, >50% of watersheds had strong negative declines in the availability of source habitats (old growth ponderosa pine, aspen/cottonwood/willow, large diameter ponderosa pine snags). Breeding Bird Survey (BBS) data indicated a 3.0% annual increase in populations in Oregon and Washington from 1966 through 1994 (Wisdom et al. 2000).

The current condition and availability of habitat for this species across the project area and watershed is extremely limited. Past harvest focused on the removal of mature ponderosa pine. Fire suppression allowed stocking of smaller trees to increase dramatically, shifting structural stage to SECC, UR, YFMS, or OFMS. In the analysis area, OFSS occurs on 3% (289 acres) and 0% (0 acres) of the warm-dry and hot-dry biophysical environments, respectively. Historically, this habitat type occurred on 5- 55% and 20-70% of the warm-dry and hot-dry biophysical environments, respectively.

The lack of OFSS habitats does not meet the needs of the white-headed woodpecker, flammulated owl, or other species that depend upon open, mature ponderosa pine stands for foraging, nesting, and roosting. Species dependent upon these habitats would likely remain at low densities, with populations poorly distributed in isolated marginal habitats.

It is assumed that with a greater availability of OFSS habitat, white-headed woodpecker population densities would be higher. Several observations of the white-headed woodpecker have been reported in the project area during field surveys and reconnaissance in recent years.

Multi- Stratum Habitat

Multi-stratum forest habitats are more common in the project area. Multi-stratum habitats include Old Forest Multi-stratum (OFMS) and Young Forest Multi-stratum (YFMS) stand structures. Currently, OFMS (2,320 acres) and YFMS (2,308 acres) comprise 29% of the analysis area. YFMS habitats are evenly distributed throughout the project area. OFMS habitats are unevenly distributed, with a fairly large, contiguous block of habitat in the northeast portion of the subwatershed.

Multi-stratum habitat is generally within or above HRV for all biophysical environments, although the landscape is skewed towards OFMS versus YFMS. Only the warm-dry biophysical

environment is below HRV for OFMS; historically, this habitat type occurred on 5-20% of this biophysical environment and currently comprises about 4%. Past forest management, primarily timber harvest and fire suppression has altered the conditions in many of these stands. Fire suppression has changed the species composition and structure from ponderosa pine-dominated stands to mixed conifer stands dominated by lodgepole pine, grand fir, and Douglas fir. This management activity created multi-stratum stand structures where they were historically not present, providing more potential habitat for species requiring multi-strata habitat. Timber harvest reduced the number of large diameter live trees, snags and large down wood, important habitat components for multi-stratum dependent species.

Habitats in the warm-dry, cold dry and cool moist biophysical environments, with OFMS and YFMS structures, provide the bulk of the habitat for the pileated woodpecker and pine marten. Table WL-2 identifies the acres of potential habitat for these species that exists in the analysis area. Primary habitat was defined as OFMS structure with >60% canopy closure. Secondary habitat was defined as OFMS and YFMS structure with 40-59% canopy closure. There are approximately 2,020 acres of suitable habitat for the pileated woodpecker and pine marten within the analysis area.

Table WL-2. Potential Pileated Woodpecker and Pine Marten Habitat (acres)

Habitat Type	Acres
Primary Habitat	261
Secondary Habitat	1,759
Total	2,020
Primary Habitat = Warm-dry, Cold Dry, &Cool Moist Forest Types, OFMS, Canopy Cover = >60%. Secondary Habitat = Warm-dry, Cold Dry, &Cool Moist Forest Types, OFMS & YFMS, Canopy Cover 40%-60%.	

Primary habitat stands have high canopy closures and extensive middle and understory vegetation development producing the highest quality habitat for multi-strata LOS dependent species. Primary habitat acres are very low due to the lack of canopies greater than 60% canopy closure, likely due to the lower site potential of warm and dry biophysical environments. Secondary habitat is comprised of stands with lower canopy closures and/or fewer live trees. Middle and understory canopies are likely less developed, due to past timber harvest and/or site potential. In OFMS and YFMS habitats, snags are relatively abundant, although in smaller size classes, and therefore, provide more limited nesting/denning/roosting habitat.

The majority of multi-stratum mixed conifer habitat is smaller isolated/fragmented blocks with similar habitat characteristics. Sizes of these individual blocks vary, ranging from 3 acres to over 290 acres with an average size of about 50 acres. Past timber harvest activities and differences in vegetation type/site potential are the primary forces that have isolated these patches of habitat. Some smaller blocks are located relatively close to the larger blocks and may contribute to the overall habitat use of those areas by pileated woodpecker and pine marten, while other blocks are isolated by substantial amounts of unsuitable habitat and may receive little use by these species. Based on the analysis of stand exams in the Forest GIS database, many of the multi-strata stands are deficient in large diameter snags and downed wood. Smaller snags, 10 inches to 20 inches, are plentiful in many multi-strata stands and help mitigate deficiencies of the larger snags. (refer to the Snag and Downed Wood Section and the DecAID analysis). Overall habitat condition and function in the multi-stratum habitats for the pileated woodpecker and pine marten is generally low. Core habitat in Dedicated Old Growth areas appears to be adequate but

capable of supporting only one breeding pair of pileated woodpeckers per DOG. Habitat features, such as higher canopy closures, complex canopy structures, near ground level vegetative cover, and higher deadwood habitat densities are uncommon. This is expected due to the prevalent biophysical environment and past management practices.

Connectivity

Dedicated Old Growth habitat and late and old structure (LOS) stands are distributed throughout the analysis area. The Regional Forester's Eastside Forest Plans Amendment #2 (USDA 1995) gives direction for maintaining connectivity between LOS habitats to allow the free movement of old growth wildlife species. Connectivity corridors should commonly have medium diameter or larger trees (≥ 9 inches DBH) and canopy closure within the upper third of site potential. Corridors should be at least 400 feet wide. If stands with these conditions are not available, then the next best stands will be selected and should be managed to improve connectivity. Those stands with a high degree of ground level vegetation provide additional screening and security cover for old growth associated species as well as for wide ranging carnivores. Generally, connectivity corridors are maintained or managed at higher tree densities and canopy cover than adjacent areas to provide more security for dispersal or movement.

Table WL-3 identifies connectivity habitat within the analysis area. There are approximately 3,476 acres of habitat within the connectivity network. Unharvested stands or stands with an abundance of small diameter trees are currently providing the best connectivity in the area.

Table WL-3. Connectivity Habitat: Total Habitat, High Quality Habitat, Habitat by Stand Structure and Biophysical Environment

Habitat Characteristic	Acres	Percentage *
Total Connectivity Habitats (does not include LOS habitats)	3,476	100
High Quality Connectivity Habitat**	592	20
Stand Structure		
Young Forest Multi-strata (YFMS)	528	15
Stem Exclusion Open Canopy (SEOC)	737	21
Stem Exclusion Closed Canopy (SECC)	1,805	52
Understory Reinitiation (UR)	406	12
Biophysical Environment		
Hot-dry Forest Type	149	4
Warm-dry Forest Type	2,245	65
Cool Dry Forest Type	6	<1
Cold Dry Forest Type	1,076	31
* Percent of total connectivity habitat within project area.		
** High quality connectivity habitat is defined as those stands with multi-stratum structure (YFMS or UR) and 40% canopy closure or greater.		

Corridors generally meet or exceed the minimum requirements as described in Amendment #2 of the Forest Plan. In some cases, stands have been identified as connectivity habitat even though minimum canopy closure requirements were not met, in order to provide some level of connection between late and old structure (LOS) habitat that did not have two or more connections. In the short-term, connectivity corridors provide for the free movement of old growth associated terrestrial wildlife.

Environmental Consequences – Old Growth

Alternative 1- No Action

Dedicated and Replacement Old Growth

Direct and Indirect Effects

Existing Dedicated Old Growth (DOG) would remain the same. Boundaries would not be adjusted to reflect logical stand or topographical boundaries. No New Replacement Old Growth (ROG) areas or Pileated Woodpecker Feeding Areas (PWFAs) would be designated to meet Forest Plan Standards. Alternative 1 would not meet Forest Plan Management Area direction for old growth. Although no new management activities would occur under this project, areas adjacent to existing DOGs could be managed under other management area (MA) standards and guidelines. The ability to manage for an adequate system of DOGs/ROGs/PWFAs could be reduced.

In the short-term, there would be no direct effects to DOGs within the project area. Habitat effectiveness for old growth species would remain as described in the existing condition. The No Action alternative would have no immediate effects on marten, pileated woodpeckers, or their habitats. All existing snags and down logs would continue to provide forage and potential nest cavities.

In the mid- to long-term, the lack of thinning or burning in this alternative would allow stands in the DOGs to develop denser canopy closure that would provide additional habitat for pileated woodpeckers and pine marten. Green replacement trees and snags would continue to develop as stands move toward late and old structure and are affected by insects and disease.

There would be 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 to develop old forest structures. In the warm-dry and hot-dry biophysical environments, disturbances would continue to be at a larger scale than historically occurred, with “out of scale” adverse effects to many wildlife species. All three DOGs include stands in the warm-dry biophysical environment.

Old Forest Single-Stratum

Direct and Indirect Effects

There is currently a lack of old forest stand structures due to past timber harvest, fire suppression and other disturbances. In the short-term, implementation of Alternative 1, the No Action Alternative, would result in no additional acres of OFSS habitat being restored or created. Due to the slow growth rates of the overstocked stands, development of old forest stand structures would develop slowly with OFSS increasing from 3% to 15% over the next 50 years.

This OFSS habitat type would continue to be below the Historic Range of Variability (HRV) within the subwatershed under this alternative, even at 50 years. As mentioned in the existing condition section, the lack of OFSS habitats does not meet the needs of species such as the white-headed woodpecker, flammulated owl, and other neotropical landbird species that depend upon open, mature ponderosa pine stands for foraging, nesting, and roosting.

This alternative would not meet the purpose and need to develop OFSS habitats as identified for this project in Chapter 1. Selection of this alternative would forgo options and management opportunities to restore habitat for these species. In the mid- to long-term, this alternative would adversely impact these species by neglecting their habitat needs and continuing existing management activities that contribute to the loss and/or conversion of limited marginal habitats that are currently providing habitat for these species. Species dependent upon these habitats would likely remain at low densities, with populations poorly distributed in isolated marginal habitats.

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 to develop old forest structures. In the warm-dry and hot-dry biophysical environments, disturbances would continue to be at a larger scale than historically occurred, with “out of scale” adverse effects to many wildlife species. Stand replacement fires could further reduce OFSS habitats, and the species that rely on them.

Old Forest Multi-Stratum

Direct and Indirect Effects

Alternative 1 would maintain the existing condition of habitat for multi-strata dependent species, such as the pileated woodpecker and the pine marten. In the short-term, existing canopy closure, stand structure, and dead wood habitats would be maintained across the analysis area as described in the existing condition section. Multi-strata stands would become denser in the mid- to long-term due to continued fire exclusion. Standing and downed wood densities would increase in the mid- and long-term as stand densities increase, and projected insect and disease infestations occur. OFMS would continue to develop, increasing from 3% to 29% over the next 50 years.

There would be 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 to develop old forest structures. In the warm-dry and hot-dry biophysical environments, disturbances would continue to be at a larger scale than historically occurred, with “out of scale” adverse effects to many wildlife species. A fire of this magnitude and severity would convert suitable pileated woodpecker and pine marten habitat to an unsuitable condition.

Connectivity

Direct and Indirect Effects

In the connectivity corridors, no timber harvest or prescribed burning activities would occur; existing conditions would remain the same in the short-term. Map W-2 identifies existing connectivity habitat within the Mill Creek Subwatershed. These corridors generally meet or exceed the minimum requirements as described in Amendment #2 of the Forest Plan. In some cases, stands have been identified as connectivity habitat even though minimum canopy closure requirements were not met, in order to provide some level of connection between late and old structure (LOS) habitat that did not have two or more connections. Under this alternative, connectivity corridors would continue to provide for the free movement of old growth associated terrestrial wildlife species in the short-term. In the mid- to long-term, multi-strata stands would

continue to develop dense habitat structure, increase snags and downed wood, and provide high quality hiding and screening cover in these time frames.

Many of the connectivity corridors are in warm-dry and hot-dry biophysical environments. Where tree stocking is high, stands would remain at high risk to stand-replacing fires that could eliminate cover and fragment connective habitats. A stand-replacing fire could make some stands unsuitable for travel.

Alternatives 2, 3, and 4

Dedicated and Replacement Old Growth

Direct and Indirect Effects

All action alternatives would adjust the Dedicated Old Growth boundaries to incorporate suitable late and old structure habitat and to reflect logical vegetation or topographical boundaries in the Forest Geographic Information System (GIS) database. All action alternatives would designate new Replacement Old Growth areas and Pileated Woodpecker Feeding Areas. Changes would make the DOG habitats in the project area consistent with the standards for MA-13 Old Growth habitats as identified in the Forest Plan, as well as recommendations and direction provided in the FEIS for the Forest Plan. Changes are summarized in Table WL-4 below. See Figure 1.3 in Chapter 1 for delineations.

The Forest Plan would be nonsignificantly amended to make changes to the DOGs and to add ROG acres, converting acres from Management Areas 1 (General Forest), MA-14 (Visual Corridors) and MA-3 (Riparian) to MA-13 (Old Growth). Standards and guidelines in MA-14 and MA-3 would still apply. PWFA acres would retain their original MA classification, except where they overlap with the ROGs.

Table WL-4. Dedicated Old Growth (DOG), Replacement Old Growth (ROG), and Pileated Woodpecker Feeding Area (PWFAs). Changes in the Old Growth Network for Alternatives 2, 3 and 4.

DOG #	Management Requirements Species	Minimum Forest Plan Acre Requirements ¹	Existing DOG Acres	Proposed DOG Acres	Proposed ROG Acres ²	Proposed Additional Pileated Feeding Acres ²	Total Proposed Acres
DOG 134	Pileated Woodpecker	600	382	395	256	83	734
DOG 241	Pine Marten	240	169	169	62	---	231
DOG 335	Pileated Woodpecker, Pine Marten	240	273	317	179	154	650
TOTALS		1,080	824	881	497	237	1,615

¹ Old-growth Management Area (MA-13) Minimum Management Requirements:

- Pileated Woodpecker Areas = 300-acre DOG + 300-acre feeding area = 600 acres. ROG = 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. "Proposed ROG Acres" and "Additional Pileated Feeding Acres" fields should total at least 300 acres for each DOG.

Under all action alternatives, there would be a net increase of 57 acres of Dedicated Old Growth habitat. The adjustments of boundaries and acreage for these DOGs would meet or exceed Forest Plan standards for MA-13. The acres moved into MA-13 would be protected and maintained as suitable habitat for pine marten or pileated woodpecker (or both). Not all of the acres added as Dedicated Old Growth are currently providing old forest structure. The acres added were the best adjacent habitat available.

There would also be a net increase of 497 acres of ROG habitats due to the delineation of three new ROGs. These ROGs would meet Forest Plan standards for size and proximity to their associated DOG units. ROGs and PWFAs areas were located in the best habitat available within ¼ mile of existing DOGs. Generally ROGs are half the size of DOGs however the ROG 134 was delineated over a larger area because the only available adjacent habitat is within the hot-dry biophysical environment. This biophysical environment is not the most suitable to sustain pileated woodpeckers and martens. Less than optimal habitat requires a larger home range for this species; therefore, 338 acres of ROG and PWFA were added to the expanded DOG for a total of 733 acres.

Table WL-5 displays the ROG/PWFA additions and summarizes structural stages. The majority of acres are in the OFMS and YFMS habitats, providing some of the best habitat in the area for pileated woodpecker and pine marten.

Table WL-5. Designation of Replacement Old Growth and Pileated Woodpecker Feeding Areas

Dedicated Old Growth (DOG) Area	MIS Species	Total Acres	Structural Stages
ROG/PWFA 134	Pileated Woodpecker	338	84% – YFMS 16% – OFMS
ROG 241	American Marten	62	100% – SECC
ROG/PWFA 335	Pileated Woodpecker American Marten	323	52% – OFMS 25% – SECC 21% – OFSS 2% - UR
ROG = Dedicated Old Growth PWFA – Pileated Woodpecker Feeding Area MIS = Management Indicator Species OFMS = Old Forest Multi-strata, OFSS – Old Forest Single Stratum, YFMS = Young Forest Multi-strata, UR = Understorey Reinitiation, SECC = Stem Exclusion Closed Canopy			

As discussed previously, ROG/PWFA 134 would be designated in the hot-dry biophysical environment. ROGs/PWFAs for DOG 335 would be located in a combination of cold dry, cool dry and warm-dry biophysical environments. ROG 241 would be located in the cold dry biophysical environment.

Snags in the ROG/PWFAs were estimated from stand exams. Snags 20 inches dbh and greater range from 1.1 to 1.4 per acre; this level is below the Forest Plan standard of 2.39 snags per acre for large diameter snags. Snags 10 inches to 20 inches dbh range from 7 to 10 per acre, and although this size class is not the optimal size for pileated woodpeckers and martens, it does help supplement deadwood habitats. Once snags fall, they will contribute to large down log habitat used by both species (see Primary Cavity Excavator Species Section). Stands generally meet or exceed Forest Plan standards for down logs.

Additional DOG and ROG acres should better maintain the integrity of the Forest’s old growth network in the short- to mid-term. Long term sustainability may be limited due to the overstocked stand conditions and the higher parentage of late seral species. There is a greater chance, particularly in the warm-dry and hot-dry biophysical environments, that fire or insects and disease will reduce the carrying capacity of DOGs/DOGs/PWFAs.

Timber harvest and prescribed fire can be used to help address long-term sustainability concerns by restoring historic stand structure and fire regimes. Regional Forester’s Eastside Forest Plans Amendment #2 (USFS 1995) and the Upper Middle Fork John Day Watershed Analysis (USFS 1998) recommended shifting OFMS stands back towards OFSS, where appropriate. This strategy is most appropriate in the hot-dry and warm-dry biophysical environments. Amendment #2 also directs that younger stands should be managed towards OFMS and OFSS. Action alternatives incorporate these strategies at varying levels (See Table WL -7).

Table WL-6. Harvest Treatment within Old Growth Habitat and Connective Corridors by Alternative.

Alternative	Harvest Acres in DOGs	Harvest Acres in ROGs	Harvest Acres in PWFAs	Harvest Acres in OFMS and OFSS	Harvest Acres in Old Growth Connectivity Corridors
Alternative 1	0	0	0	0	0
Alternative 2	0	88 (18%)	50 (7%) ¹	61 (2%)	257 (7%)
Alternative 3	0	50 (10%)	50 (7%) ¹	54 (2%)	187 (5%)
Alternative 4	0	0 (0%)*	0 (0%) ¹	0 (0%)	0 (0%)

¹Pileated Woodpecker Feeding Areas overlap Replacement Old Growth.
* Alternative 4 includes precommercial thinning in replacement old growth without commercial harvest. These acres are not shown in the table.

The Forest Plan (page. IV-106) permits management of the ROGs to maintain or enhance the capability of a site to provide old-growth habitat in the future. In ROG 335, all action alternatives would thin 50 acres (Unit 32). In ROG 241, Alternatives 2 and 4 would thin 38 acres (Units 38 and 39). Alternative 3 would not thin Units 38 and 39. Alternatives 2 and 3 would use a combination of commercial and precommercial thinning. Alternative 4 would strictly use precommercial thinning.

Thinning prescriptions would be modified to induce uneven-aged management, to reduce fire risk, and to increase growth rates on the residual trees. All trees 21 inches and larger in diameter would be retained, except where they present a safety hazard or operational constraints such as in the construction of temporary roads for logging. Existing snags 12 inches dbh and greater would be retained except where they present a safety hazard. Approximately 8.6 miles of temporary road would be constructed in Alternative 2, and 1.5 miles in Alternative 3 to facilitate logging and decommissioned when logging is completed.

Stands are in the cold dry and warm-dry biophysical environments. They classify as SECC or SOCC, mid-successional stands which currently provide little to no nesting habitat for pileated woodpeckers or denning habitat for marten due to lower canopy cover and a deficiency in large diameter trees, snags and down logs. Stands may be used for foraging, more likely for pileated woodpeckers and less likely for martens.

In the short- to mid-term, thinning and road construction would further reduce the suitability of these stands for pileated woodpeckers and pine martens. Thinning would, however, accelerate growth of residual trees and development of old growth habitat; stands could provide source habitat for pileated woodpeckers and martens more quickly than under the No Action Alternative. All snags and down logs would continue to provide potential nest cavities and foraging habitat. The number of snags felled for safety reasons during logging would be considered incidental; felled snags would be retained on site as downed logs. Alternative 3 does not treat Units 38 and 39; in the short- to long-term, conditions would provide better foraging habitat for pileated woodpeckers and possibly pine marten, but would take longer to develop old growth conditions suitable for nesting or denning.

Alternative 4 would be strictly precommercial thinning of smaller diameter trees. This treatment is not as intensive as the commercial/precommercial thinning proposed in Alternatives 2 and 3; post-treatment canopy cover would be greater, but the stands would likely take longer to develop into old growth.

Although habitat for pileated woodpecker and pine martens would be reduced in the short- to mid-term, core areas in the DOGs and the remainder of the ROGs/PWFAs would be maintained to provide habitat. Implementation of any of the action alternatives would meet the direction in the Forest Plan, which should provide for the viability needs of the pileated woodpecker, pine marten, and other OFMS associated wildlife species. DOG and ROG boundaries would be consistent with forest vegetation stand boundaries in the Forest GIS database after implementation. DOGs will not be treated. Changes would improve the effectiveness of administering these habitats and ensure their continued function on the landscape.

The effects of treatments in old growth outside the DOGs/ROGs and in connectivity corridors will be discussed in the Old Forest Single Stratum, Old Forest Multi-strata, and Connectivity sections below. All alternatives thin an additional 39 acres of OFMS (portion of Unit 78). Treatment acres are in the cool dry, biophysical environment. OFMS likely provide nesting/denning habitat as well as foraging habitat for pileated woodpeckers and marten. Alternatives 2 and 3 would thin trees to about 65 square feet of basal area. Stands would still classify as OFMS following treatment, although tree stocking and canopy cover would be reduced. In the short- to mid-term, thinning would reduce the suitability of these stands for pileated woodpeckers and pine martens. Thinning would, however, reduce fire risk and increase growth rates on residual trees. Alternative 4 would be strictly precommercial thinning of smaller diameter trees. This treatment is not as intensive as thinning proposed in Alternatives 2 and 3; post-treatment canopy cover would be greater, but growth rates on residual trees would be lower. Habitat for pileated woodpeckers and pine martens would be reduced.

Old Forest Single-Stratum

Direct and Indirect Effects

Chapter 1 identified a need to develop historic levels of OFSS structure habitat in the project area. In the Mill Creek subwatershed, OFSS occurs on 3% and 0% of the warm-dry and hot-dry biophysical environments, respectively. Historically, this habitat type occurred on 15-55% and 20-70% of the warm-dry and hot-dry biophysical environments, respectively. In addition, some cold dry biophysical environments, particularly those in grand fir/grouse huckleberry plant associations, are currently overstocked, multi-strata stands; historically many of these sites were also dominated by OFSS stands.

Table WL-7 displays acres of OFMS conversion, OFSS maintenance and OFSS development. Descriptions are described below the table. OFSS treatments would benefit species that utilize these habitats including the white-headed woodpecker and flammulated owl. Table WL-7 also displays the percentage of the Mill Creek subwatershed that would classify as OFSS in 50 years; the Forest Vegetation Simulator (FVS) model and fire behavior extension was used to make these projections and are intended to be used as a comparison tool between alternatives.

Table WL-7. OFSS Treatments. Acres of OFSS Development by Alternative. Projected OFSS at 50 years by Alternative. Existing OFSS comprises 3% of the Mill Creek Subwatershed.

	Alt. 1	Alt 2	Alt 3	Alt 4
Treatment Acres in OFMS - OFMS to OFSS conversion	0	44	40	39
Treatment Acres in OFSS – OFSS Maintenance	0	17	14	6
Treatment Acres - OFSS Development¹	0	2,130	1,571	750
% of Mill Creek Subwatershed in OFSS in 50 years	15%	27%	24%	15%

¹Thinning acres in YFMS, UR, SECC, and SEOC stands.

The quickest method to create OFSS is to convert OFMS stands directly into OFSS stands by thinning from below. Treatments are proposed in hot-dry, warm-dry, cool dry and cold dry biophysical environments. In the warm-dry biophysical environments, only OFSS stands would be treated; the warm-dry OFMS structural stage is currently below HRV, so treatment would not occur. OFMS/OFSS conversion treatments would move stands towards OFSS but not necessarily change structural stage classification in one harvest entry. In OFSS maintenance treatments, stands already classify as OFSS; thinning would remove understory trees that have grown in due to fire suppression. Following treatment, stands would be more open and better mimic historic conditions. Table WL-7 displays acres treated; acres do not vary significantly between alternatives and treat only a small percentage of the total OFMS/OFSS acres in the subwatershed, i.e., about 2%. Locally, treatments at such levels would improve habitat for white-headed woodpecker; at the landscape level, treatment levels would be insignificant.

Proposed OFSS development treatments have a much greater influence on white-headed woodpecker habitat. The three action alternatives prescribe commercial and/or precommercial thinning of mid-successional stands (YFMS, UR, SECC, and SEOC) to help develop OFSS habitat over the mid- to long-term. The majority of the proposed thinning units are in the warm-dry biophysical environment. OFSS development in treated stands would depend upon the current availability of large diameter trees (21+ inch dbh), the thinning intensity, and the resultant time it takes for small diameter trees to grow into large diameter trees. Shelterwood harvest would also be used to shift multi-strata stands back towards single-stratum stands. Table WL-7 indicates that Alternative 2, followed by Alternative 3, would implement the most OFSS development treatments. Although proposed thinning would be intended to benefit these species in the mid- to long-term, some habitats may actually be used soon after treatment. In the short-term, canopy cover would be reduced and herbaceous vegetation and shrub growth would be stimulated. Populations of species that use OFSS, including the white-headed woodpecker, would be expected to increase. Alternative 4 is restricted to precommercial thinning of small diameter trees, and therefore, does little to accelerate growth of residual trees; although treatment would open understories and improve habitat for white-headed woodpeckers, development of

OFSS would likely take longer than under Alternatives 2 and 3. Under all action alternatives, prescribed burning would be utilized in many of these stands to maintain open conditions.

Table WL-7 displays the percentage of the Mill Creek Subwatershed that would classify as OFSS in 50 years. Currently, about 3% of the subwatershed classifies as OFSS. Under Alternatives 2 and 3, 27% and 24% of the subwatershed would be expected to classify as OFSS in 50 years compared to 15% under the No Action Alternative. Alternative 4 does little to accelerate growth of residual trees; development of OFSS over time would be similar to levels expected under the No Action Alternative. Populations of species that use OFSS, including the white-headed woodpecker and flammulated owl, would be expected to increase under all alternatives, but available habitat would be substantially higher under Alternatives 2 and 3.

Old Forest Multi-Stratum

Direct and Indirect Effects

OFSS development would come at the expense of YFMS habitat. Development treatments would alter stand structures in multi-strata stands in the short-, mid-, and long- term, making them less suitable to multi-strata associated species. Table WL-8 displays the number of acres of OFMS and YFMS habitat that would be treated. Table WL-8 also displays the percentage of the Mill Creek subwatershed that would classify as OFMS in 50 years; the Forest Vegetation Simulator (FVS) model and fire behavior extension were used to make these projections and are intended to be used as a comparison tool between alternatives.

Table WL-8. Acres of YFMS treatment by Alternative. Projected OFMS at 50 years by Alternative. Existing OFMS comprises 15% of the Mill Creek Subwatershed.

	Alt. 1	Alt 2	Alt 3	Alt 4
Treatment Acres – OFMS/YFMS	0	418	248	135
% of Mill Creek Subwatershed in OFMS in 50 years	29%	28%	29%	29%

As discussed previously, OFMS/YFMS stands would be moved towards a single-stratum habitat condition in the mid- and long-term. Thinning and prescribed burning would result in immediate reductions to overall canopy closure as well as substantial changes in stand structure (multi-stratum to single-stratum) in the stands entered. Prescribed burning would help maintain these conditions and support development of OFSS.

Stand density and canopy cover would be reduced to levels below what is considered primary habitat for pileated woodpecker and pine marten. Habitats would generally classify as secondary habitat for these species at best, and as such are less valuable for nesting and denning habitat. Habitat conditions after harvest would generally preclude nesting by the pileated woodpecker, however, existing snag and downed wood densities would generally be maintained in the short- and mid-term (slight decreases are likely to result from harvest activities). These stands could be used by the pileated woodpecker for foraging. Pine marten would likely avoid these areas after treatment.

In the biophysical environments being treated, OFMS and YFMS would be expected to remain within HRV immediately after treatment. Treatment units are generally smaller and isolated, so large core habitat areas for these species would remain. Because of the DOG/ROG network and the availability of suitable multi-strata habitat elsewhere in the analysis area, it is unlikely that proposed reductions in multi-strata habitat would affect pileated or pine marten populations or their distribution in the analysis area.

Under all alternatives, OFMS would be expected to increase over time. At year 50, about 29% of the subwatershed would classify as OFMS compared to 15% today. Essentially all alternatives would develop about the same amount of OFMS over time. OFMS stands would remain at risk to a large-scale, stand-replacing fires that could set back structural stage development, resulting in large areas of young trees and longer time spans to develop old forest structures.

Implementation of any of the action alternatives would meet direction in the Forest Plan, which should provide for the viability needs of the pileated woodpecker, pine marten, and other OFMS associated wildlife species. Habitat would increase over time.

Connectivity

Direct and Indirect Effects

With the implementation of each of the action alternatives, there are some activities that would occur within connectivity corridors. WL-9 shows the acres of connectivity habitat that would be treated under each action alternative and the percentage of the connectivity network that would be affected. See Appendix A for a list of units entering connectivity corridors.

Table WL-9. Connectivity habitat acres treated by Alternative. Percentage of total corridor acres treated by harvest.

Alternative	Acres Connectivity Habitat Treated by Harvest	% of Connectivity Habitat Treated by Harvest
Alternative 1	0	0%
Alternative 2	257	7%
Alternative 3	187	5 %
Alternative 4	177	5%

Under Alternatives 2 and 3, commercial and precommercial thinning would be implemented. Alternative 4 would strictly use precommercial thinning of small diameter trees. All acres would be treated with an OFSS development prescription as described previously. This prescription would begin to move these stands toward an OFSS stand structure by thinning the stands from below, removing a portion of the understory tree layer. Thinning intensity would depend on the biophysical environment being treated.

In the short-term, canopy cover and screening cover would be impacted in these stands. Canopy cover would not be reduced below standards for connectivity in the amended Forest Plan; i.e., cover would not be reduced below 2/3rds of site potential. Canopy closure in these stands would

range from 32% to 50% following treatment. A minimum of 25% of each stand would be retained in untreated patches at least 1 acre in size to maintain additional hiding/screening cover. Maintenance of existing downed woody material in the stands would maintain a portion of understory screening cover as well. Understory screening cover (shrubs, grasses, and forbs) impacted by harvest activities (felling and skidder use) would recover in the mid-term.

Although treatment acres would vary by alternative, differences are minimal and less than 10% of the connectivity corridors would be harvested under all alternatives. Prescribed burning would also be used in the connectivity corridors; stands would be burned in a mosaic of treated and untreated patches. Tree mortality would be kept relatively low and would be expected to range from 1% to 15% in most areas. Although burning would reduce cover, prescriptions would be designed to meet Forest Plan standards for connectivity. Treatments would not result in changes that would prevent the use or free movement of old growth associated species, wide ranging carnivores or big game animals.

All Alternatives

Cumulative Effects

All of the activities in Appendix D – Cumulative Effects have been considered for their cumulative effects on old growth, connectivity habitat and associated species. The following discussion focuses on those past, ongoing and foreseeable future activities that may contribute positive or negative effects. Past timber harvest and road building have significantly reduced and fragmented the amount and effectiveness of old growth habitat.

Old growth habitat is deficient in the Planning Area as reflected in the HRV tables in the Vegetation Section of this document. OFSS is well outside HRV, particularly in the hot-dry and warm-dry biophysical environments. Loss of OFSS is due to a combination of timber harvest and fire suppression activities. Fire suppression allowed tree densities to increase, shifting many stands from OFSS to OFMS. Removal of large diameter trees then converted these stands to YFMS or younger, even-aged structural stages. OFMS is within HRV for all biophysical environments except the warm-dry type. OFMS habitats in the warm-dry biophysical environment have been reduced below HRV, primarily due to past timber harvest and road construction.

Forest Plan, Management Area 13 (MA-13) provides for the management of old growth habitat through a system of Dedicated Old Growth (DOG) and Replacement Old Growth (ROG) areas. Under the action alternatives, the additional protections afforded through the DOG, ROG, and PWFA designations and re-delineations would create a beneficial cumulative effect on the viability of old growth MIS by ensuring management of those habitat conditions needed for these species. These areas would be managed in the future to maintain their suitability (habitat conditions and size) for pine marten and pileated woodpecker, and help ensure the viability of these species within the analysis area. The No Action alternative does not meet Forest Plan standards for MA-13, and therefore, may not be as effective as the action alternatives in protecting old growth.

Since 1993, the Forest Plan as amended has directed the Malheur National Forest to conduct timber sales in a manner that moves stands towards OFMS and OFSS structural stages, regardless of whether or not they are in Management Area 13. Timber sales planned since that

time have not contributed to loss of late and old growth forest, although understory stocking may have been reduced to shift stands from OFMS to OFSS to better reflect HRV.

Shifting stands from OFMS to OFSS would reduce habitat for canopy dependent species such as pileated woodpecker and pine marten and improve habitat for species such as white-headed woodpecker and flammulated owl. This shift in old growth type would increase, rather than decrease the wildlife species diversity. Cumulatively, restoring natural vegetation conditions and fire regimes would make these habitats far more self-sustaining for associated wildlife species. Overall, proposed timber management and prescribed burning would contribute positively toward the viability of species that use old growth habitats.

Past management activities have reduced snags and down wood in old growth habitats. Design measures for the action alternatives would minimize additional loss of these habitats; additional losses would be considered incidental. The Forest's firewood policy prohibits the cutting of firewood in DOG/ROG areas, so prescribed snag and downed wood levels should be maintained. In OFMS and OFSS outside the DOG/ROG network, snags along roads would continue to be removed as firewood, reducing habitat for pileated woodpeckers, pine martens, white-headed woodpeckers, three-toed woodpeckers and other species that use deadwood habitats.

Adjacent private lands have managed in the past. Most adjacent private lands have been lightly commercially thinned within the last decade. In the past, private lands appear not to have been managed for old growth habitat and no change in this strategy is expected. These areas are not expected to provide OFMS or OFSS habitat in the future.

Past harvest has reduced the quantity and quality of connectivity between old growth stands. Since 1993, the Forest Plan as amended has directed the Malheur National Forest to protect connectivity habitat between LOS stands. Recent timber sales such as Clear, Olmstead, and Dry designated connectivity habitat in the landscape surrounding Crawford. The Crawford analysis considered these connectivity corridors when identifying corridors with the Crawford area. The nearby Easy Fire burned both old growth and connectivity habitat, and opportunities to designate connectivity habitat in the fire area has been reduced. Even though the action alternatives proposed in Crawford would conduct harvest and prescribed burning activities within connectivity corridors, the prescriptions would maintain Forest Plan standards for connectivity, permitting movement of wildlife species across the landscape. Alternatives proposed in Crawford would not have an adverse cumulative effect on the quantity and quality of connectivity. There are no foreseeable future activities that would affect connectivity.

In the short-term, the No Action Alternative would not contribute to cumulative losses of old growth or connectivity habitat because stands would not be treated. In the long-term, the No Action alternative, by forgoing action, could negatively contribute to the loss of OFSS and associated species.

In the short-term, the action alternatives would not contribute to cumulative losses of mature and old growth habitat because stands would not be treated except to enhance old growth attributes. In the long-term, the action alternatives would contribute positively to cumulative effects by accelerating the development of OFSS and maintaining connectivity habitat between LOS. Therefore, proposal activities would contribute positively toward the viability of species that use these habitats. There are no significant adverse cumulative effects to pileated woodpeckers or pine martens or their habitat from any of the alternatives; there are positive effects to white-headed woodpeckers from OFSS development.

Affected Environment - Big Game Habitat

Rocky Mountain elk and mule deer are big game species of concern due to their high public value. Species are considered widely distributed across the District, Forest and the Blue Mountain Region. Rocky Mountain elk are identified in the Forest Plan as a Management Indicator Species (MIS); habitat quality is evaluated in terms of forest cover, forage, cover/forage spacing and open road density.

The project area is entirely within big-game summer range (predominately ponderosa pine and mixed conifer stands above 4,600 feet elevation). Lower elevations in the area represent transition range, although some elk are observed here in summer months. Due to significant snow accumulations, most elk leave the area to winter at lower elevations. The amount of big game sign; pellets and beds, and animals observed indicates a moderate to high use of the area.

Elk habitat was evaluated using the Habitat Effectiveness Index (HEI) (Thomas et al. 1998), satisfactory and marginal cover percentages, and open road densities. Big game cover was designated using stand exams, Most Similar Neighbor analysis, aerial photograph interpretation and field reconnaissance.

Big Game Populations

Big game management on the Malheur National Forest is a cooperative effort between the Forest Service and the Oregon Department of Fish and Wildlife (ODFW) where the Forest Service manages habitat while ODFW manages populations. The agencies cooperate by managing big game according to pre-established Management Objectives (MOs) for each big game management unit. The Crawford Project Area lies within portions of the Sumpter and Desolation Big Game Management Units. Table WL-10 displays Management Objectives for elk populations, bull to cow ratios, and calf to cow ratios by Management Unit. Annual estimates are displayed since 1995.

Table WL-10. Wintering Elk populations estimates and Management Objectives

Year	Population	Bulls per 100 cows	Calves per 100 cows
Desolation Unit			
Year	Management Objectives (MOs)		
	1,300	10	N/A
2005	1,235	8	33
2004	1,200	8	28
2003	1,365	6	17
2002	1,625	9	25
2001	1,400	12	40
2000	1,300	11	32
1999	1,350	9	37
1998	1,500	12	31
1997	1,600	10	52
1996	1,400	10	27
1995	1,400	6	48
Sumpter Unit			
Year	Management Objectives (MOs)		
	2,000	10	N/A
2005	1,800	15	35
2004	1,700	13	34
2003	2,000	9	35
2002	2,000	14	34
2001	2,000	12	33
2000	2,005	13	33
1999	2,070	11	39
1998	2,150	13	43
1997	2,305	14	38
1996	2,310	13	27
1995	2,330	2*	27

Table WL-10 indicates that elk population levels have remained relatively stable over the last 11 years in both the Sumpter and Desolation Management units in spite of past forest management activities. Population numbers and management objectives are being met at the 90% level for the Sumpter Management Unit and at 95% level for the Desolation Management Unit (ODFW 2006).

Wintering elk populations have met population MOs except for 2004 and 2005. ODFW Biologists Darren Bruning and George Keister (personal communication, 2004, 2005 and 2006) stated that although animal numbers fell below MOs in recent years, the lower values are considered insignificant and adjustments in hunting permits can quickly recover populations.

Bull to cow ratios have generally exceeded MOs in the Sumpter Management Units and dropped below MOs in the Desolation Management Units. As bull/cow ratios decline below 10 bulls/100 cows, breeding dynamics within a herd also change, and there can be a corresponding reduction in cow/calf ratios (ODFW 2003). Bull to cow ratios are influenced by a number of factors including numbers of hunters, length of hunting seasons, including the rutting period in the hunting season, lack of restrictions of antler class in harvest, lack of hiding cover, and high open road densities (Wisdom and Thomas 1996, Irwin et al 1994, Schommer and Johnson 2003).

Calf recruitment is the number of sub-adult animals added to the population each year. Recruitment levels are expressed as the number of calves per 100 cows. ODFW does not establish MOs for calf to cow ratios because the level of recruitment necessary for population

maintenance varies annually depending on the rate of adult mortality. The average number of calves needed to sustain elk populations ranges between 20 to 40 calves per 100 cows, depending on the annual adult mortality. Both the Sumpter and Desolation Management Units have generally supported ratios within this range.

Since the 1960’s, there has been a general decline in calf to cow ratios in many of the Management Units in Eastern Oregon. Several ODFW biologists feel predation by bears, cougars, and coyotes are the main reason for poor calf survival (Communication with ODFW biologists Darren Bruning and George Keister 2004). Another factor affecting the low calf survival may be the lack of hiding cover especially in riparian areas which contributes to increased predation. ODFW is currently conducting a three-year study in the northern Blue Mountains to investigate the potential causes of calf mortality.

Habitat Effectiveness Index (HEI)

Thomas, et al. (1988), developed the Habitat Effectiveness Index (HEI) model for estimating elk habitat effectiveness on the landscape. Overall habitat effectiveness (HEscr) incorporates three variables or indices for summer range: cover quality (HEc), size and spacing of cover (HEs) and open road density (HEr). The Forest Plan establishes minimum standards for these indices. In addition, the Forest Plan establishes minimum standards for retention of satisfactory cover (%S), marginal cover (%M), total cover (%S and %M), and open road density (see Table WL-11).

Habitat components; thermal/hiding cover and forage, have been altered due to past management and fire suppression; however, cover habitats tend to be adequately distributed throughout the analysis area. Past timber harvest, fragmentation, fire suppression and natural openings result in a cover/forage ratio of about 50% cover and 50% forage. Travel and migration corridors are provided for daily and seasonal movements.

Table WL-11 displays existing HEI values, cover percentages, and open road densities for the Mill Creek Subwatershed.

Table WL-11. Existing HEI Values, Cover Percentages and Open Road Densities.

Subwatershed	HEc	HEs	HEr	HEscr (HEI)	%S	%M	Total Cover %	Open Road Density (miles per square mile)
Forest Plan Standard	.30	.30	.40	.40	12%	5%	20%	3.2
Mill Creek	.53	.69	.50	.57	2.7%	47.1%	49.8%	1.8
HEI = HEscr = Habitat Effectiveness Index 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								

Timber harvest, precommercial thinning, road construction, fire suppression, wildfires, insect and diseases, livestock grazing and natural site capabilities have all contributed to the current habitat conditions displayed in Table WL-11. The current cover/forage ratio is 50:50. The following sections discuss the various habitat components in more detail.

Forage

Approximately 8,900 acres or 50% of the subwatershed currently classifies as forage. For the purpose of this analysis, forage areas include areas ranging from grasslands to forested stands with less than 40% canopy cover. Current forage conditions are primarily the result of site productivity, fire suppression, and timber and grazing management. Overstocked forested stands tend to reduce forage; many shrubs, grass and forb species are inhibited by reduced sunlight reaching the forest floor. Livestock grazing can be beneficial or detrimental to big game. Range standards and AUMs (animal unit months) are set to meet the forage needs for both livestock and big game.

Cover

Satisfactory and marginal cover is sometimes referred to as thermal cover. Deer and elk use thermal cover to moderate harsh weather conditions, i.e., to keep cooler on hot days and to keep warmer on cold days. Under thermal cover, animals need to expend less energy for thermal regulation. The Forest Plan defines satisfactory cover for elk as a stand of coniferous trees 40 or more feet tall with an average canopy closure equal to or exceeding 50% for ponderosa pine and 60% for mixed conifer. Acres of satisfactory cover equal 476 acres, 2.7% of the subwatershed. Satisfactory cover is below the Forest Plan standard of 12%. Marginal cover is defined as a stand of coniferous trees greater than 10 feet tall with an average canopy cover meeting or exceeding 40 percent. This habitat type is present on 8,386 acres, 47.1% of the subwatershed. Total cover equals nearly 50%, above the Forest Plan standard of 20%. See figure WL-1.

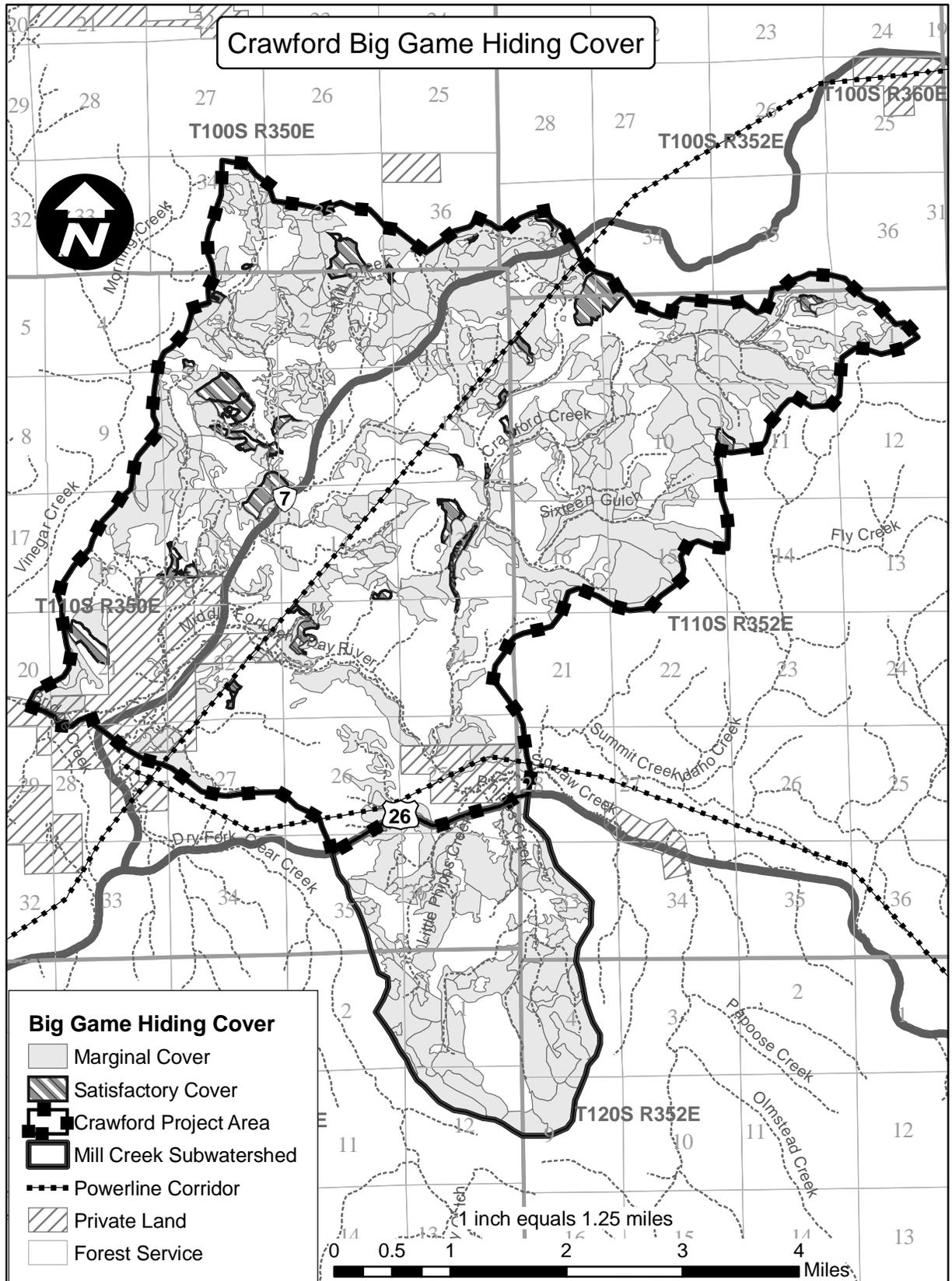
It is important to note that recent research at the Starkey Experimental Station in La Grande, Oregon (Cook 1998) has raised the concern that resource managers may be overstating the importance of thermal cover on elk condition. Studies suggest that the energetic benefits of cover may be inconsequential to elk performance, and that it is forage or nutritional effects that may have the greater impact on individual animal performance. However, these studies do not dispute elk's preference for dense forest stands or the numerous studies that show elk using dense stands disproportionately to their availability. Dense conifer cover contributes to better distribution of elk across available habitat, and may be more of a disturbance/hiding cover issue than a thermal regulation issue.

Hiding cover, also referred to as security cover, is also important to big game animals. Hiding cover provides a visual barrier between big game animals and disturbance sources. This is especially important during hunting season when big game animals alter their travel patterns to avoid humans. Hiding cover is difficult to quantify. Many stands classified as satisfactory or marginal cover provide hiding cover. Even in non-thermal cover stands, small thickets of saplings 1 to 2 acres in size can offer security. Generally, hiding cover is more prevalent in the moist forest environments at higher elevations and less prevalent in the dry forest environments at lower elevations.

Table W-11 displays levels of satisfactory and marginal cover; these cover percentages provide some indication of the availability of hiding cover in the subwatershed. Satisfactory cover is typically multi-storied and often meets elk hiding cover criteria. Satisfactory cover is limited (476 acres) and is in small 1 to 73 acres patches distributed throughout the subwatershed. However, there are 8,386 acres of marginal cover, much of which will contribute to hiding cover at various levels. Due to the relatively flat topography, existing levels of hiding cover are generally not mitigated by landforms.

Historically, this area may not have had a substantial amount of cover. About 65% of the subwatershed is in the hot-dry and warm-dry biophysical environments. These environments typically do not support high densities of conifer stems for more than 40 years. In recent years, commercial and precommercial thinning in the dry biophysical environments have started shifting stands back towards more historic conditions, reducing hiding cover in size and quality. Nevertheless, cover is currently believed to be at levels that exceed HRV.

Figure WL-1. Crawford Big Game Hiding Cover



Roads

The open road density for the Mill Creek subwatershed is 1.8 open miles per square mile. This density is below the Forest Plan standard of 3.2 miles per square mile for summer range (USDA 1990, IV-6), and very near the Forest Plan desired condition of 1.5 open miles per square mile.

The northeast boundary of the Mill Creek subwatershed is shared with the Patrick Creek Cooperative Travel Management Area (also known as a green dot closure area) on the Wallowa-Whitman National Forest. Restriction periods reduce some traffic in the fall and correspond to general deer and elk hunting seasons. Open road densities in Table WL-11 do not reflect seasonal closures. The change in numbers would benefit big game; however, the change is relatively small and would not change the overall HEI and HEr values.

Even with this relatively low road density there is concern regarding impacts to big game. Road closures have not been effective in some areas of the subwatershed. The greatest potential for impact is during hunting seasons, when hunter traffic and the associated “stimulus” associated with those activities are at their highest level. Road closures are difficult to enforce, even those with barricades and gates, due to flat topography, open forest vegetation and a lack of enforcement personnel.

Perhaps more important than the impacts of road densities upon elk habit use and selection is the spatial relationships of those roads. Recent studies at the Starkey Experimental Station found a strong correlation between road activity and habitat selection (USDA 2006). The research determined distance from roads was more accurate for estimating disturbance to elk than open road density alone. Researchers found a strong correlation between road activity and habitat selection. Elk response was affected by traffic rates, amount of forest cover near roads, and the type of road (which related to traffic rates). Female elk consistently selected areas away from open roads in both spring and summer. Once the elk were farther away from roads, they were more influenced by other factors such as conditions affecting forage. When elk were unable to avoid roads and trails, subsequent studies showed that animals increased their movement rates, which can increase energy expenditures. Higher movement rates could thus reduce the animals’ fat reserves and undermine general animal condition and winter survival. The same research indicated that mule deer behavior seemed to be affected more by elk than by roads. Mule deer tended to avoid elk and so the deer often used areas near roads. That is, mule deer are more likely to use areas least used by elk, which means deer end up in areas near roads with the most traffic.

The Starkey research (USDA 2006) suggests the spatial arrangement of roads has a greater influence on elk and deer than the Forest Plan road density model suggests. The research has shown that distance bands are more accurate for estimating disturbance to elk than road density alone. Traffic effects would gradually decrease as distance from open roads increases. All habitats in the analysis area are within 1,000 meters of an open road. About 97% of the area is within 500 meters of an open road; i.e., only 3% of the area is further than 500 meters. Therefore, the presence of open roads likely reduces the habitat effectiveness of the area. This is particularly important given the existing cover levels and the gentle topography for much of the area.

Fawning/Calving Habitat

To determine the amount of fawning/calving habitat within the Mill Creek subwatershed a GIS analysis was conducted. The following habitat variables were considered in this analysis; slopes

< 15%, canopy cover > 37%, and proximity to water (streams, pond, and springs) < 400 meters (Toweill and Thomas 2002). This analysis determined that there are approximately 430 acres of fawning/calving habitat that meet the criteria within the analysis area. However, this could be an underestimate due to the variable nature of fawning/calving habitat selection by female deer and elk. At first consideration, 430 acres does not seem to be adequate. However, the elk and mule deer populations in the Sumpter and Desolation Game Management Units have had a stable population for the last 11 years (see Table WL-10). It is possible that the majority of deer and elk are born outside of the analysis area.

Environmental Consequences - Big Game Habitat

Alternative 1 - No Action

Direct and Indirect Effects

Existing conditions would be maintained in the Mill Creek subwatershed, resulting in no change in the Habitat Effectiveness Index (HEI) for elk. HEI would remain at .57 in the short-term (0 – 5 years) and mid-term (5 – 25 years). The existing cover to forage ratio (50:50) would be maintained in the short-term and mid-term. In the long-term (> 25 years), HEI would likely remain stable.

Future development of multi-strata stands (with continued fire suppression) would create additional satisfactory and marginal cover stands in the long-term, increasing hiding and security cover for elk. These stands would become denser, and downed wood would be expected to increase as insect and disease levels increase. Increasing stand density and downed wood would improve hiding cover by increasing understory screening structure. These long-term (>25 years) changes could improve HEI over time, although forage would continue to decline.

In the short-term, the current quantity, quality and distribution of forage habitat within the analysis area would be unchanged. In the mid- to long-term, forage would decrease as tree canopies close in forested stands and shade the ground. Use of these habitats would not change from the way they are currently utilized by deer and elk.

Habitat changes would increase the chance of a high severity wildfire in the analysis area. A fire of moderate to intense magnitude and severity could convert multi-strata cover habitat to stand initiation forage habitat in the short- and mid-term, increasing vulnerability of big game to hunting in the roaded portion of the analysis area.

With the selection of this alternative, open road densities would be maintained at the existing levels as described in the Affected Environment section. Within the Mill Creek subwatershed, open road densities meet the desired condition (for the year 1999) identified in the Forest Plan (USDA 1990, IV-6). Existing road densities would remain at 1.8 miles per square mile, which is below the 3.2 miles per square mile in summer range habitat identified in the Forest Plan (USDA 1990, IV-6), and very near the 1.5 miles per square mile desired condition in summer range. This alternative would not result in direct effects to big game security through its implementation.

Relationships between the spatial distribution and disturbance associated with open roads and hiding cover habitat would also not change, as existing road densities and levels of use are expected to remain the same in the short- to long-term. Implementation of this alternative would

construct no new roads, but at the same time, it would do nothing to modify existing open road densities or road management.

In the short-term fawning/calving habitat would remain as described in the existing condition section. In the mid- to long-term increasing cover would likely increase habitat.

Table WL-10 indicates that elk population levels have remained relatively stable over the last 11 years in both the Sumpter and Desolation Management units in spite of past forest management activities. Population numbers and management objectives are being met at the 88% level for the Sumpter Management Unit and at 108% level for the Desolation Management Unit (ODFW 2006). In the absence of a large disturbance event such as wildfire, the No Action alternative would likely maintain big game habitat and populations in the short- to long-term.

Action Alternatives – Alternatives 2, 3 and 4

Direct and Indirect Effects

Table W-12 displays HEI, cover percentage and open road density values for the Mill Creek subwatershed for the Action alternatives. The No Action alternative is also displayed for comparison purposes. All of the action alternatives would affect thermal cover and hiding cover. Table WL-13 displays the number of acres (and percentage) of satisfactory and marginal cover treated by each alternative. The magnitude of change would depend on the acres of satisfactory and marginal habitat converted to forage and the distribution of these habitats across the analysis area. Overall HEI for all alternatives would be .57; cover reductions were not great enough to change HEI from the existing condition. Under all action alternatives, open road densities would be increased by 0.4 miles; as with cover, the magnitude of this change is insufficient to change open road density or the HER value at the subwatershed level. Following Tables WL-12 and WL-13, the effects of the action alternatives will be discussed in more detail.

Table WL-12. Big Game HEI, Cover Percentages, and Open Road Density for Mill Creek Subwatershed by Alternative.

Alternatives	HEc	HEs	HEr	HEcsr (HEI)	%S	%M	Total Cover %	Open Road Density (miles per square mile)
Forest Plan Standard	.30	.30	.40	.40	12%	5%	20%	3.2
Alt 1 - Existing Condition No Action Alt	.53	.69	.50	.57	2.7	47	49.7	1.8
Alternative 2- Proposed Action	.53	.70	.50	.57	2.3	42	44.3	1.8
Alternative 3	.53	.71	.50	.57	2.7	43.1	45.8	1.8
Alternative 4	.53	.69	.50	.57	2.7	45.6	48.3	1.8
HEI = HEcsr = Habitat Effectiveness Index 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 or roads open to vehicular traffic %S = Satisfactory Cover %M = Marginal Cover % Total Cover = %S + %M								

Table WL-13. Reductions in Satisfactory and Marginal Cover by Acres and Percentage.

	Alt. 1		Alt 2		Alt 3		Alt 4	
	Mechanical Treatment ¹	Prescribed Fire ²						
Satisfactory Cover - Acres and % Changed	0	0	70 (-15%)	178 (37%)	0	55 (12%)	0	0
Marginal Cover - Acres and % Changed	0	0	914 (-11%)	947 (11%)	704 (-8%)	947 (11%)	264 (-3%)	947 (11%)
Calving & Fawning Acres (%) Treated	0	0	84 (19.5%)		84 (19.5%)		84 (19.5%)	
Forage Acres (%) Created	0	0	984 (+10%)	NA ³	704 (+10%)	NA ³	264 (+3%)	NA ³
<p>¹Mechanical treatment refers to removal of trees by cutting; following treatment, stands would no longer classify as satisfactory or marginal cover.</p> <p>² Prescribed fire prescriptions are designed to maintain overstory canopy cover. Prescribed fire would kill some trees, but given design features, would not be expected to take stands out of satisfactory or marginal cover classification. Although stands would not be formally classified as “forage,” prescribed fire would enhance/increase forage over time.</p>								

The most direct effect from the action alternatives would be the reduction in satisfactory and marginal cover and the change in cover/forage distribution. Mechanical harvest, i.e., commercial thinning, shelterwood harvest and/or precommercial thinning would drop stands out of cover classification. Cover stands would be converted to forage habitat. Table W-13 displays the number of acres of satisfactory and marginal cover treated.

Alternative 2 would reduce satisfactory cover by 70 acres or 15% of existing satisfactory cover. Satisfactory cover is already below Forest Plan standards; further reductions would require a non-significant Forest Plan amendment. Alternatives 3 and 4 do not reduce satisfactory cover.

All action alternatives would prescribe burn an estimated 6,000 acres of the project area over the next 3 to 5 years with no more than 3,000 acres burned in any one year. Multiple entries may be needed to gradually reduce the litter layer that has increased beyond historical conditions. Table 13 displays the number of acres of satisfactory and marginal cover that would be underburned under each alternative. Note that timber harvest units could also be underburned and acres affected are reflected in the mechanical treatment acres displayed. Burning would occur during spring or fall periods annually for five years. Scheduling is highly dependent on weather conditions. Burning would be limited to one grazing pasture per year and would not occur within harvest or commercial thinning units until these activities including fuels treatments are completed.

Prescribed burning would occur in a mosaic fashion and not all acres are blackened at one time. Tree mortality ranges for forested stands would be as follows:

- Trees 0-5" dbh, tree mortality could be 35% but is expected to range from 5 to 15%.
- Trees 5-10" dbh, tree mortality could be 15% but is expected to range from 5 to 10%.
- Trees 10-20"+ dbh, mortality could be 10% but is expected to range from 1 to 2%.

Prescribed fire in satisfactory cover blocks would have an additional design measure; mortality in trees 1"-10" dbh would not exceed 5%. Prescribed fire prescriptions are designed to maintain overstory canopy cover. Fire would kill some trees, but given design features, would not be expected to take stands out of satisfactory or marginal cover classification.

The action alternatives would cause the loss of hiding/security cover during and immediately after mechanical and burning operations. The potential negative effects of removing understory trees would be reduced by the design requirement to retain unthinned patches of dense trees throughout the project area. Unthinned patches would comprise 5% to 15% of each unit and range from 2 to 5 acres in size depending on the density of understory trees. In units where treatment is limited to prescribed burning, losses in hiding cover would be lower. Burning occurs in a mosaic of burned and unburned patches. In the absence of additional treatments, hiding cover should begin to recover between 5 to 10 years.

Thinning and burning would improve forage conditions by opening canopies and allowing more light to the forest floor. 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 grass and forb species and 10 to 15 years for shrubs 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. Species that respond favorably to fire include pinegrass, elk sedge, wild rose, snowberry, ceanothus, serviceberry, chokecherry and currant.

Mountain mahogany and bitterbrush appear to be somewhat dependent on fire for long-term viability, although short-term effects can be detrimental to these plants. Fire may kill existing plants, but would prepare the necessary seedbed for regeneration. Sagebrush is also killed by fire, but seed germination can be fostered by improved seedbeds as well. The project is not intending to burn through large, expansive shrublands. Mortality and damage of smaller shrub stands and scattered individual plants would be expected. Mosaic burning would retain shrubs throughout the project area. 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.

Action alternatives would change the cover/forage ratio in the Mill Creek subwatershed. Alternative 2 would change the cover/forage ratio from 50:50 to 44:56. Alternative 3 would create a cover/forage ratio of 46:54 and Alternative 4 would create a ratio of 48:52. Cover/forage edge is calculated in the HEs variable of the HEI model. Alternatives 2 and 3 would increase HEs from .69 to .70 and .71 respectively, indicating there will be more cover/forage edge. The cover/forage edge provides both cover and forage within a short distance and is beneficial to elk. As discussed previously, research from Starkey (Cook 1998) suggests that the energetic benefits of cover may be inconsequential to elk performance, and that it is

forage or nutritional effects that may have the greater impact on individual animal performance. Under Alternative 4, HEs does not change from the No Action alternative.

Harvest and burning treatments would occur primarily in the warm-dry and hot-dry biophysical environments. These stands are considered outside HRV, i.e., overstocked and likely unsustainable given the high risk of uncharacteristically severe fire and insect epidemics. Many of these stands could fall out of cover within the next 25 years even if not treated.

Table WL-13 displays the number of acres of fawning/calving habitat that would be modified by alternative. Under all action alternatives, approximately 84 acres or 19.5% of the 430 acres of potential fawning/calving habitat would be modified. It is possible that the majority of deer and elk are born outside of the analysis area. In addition the total acres of fawning/calving habitat could be underestimated due to the variable nature of fawning/calving habitat selection by female deer and elk. During spring burning, if crews see lone animals, they would search the immediate area for calves and fawns and avoid igniting fire where young animals are discovered. Therefore, it is not anticipated that activities proposed would likely effect fawning/calving success. Elk populations in the Sumpter and Desolation Game Management Units have been stable for the last 11 years (see Table WL-10).

Open road densities would increase during timber sale operations to facilitate harvest and log haul. There would be a short-term increase in big game disturbance during logging. Alternative 2 would construct about 8.6 miles of temporary roads to support timber harvest. Alternative 3 would construct 1.5 miles of temporary road. Alternative 4 would not construct temporary road. These roads would increase open road densities only for the duration of the timber harvest activities. All temporary roads would be ripped and seeded as needed after use. An additional 11.9 miles of closed roads would be opened to help facilitate log haul, with most being closed upon completion of timber work. Temporary increases in open road densities would not significantly impact big game.

Recent results from long-term big game studies at the Starkey Project indicates that elk avoided the short-term disturbance of logging activity itself, but elk did not avoid the harvests units or the log-hauling roads during and after timber harvest. In general, the elk populations become more dispersed during and after timber harvest which suggests that elk were moving farther over larger areas to meet their needs. Elk productivity was not negatively affected by timber harvest; however, the vulnerability of elk to hunting did increase. Open landscapes and relatively flat topography make elk more visible to hunters. This would increase hunter success, but would have little effect on elk performance (weight gain, general body condition) (USDA 2006).

Action alternatives would permanently reopen 1.7 miles of closed road and close/decommission 1.3 miles of open road for a net increase of 0.4 miles of open roads. Open road miles would increase from 50.7 to 51.1 miles, slightly reducing available habitat but the change is not large enough to cause a change in the HEr variable. The open road density of 1.8 miles per square mile is below the Forest Plan standard of 3.2 miles per square mile, but slightly higher than the desired condition of 1.5 miles per square mile in summer range. Current road distribution could also continue to affect big game use with only 3% of the analysis area further than 500 meters from an open road. Further reduction in cover, with essentially the same open road density, would decrease security for elk. Activities would likely change big game distribution, but not affect populations.

Reductions in cover may displace some elk onto private land (George Keister, ODFW Wildlife Biologist, personal communication 2006). This could be a problem for private land owners

because their forage and economic resources may be unable to absorb the effects of increases in wild ungulates. This could also be a problem for elk since the current remedy for the private land owner is to issue depredation tags to remove the problem elk. ODFW would continue to adjust hunting permits to maintain populations.

In summary, overall HEI would remain the same under all alternatives. Reductions in thermal and hiding cover would likely affect big game distribution, but would not be expected to affect population numbers. Although satisfactory cover is below Forest Plan standards, total cover remains near or in excess of standards. Retention of unthinned patches in units would help mitigate losses in cover. Forage would increase. Elk populations have remained relatively stable during the last 10 years. Implementation of the action alternatives would not be expected to reduce populations.

All Alternatives

Cumulative Effects

All of the activities in Appendix D have been considered for their cumulative effects on big game habitat and associated species. The following discussion focuses on those past, ongoing and foreseeable future activities that may contribute positive or negative effects.

Past timber harvest, road construction, and fire suppression in the analysis area has affected the quantity, quality, and distribution of cover habitat. In the past there have been 25 timber sales in the Mill Creek subwatershed and many in the surrounding area. From 1910 thru 1998 some 4,330 acres have been treated; some of these acres have had multiple entries. Road construction has increased road-related disturbance on big game animals and their habitats. Historic livestock grazing may have affected forage, but today's livestock grazing is considered compatible with big game use. Past activities are reflected in the HEI, cover and road density values described at the beginning of this section. Overall HEI, total cover and marginal cover meet Forest Plan standards; satisfactory cover does not meet standards.

As discussed previously, Starkey research (USDA 2006) indicates that elk avoided the short-term disturbance of logging activity itself, but elk did not avoid the harvests units or the log-hauling roads during and after timber harvest. In general, the elk populations become more dispersed during and after timber harvest which suggests that elk were moving farther over larger areas to meet their needs. Elk productivity was not negatively affected by timber harvest; however, the vulnerability of elk to hunting did increase. Open landscapes and relatively flat topography make elk more visible to hunters. This would increase hunter success, but would have little effect on elk performance (weight gain, general body condition).

Other ongoing and foreseeable actions, i.e., summer and winter recreation, hunting, firewood cutting, and livestock grazing would continue to occur in the area but are not expected to affect big game on the large scale. These actions may temporarily and in the short-term affect individual animals but are not expected to affect populations.

Disturbance of elk by hunting along open roads and off-road vehicle use would have more impact on big game populations than big game cover conditions created by the Crawford alternatives. Crawford proposes a small increase in overall open roads of 0.4 miles; however, the overall trend in the Forest Service is to reduce open road densities below Forest Plan Standards whenever possible. In fact the Mill Creek subwatershed is already 1.4 miles/square mile below

Forest Plan Standards. The proposed increase in open road miles is not large enough to change open road densities at the subwatershed level.

Forest lands on adjacent private lands have been managed in the past and are expected to be managed the same way in the future; forests would be expected to provide forage for big game rather than cover. Cover/forage classification is reflected in the HEI and cover values in the existing condition section.

Elk population census data for the Desolation and Sumpter Management Units indicate a relatively stable, level, population trend (Table WL-10). It appears that past forest management has not been detrimental to elk populations in this management unit. It is not anticipated that planned activities under any of the action alternatives would cause a decline in elk populations either. However, activities would likely cause a redistribution of animals across the landscape.

The No Action would not contribute significant adverse cumulative effects to big game populations. The combined effects of the Crawford action alternatives and past, present, and reasonably foreseeable future activities would not be expected to adversely affect populations or viability of big game species within the analysis area. Combined, projects would be expected to maintain overall HEI at or above Forest Plan standards.

Affected Environment - Primary Cavity Excavator Species

Primary Cavity Excavators (PCEs) depend on standing and downed wood for foraging, nesting, and roosting. These species create cavities in dead and live trees. Secondary cavity users (flying squirrels, etc.) can use cavities excavated by these species. Primary cavity nester habitat can occur in a variety of vegetative communities with various structural conditions (Thomas 1979). In general, existing and potential habitat can be found throughout the analysis area, except for non-forest areas and forest stands in the process of regeneration (stand initiation and stem exclusion structures). Few large snags and down logs occur in much of the formerly harvested areas in the analysis area. Untreated stands, stands within the wilderness area, and Dedicated Old Growth stands have relatively high snag densities when compared to previously harvested stands.

The Forest Plan identifies 11 primary cavity excavators as Management Indicator Species for the availability and quality of dead and defective wood habitat: black-backed woodpecker, three-toed woodpecker, downy woodpecker, Lewis' woodpecker, white-headed woodpecker, pileated woodpecker, downy woodpecker, hairy woodpecker, northern flicker, Williamson's sapsucker, red-breasted sapsucker and yellow-bellied sapsucker (USDA 1990, IV-32). The red-breasted and yellow-bellied sapsuckers were formerly classified with the red-naped sapsucker. Neither the red-breasted or yellow-bellied sapsucker are known to occur in Eastern Oregon; the red-naped sapsucker does occur throughout the area and will be used a substitute MIS in this discussion.

Habitat trend information derived from Interior Columbia Basin studies (Wisdom et al. 2000) was reviewed. Habitat trends vary across the Blue Mountains with some watersheds experiencing increased habitat and others decreased habitats, but overall, the trend is towards a loss of habitat. Population trends for these species do not reflect the loss of habitats, with only the pileated woodpecker showing large declines (Wisdom et al. 2000).

Forest Plan Standard for Wildlife Snags

The Forest Plan establishes standards and guidelines for dead standing and downed wood for various levels of biological potential in each management area for Primary Cavity Excavators (PCEs). The plan was amended in 1995 by the Regional Forester’s Forest Plan Amendment #2, also known as the “Eastside Screens.” This amendment requires the retention of snags and green replacement trees greater than or equal to 21 inches diameter breast height (or the representative diameter in the overstory) at 100 percent potential population levels for primary cavity excavators or the best available science. The Forest Plan, as amended, requires that an average 2.39 snags per acre, 21 inches dbh and greater, be maintained within forested stands. It is assumed that these snag and down log levels will provide the minimum level required for 100% of potential population levels of primary cavity excavators (USDA 1990).

Existing Snag Densities

Table WL-12 displays existing snag densities for the Crawford Project extrapolated from stand exams within the analysis area. Stands were queried using the GIS database based on the biophysical environment. Snags were extrapolated from stand exams using a similar neighbor analysis. Snag analysis was conducted on the Mill Creek Subwatershed.

Stands within the Hot-dry and Warm-dry biophysical environments were classified as the Ponderosa Pine/Douglas Fir Forest habitat type for the DecAID analysis. Stands within the Cool Moist were classified as Eastside Mixed Conifer Forest habitat type. Cool Dry and Cold Dry biophysical environments were classified as the lodgepole habitat type.

Table WL-12. Estimated Snag Densities in Crawford Analysis Area by Habitat Type and Diameter.

Wildlife Habitat Type	Snag Diameter at Breast Height (dbh) DecAID Categories	
	> 10 inches	> 20 inches
Ponderosa Pine/Douglas-fir	1.3 snags/acre ¹	0.1 snags/acre ²
Eastside Mixed Conifer – East Cascades/Blue Mountains	8.6 snags/acre ¹	0.1 snags/acre ²
Lodgepole Pine	4.1 snags/acre ¹	0.1 snags/acre ²
Snag density data in stand exams does not exactly match snag density categories in DecAID. ¹ Snag density is for snags greater than or equal to 12 inches dbh. Data was not collected down to the 10-inch level. ² Snag density is for snags greater than or equal to 21 inches dbh. Data was not collected down to the 20-inch level. Therefore, snag estimates are likely conservative.		

On average, current snag densities do not meet Forest Plan standards, i.e., 2.39 snags per acres greater or equal to 21” dbh. This is likely due to past timber harvest. Past harvest removed a large proportion of the snags and existing mature trees (snag replacement trees) from the area. In particular, the large diameter snags 20 inches dbh and greater are deficient.

Current snag densities are more similar to densities found in 1927 timber surveys conducted south of the project area on the Prairie City District (Matz 1927). Forest types are similar to those found in Crawford. Densities were similar, with averages of 1.7 snags per acre 12”-20” dbh and 1.2 snags per acre greater than 20” dbh (Matz 1927).

DecAID Tool

Existing snag data was also compared to wildlife data in DecAID 2.0 (Mellen 2006). DecAID is an internet-based computer program developed as an advisory tool to help federal land managers evaluate effects of management activities on wildlife species that use dead wood habitats. The tool synthesizes published literature, research data, wildlife databases, and expert judgment and experience. DecAID provides both wildlife use and forest inventory data; this analysis will focus on the wildlife use data. DecAID is not intended to be prescriptive; i.e., it is not used to establish standards for snags or down logs. Information is used primarily as a comparison tool.

Data provided in DecAID allows the user to relate the abundance of deadwood habitat for both snags and logs to the frequency of occurrence of selected wildlife species that require deadwood habitat for some part of their life cycle. Tolerance levels (30%, 50%, & 80%) are used to describe the % of the population that utilizes a particular habitat characteristic (e.g. snag density, downed wood density, etc.). Essentially, the lower the tolerance level, the fewer individuals will likely use the area (landscape, watershed, etc.). For example, at the 30% tolerance level for any given species, it would be expected that 30% of a population would find suitable or usable habitat at the specified snag density. Consequently, 70% of a population would not find suitable habitat conditions at that snag density. It should not be assumed the highest tolerance level (80%+) is always the goal for management. In many instances, historic conditions, particularly in the dry forest types did not support the density of snags at the 80% level. In the analysis area, existing snag levels correlate to the lower tolerances levels for various PCE species, primarily at the 30%-50% tolerance levels or lower. The 1927 local data (Matz 1927) suggest that historic conditions could only provide for dead wood conditions at these lower tolerance levels.

While DecAID provides data on wildlife use of snags and down wood, it does not measure the biological potential of wildlife populations. There is no direct relationship between tolerances, snag densities and snag sizes used in DecAID and snag densities and sizes that measure potential population levels (Mellen et al 2006). Therefore, DecAID wildlife tolerance levels are only one component used to evaluate the effects of this project on dead wood habitats and associated species. This analysis also used species' ecology, project design features, Forest Plan standards, local historic snag data and projected snag levels to analyze effects.

Downed Wood

Currently, retention of downed logs is based on the Forest Plan, as amended by the Regional Forester's Eastside Forest Plan Amendment #2. Forest Plan standards and current downed wood densities within the analysis area are displayed in Table WL-14. Current downed wood densities in the analysis area meet Forest Plan standards, based on data collected during stand exams. DecAID was not used to analyze the effects of treatment on downed wood in the analysis area for several reasons. DecAID provides estimates of % cover of downed wood. Available data for the analysis area could be converted to % cover; however, without the length of each piece of wood counted (data which was unavailable), this analysis would likely underestimate % cover. It is expected that current levels of downed wood provide habitat between the 30% and 50% tolerance level.

Table WL-14. Forest Plan Standards/Existing Downed Wood Densities in Analysis Area

Regional Forester’s Forest Plan Amendment #2 (USDA 1995)			Crawford Project Area (Mill Creek subwatershed) Stand Exam Data		
Species	Minimum Log Size Criteria	Down Wood Density	Potential Vegetation Group	Minimum Log Size Criteria	Down Wood Density
Ponderosa pine	Small end diameter>12” and Piece length >6’	3-6 pieces	Ponderosa pine/Douglas fir	Small end diameter>12” and Piece length >6’	12.3
	Total length	20’-40’		Total length	74’ (minimum)
Mixed Conifer	Small end diameter>12” and Piece length >6’	15-20 pieces	Mixed Conifer (grand/white fir, subalpine fir, lodgepole pine)	Small end diameter>12” and Piece length >6’	16.3
	Total length	100’-140’		Total length 100’-140’	100’ (minimum)

Pileated Woodpecker (Dryocopus pileatus)

See the Old Growth section for the ecology, habitat, and population status.

White-headed Woodpecker (Picoides albolarvatus)

See the Old Growth section for the ecology, habitat, and population status.

Three-toed Woodpecker and Black-backed Woodpecker (Picoides arcticus)

The three-toed woodpecker is designated in the Forest Plan as a MIS species for old-growth lodgepole pine and was discussed in the Old Growth section. The black-backed woodpecker is an indicator of primary cavity nesting habitat. These species are similar in appearance and some habitat needs overlap. Marshall (1992) described the similarities and differences in life history, distribution, and habitat requirements. Both species are similar in size, appearance, and forage almost solely on bark beetle larvae. The black-backed woodpecker forages in a broader range of mixed conifer types compared to the three-toed woodpecker. Both species are associated with mature and over mature stand structures. Home range size for the black-backed is estimated at averaging 430 acres, and for three-toed 130-750 acres. Suitable habitat for both species 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).

Nest trees for these woodpeckers may be living or dead with heart rot (Marshall 1992). Black-backed woodpeckers selected nest sites with high densities of small diameter snags in a study by Saab et al. (1999). Black-backed woodpeckers were noted selecting unlogged stands with high snag densities for both nesting and foraging habitat.

Available habitat exists for black-backed woodpeckers. Grand fir stands in the Mill Creek subwatershed have some degree of insect mortality, and grand fir or ponderosa pine trees are available for nesting. These woodpeckers were sighted in the Mill Creek subwatershed during wildlife surveys.

Lewis' Woodpecker (Melanerpes lewis)

Unlike most other woodpecker species in Oregon, Lewis' woodpecker inhabits primarily open forest and woodlands since its primary foraging strategy is fly catching. Nesting habitat consists of two distinct types in eastern Oregon: riparian areas with large cottonwoods, and fire maintained or burned old-growth ponderosa pine forests (NatureServe 2005). 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).

No suitable habitat containing burned ponderosa pine or large diameter cottonwoods are known to exist within the planning area. There are no reported sightings of this species in the project area nor was this species located during breeding bird surveys (Adamus et al. 2001).

Williamson's Sapsucker (Sphyrapicus thyroideus)

In northeastern Oregon Bull et al. (1986) described this species as occurring in mature and old-growth mixed conifer forests at 3,500 - 6,500 feet elevations. Nesting occurs in both live and dead tree species comprised mainly of western larch, but also ponderosa pine, Douglas-fir, and grand fir, in trees and snags averaging 27 inches diameter at breast height with 53% of nesting occurred in grand fir forest types. References to home range size were not found in the literature. A majority of foraging consisted of feeding at sapwells of western larch and Douglas-fir with diameters averaging 8.5 inches.

Suitable old growth comprises approximately 17% of the area, however snags are variable throughout. Sapsucker foraging sign was noted during wildlife surveys and one nest site was located.

Red-naped Sapsucker (Sphyrapicus nuchalis)

Suitable habitat for this species 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 is not selected, but other species may be used (Bull et al. 1986). Hairy woodpeckers feed primarily in ponderosa pine stands, and will use grand fir stand types as well. Live and dead trees greater than 10 inches dbh serve as foraging habitat.

Habitat for this species is well distributed throughout the planning area. However, low snag densities in the ponderosa pine hot-dry communities may inhibit occupation in these areas. One hairy woodpecker was noted during wildlife surveys. Cavities were also reported.

Hairy Woodpecker (Picoides villosus)

Suitable habitat for this species 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 is not selected, but other species may be used (Bull et al. 1986). Hairy woodpeckers feed primarily in ponderosa pine stands, and will use grand fir stand types as well. Live and dead trees greater than 10 inches dbh would serve as foraging habitat.

Habitat for this species is well distributed throughout the planning area. However, low snag densities in the ponderosa pine hot-dry communities may inhibit occupation in these areas. One hairy woodpecker was noted during wildlife surveys. Cavities were also reported.

Downy Woodpecker (Picoides pubescens)

Preferred habitat for this small woodpecker includes cottonwood and aspen stands and riparian areas, but they will use coniferous-deciduous and sometimes coniferous forests. Territories are 5-9 acres. Nesting occurs in trees and snags greater than 8 inches dbh at heights over 15 feet (Marshall et al. 2003). 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. However, this species may be relegated to breeding at lower elevations (Csuti 1997), and may not breed in the elevations found in the Crawford planning area. No birds were reported during breeding bird surveys (Adamus et al. 2001).

Northern Flicker (Colaptes auratus)

This species uses a wide variety of plant communities and successional stages. It prefers open habitats, and is commonly found foraging on the ground in open woodlands, meadows, fields and regeneration harvest areas (DeGaaf et al. 1991 and Csuti 1997). Thomas et al. (1979) reports this species using all forest successional stages for foraging and young (40-79 years) to old-growth (160+ years) for reproduction. Limited reproductive use of earlier stages is due to the absence of snags that this species requires for nesting. Nesting occurs in open areas in snags with some decay. Marshall (2003) noted 71% nest trees had broken tops. Average nest tree diameter was 22" dbh and nest holes were averaged 49 feet. Flickers and their nest cavities were seen within the project area during surveys.

Environmental Consequences - Primary Cavity Excavator Species

Effects to Primary Cavity Excavators (PCE) species were evaluated using the following information: species' ecology, project design features, Forest Plan standards, DecAid tolerance levels, local historic snag data and projected snag and down log levels. The Crawford Project is a green timber sale. As such, harvest would only remove live trees. Snags would not be targeted for removal under this project. Some snags may be lost in treatment units for safety reasons, however, these would be incidental to the harvest of live trees, and any snags felled for safety reasons would be left on the ground.

The effects of harvest activities and prescribed burning on the pileated woodpecker and white-headed woodpecker are discussed here as well as in the Old Growth section of this document. This section also examines effects on other MIS species, including the downy and hairy

woodpeckers, Lewis' woodpecker, the black-backed woodpecker, various sapsuckers, and other primary cavity excavator species described in the Forest Plan (IV-32, Standard 61) as they relate to reductions in snags and downed wood habitat elements.

Alternative 1 - No Action

Direct and Indirect Effects

Selection of this alternative would maintain existing levels of snags and downed wood in the analysis area. No activities would be implemented, so there would be no creation or loss of existing snags or downed wood. Snags would continue to be recruited and fall at existing rates in the short- and mid-term. Snag densities would fail to meet Forest Plan standards in the short and mid-term. In the long-term, continued fire suppression and multi-strata development would increase the chance of insect infestations and disease. These occurrences would potentially increase snag densities.

Downed wood densities would continue to meet Forest Plan standards in the future. Where densities of these habitats are currently high, such as the unmanaged mixed conifer stands, habitat needs for a variety of deadwood dependent species would be met. Within stands where densities of deadwood habitats are low or non-existent, habitat needs for deadwood dependent species would not be met in the short- and mid-term. In the long-term, continued fire suppression and multi-strata development would increase the chance of insect infestations and disease. These occurrences would potentially increase down log densities.

Habitat for Management Indicator Species (MIS) would remain unchanged in the short- and mid-term with the selection of the No Action Alternative. As described above, snag and downed wood used by these species would have the same availability, distribution, and density within this time frame (0-20 years). Deadwood habitat would remain stable for species such as the pileated woodpecker, downy, and hairy woodpeckers, and others. These habitats would continue to provide snags for foraging and nesting, as well as higher canopy closures and near ground level canopy development that provides protection from predators. The growth of understory hardwood shrubs required by some PCE species could be inhibited by reduced solar radiation. In the long-term, insect infestations, disease, and fire would have varying impacts on the quantity and quality of PCE habitat. Disease and insects would increase foraging and nesting habitat for these species. Although snag and down log habitat would be expected to increase, DecAID tolerance levels would be expected to remain around the 30%-50% or lower, as described in the existing condition section.

In the long-term, without management, snag densities may meet or exceed Forest Plan standards. Higher fuel loads would increase the chance of a high severity wildfire. A fire of this magnitude and severity would affect snag and downed wood densities to varying degrees. Stand replacement wildfire would benefit some species (Lewis', black-backed, northern three-toed, and hairy woodpecker, and the northern flicker) while reducing habitat for other species (pileated, white-headed, and downy woodpecker, and the red-naped and Williamson's sapsucker) less associated with fire.

Alternatives 2, 3, and 4

Direct and Indirect Effects

Generally, the effects on existing snags and downed wood and the affected PCE populations would not vary considerably between the different treatment types. In relation to their impact on snag and downed wood habitat, the difference between alternatives would vary by the number of acres treated.

During harvest operations, it is expected that individual snags and pieces of downed wood would be lost through felling of snags that pose a hazard to workers and equipment. Snags felled to provide access to units or within treatment units would be left on site to provide downed wood. Generally, snags would be avoided during these operations. Downed wood could be directly affected by ground based (skidder/tractor) harvest operations. It is assumed that some level of direct impact would occur, as OSHA regulations requirements and the realities of ground based operations and activities would inevitably result in those impacts. The degree of the impact that these activities would have is expected to be low and negligible at the subwatershed scale. Project design criteria, such as retaining clumps of live trees around snags and locating landings and temporary roads where there are few or no snags, would help minimize losses.

Tables WL-15, WL-16, and WL-17 display treated acres and changes to snag densities by alternative, for the Mill Creek subwatershed. The data summarized in these tables was calculated on the assumption that 10% of the existing snags within treated stands (under all treatment types) would be lost during harvest operations. This assumption is based on observations of past green timber sales on the District, the type of equipment that would be used, and professional judgment. The 10% estimate is at the high end of expected losses of snags which have locally ranged from 2% to 10%. This level of impact is used to produce post-harvest snag densities that can be compared to data in the DecAID Advisor. No harvest is proposed in the Eastside Mixed Conifer Forest Habitat, so post-harvest snag estimates are only calculated for the Ponderosa Pine/Douglas-Fir Habitat Type. For this reason, effects on Eastside Mixed Conifer Forest Habitat will not be considered further, and therefore, effects would be as described under Alternative 1.

Table WL-15. Pre-harvest and post-harvest snag densities within the Mill Creek subwatershed Forest Habitat under Alternative 2.

Evaluation Units		Unit	Diameter Group	
			>= 12" dbh	>=21" dbh
Snag Analysis Area	Affected Area	Acres	2,192	2,192
	Subwatershed		15,922	15,922
Snag Density	Affected Area	Snags/acre	1.3	.10
	Subwatershed			
Pre-Harvest	Affected Area	Total Snags	2,850	219
	Subwatershed		20,699	1,592
Post-Harvest	Affected Area	Snags/acre	1.17	.09
		Total Snags	2,565	197
	Subwatershed	Total Snags	20,414	1,570
		Snags/acre	1.3* (no change from existing)	0.1* (no change from existing)

* Snag densities and total snag number were calculated using the entire subwatershed area. Snag extrapolation was based on average snags estimated for the PP/DF type since the majority of the treatment is occurring in these types. Portions of the analysis area are dominated by grassland, grass-shrubland, and shrub-woodland habitats that do not contribute to snag habitat. Exclusion of these acres from the above calculations did not change post-harvest snag densities in the subwatershed. Conclusions would not change.

Table WL-16. Pre-harvest and post-harvest snag densities within the Mill Creek subwatershed Forest Habitat under Alternative 3.

Evaluation Units		Unit	Diameter Group	
			>= 12" dbh	>=21" dbh
Snag Analysis Area	Affected Area	Acres	1,506	1,506
	Subwatershed		15,922	15,922
Snag Density	Affected Area	Snags/acre	1.3	.10
	Subwatershed			
Pre-Harvest	Affected Area	Total Snags	1,958	150
	Subwatershed		20,699	1,592
Post-Harvest	Affected Area	Snags/acre	1.17	.09
		Total Snags	1,762	136
	Subwatershed	Total Snags	20,503	1,556
		Snags/acre	1.3* (no change from existing)	0.1* (no change from existing)

* Snag densities and total snag number were calculated using the entire subwatershed area. Snag extrapolation was based on average snags estimated for the PP/DF type since the majority of the treatment is occurring in these types. Portions of the analysis area are dominated by grassland, grass-shrubland, and shrub-woodland habitats that do not contribute to snag habitat. Exclusion of these acres from the above calculations did not change post-harvest snag densities in the subwatershed. Conclusions would not change.

Table WL-17. Pre-harvest and post-harvest snag densities within the Mill Creek subwatershed Forest Habitat under Alternative 4.

Evaluation Units		Unit	Diameter Group	
			>= 12" dbh	>=21" dbh
Snag Analysis Area	Affected Area	Acres	795	795
	Subwatershed		15,922	15,922
Snag Density	Affected Area	Snags/acre	1.3	.10
	Subwatershed			
Pre-Harvest	Affected Area	Total Snags	1,034	80
	Subwatershed		20,699	1,592
Post-Harvest	Affected Area	Snags/acre	1.17	.09
		Total Snags	931	72
	Subwatershed	Total Snags	20,596	1,570
		Snags/acre	1.3* (no change from existing)	0.1* (no change from existing)

* Snag densities and total snag number were calculated using the entire subwatershed area. Snag extrapolation was based on average snags estimated for the PP/DF type since the majority of the treatment is occurring in these types. Portions of the analysis area are dominated by grassland, grass-shrubland, and shrub-woodland habitats that do not contribute to snag habitat. Exclusion of these acres from the above calculations did not change post-harvest snag densities in the subwatershed. Conclusions would not change.

Burning of activities fuels following timber harvest also has the potential to affect snag and downed wood habitat. The timing (season) of burning, weather (humidity and resultant fuel moisture), and fuel condition and location would combine to determine the intensity of burning. Due to the use of whole tree yarding in the project area, the vast majority of project fuels will be located at landings. Due to the activities and location of landings, it is unlikely that snags or downed wood would be consumed. The area around landings would generally be made snag free in order to ensure the safety of workers at the sites.

As the incidence of insects and disease decreases in treated stands, it would be expected that these agents will create fewer snags. Retention of untreated patches of trees would continue to provide avenues for snag creation. Endemic levels of insect and disease would continue to operate in the stands providing a flow of future snags.

Indirect effects on deadwood habitats include impacts to future deadwood habitats (green tree replacements). The relative affect to the species that would use post treatment habitats is expected to be minor because all stands would be fully stocked following treatment. Forest Plan standards for green tree replacements would be met following treatment. Sufficient snag replacement trees would be available to meet future needs in all treatment units.

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 the Crawford Project area, effects to existing dead wood habitats would be expected to be minimal.

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 12 inches dbh and greater. Greater protection would be given to trees 21 inches dbh and

greater. In other project areas, this mitigation appears to be successful in maintaining most hard snags; however, some larger snags probably would be burned. Many, if not most, soft snags would probably be lost.

Tree mortality directly from the implemented burns, and indirectly from subsequent insect attacks, would likely result in the creation of new snags. Fire would be expected to cause localized single or clumped tree mortality. Burning prescriptions would permit killing as much as 10% of the trees 10" dbh and greater, 15% of the trees 5" to 10" dbh, and 35% of the trees less than 5" dbh, although actual tree mortality levels are expected to be lower (See Alternative Descriptions and Mitigation Measures in Chapter 2). Although it is not the intent of this project to kill many dominant or codominant trees, some may be lost. Tree mortality would be greater under fall burns than spring burns due to drier weather conditions and lower fuel moistures. Fire-induced mortality could help offset snags lost during burning. This "snag exchange" may even increase local woodpecker viability if fire created snag recruitment exceeds losses. Because the project area is considered deficient in snags, increased snag habitat would be considered a benefit to snag-dependent species. Because most of the mortality would be in trees smaller than 7" dbh, most of the benefits would be to foraging habitat rather than nesting habitat. Most snag dependent species prefer larger snags, those greater than 10" dbh, for nesting opportunities.

Overall, prescribed burning would be expected to maintain or increase populations of primary cavity excavators. 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/ladder fuels, senescent shrubs and dense regeneration. Species that are strongly associated with fire-burned trees would likely benefit the most, particularly species such as the black-backed, three-toed, hairy and Lewis' woodpeckers and northern flickers. Population increases would depend on the intensity of the burn and the resultant tree mortality.

Black-backed and three-toed woodpeckers, in particular, have been shown to respond favorably to these small pulses in snag creation (Knotts 1998). Foraging habitat should temporarily improve with the increase of fire-killed trees <7 inches dbh due to the increase in insect populations. These species require smaller diameter snags for nesting than other species; therefore, burning may provide additional opportunities. Once the insects decline and these snags fall, black-backed and three-toed woodpecker should return to pre-burn levels. With repeated burnings over the life of the project, habitat should be created and higher populations should be maintained as long as burning occurs and probably for 2-5 years after the last burn. If no more burning projects are implemented in the area, populations would be expected to decline to pre-burn levels.

Hairy and Lewis' woodpeckers and northern flickers 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/ladder fuels, senescent shrubs and dense regeneration. Killing of smaller diameter trees, i.e., those less than 7 inches dbh would increase foraging habitat; although larger snags are preferred for foraging, these species would utilize the smaller snags. Increases in nesting opportunities would be more limited as these species prefer larger diameter snags, particularly the Lewis' woodpecker and northern flicker. The "exchange of snags" described previously may have a somewhat greater effect on Lewis' woodpecker. This species prefers soft snags, and a portion of the existing soft snags would be expected to be lost during burning, although mitigation would minimize losses.

Burning could eventually increase populations of Lewis' woodpeckers, but may be delayed for several years until newly created snags decay and shrub densities increase.

White-headed woodpecker populations would likely stay the same or increase slightly. The species would benefit from increases in snags, but creation of large snags would be low. White-headed woodpeckers prefer Old Forest Single Stratum (OFSS). Harvest and burning treatments would be expected to increase OFSS habitats in the short- to long-term as discussed in the Old Growth Habitat section.

Pileated woodpeckers could benefit from increases in snags, but creation of large diameter snags would be low. There would be a loss of foraging substrate because some large down logs would be completely consumed by fire; however, sufficient amounts would remain to maintain habitat. For the pileated woodpecker, snag density estimates in the Crawford analysis area are below the 30% tolerance level in both the >10-inch and >20-inch diameter groups. The studies used to derive this data are largely from NE Oregon, and are applicable to the analysis area, although the habitat in the analysis area is near the southernmost extent of the range of the pileated woodpecker in north-central Oregon. The high number of snags per acre was derived from nest sites. Attaining snag densities at this level is only possible in the moist mixed conifer sites. The pileated woodpecker prefers moist, dense sites dominated by grand fir, subalpine fir, western larch, and Douglas fir cover types. Data confirms that the dry forest types in the Crawford area are probably not conducive to supporting pileated woodpeckers. The network of designated old growth areas would continue to provide for populations (see Old Growth section for additional effects).

Populations of Williamsons and red-naped sapsucker, and downy woodpeckers would change little with this alternative. Species prefer larger snags for nesting and only a limited number of large snags would be created. Some riparian areas would be burned, potentially affecting downy woodpeckers and red-naped sapsuckers, but the fire would be low intensity and few logs and snags would be expected to burn. With time, expansion of aspen stands would benefit both downy woodpeckers and red-naped sapsuckers. At the project level, large snag and aspen habitat is quite limited and would be expected to increase only slightly; consequently, populations of these species are not expected to change with this project.

Fires would be kept at a low enough intensity to meet standards for large down logs as specified in Regional Forester's Eastside Forest Plans Amendment #2. Burning in a mosaic of burned and unburned patches would help maintain levels. With spring burning, many large, sound down logs are charred or partially consumed, but few are completely consumed by the fire if fuel moistures are high. A sufficient number of uncharred logs would remain to provide habitat for species that prefer them. The Forest Plan, as amended, requires that no more than 3 inches of the log diameter, 1.5 inches on either side of a log, be consumed. There is no requirement to prevent charring. During fall burning, more logs would be charred or consumed by the fire; however, Forest Plan standards probably would be met. Few uncharred logs would remain in units that are burned in the fall which could affect species that prefer uncharred logs. Although fire would be allowed to back into RHCAs, larger logs in RHCAs would probably be uncharred.

Temporary road construction could eliminate snags, but given the existing snag levels in the project area and the relatively flat topography, it is expected that road locations can be tweaked enough to minimize the need to remove snags. Alternative 2 would construct about 8.6 miles or temporary road; Alternative 3 would construct 1.2 miles. Hazard trees may need to be removed along haul routes, but firewood cutting has removed most snags along open road systems.

Disturbance associated with implementation of any of the Action Alternatives could cause PCE species present in treatment units to temporarily move elsewhere. These movements are expected to be temporary; these species would return to treated stands following completion of harvest activities.

Overall, the project may have some negative effects on primary cavity excavators and other animals that use snags and down logs, but effects would be minimal given alternative design and mitigation measures that would be used to protect existing snags and down wood. Changes in snags would be expected to be minor due to the small area affected and the fact that snags would not be targeted for removal; snags felled for safety would be incidental to the harvest of live trees and at the most would impact 10% of the existing snags in the project area. Prescribed fire would result in a snag exchange with some snags being and lost and some snags being created; overall, fire would likely increase snags. Although the analysis area is below Forest Plan standards, this additional impact is considered incidental and not expected to adversely affect PCE populations in the analysis area. Because snag densities would be expected to stay the same or increase, no adverse effects to primary cavity excavator populations would be expected. DecAID wildlife tolerance levels would be expected to stay the same as described in Alternative 1 or improve slightly.

All Alternatives

Cumulative Effects

Timber harvest, fire suppression, road construction, wildfire, and firewood cutting have impacted the quantity, quality, and distribution of deadwood habitats and PCE populations dependent on these habitat features across the analysis area. These activities have created the existing condition of deadwood habitats in the analysis area.

Past timber harvest projects were generally very intensive, focusing upon the removal of the larger, more valuable ponderosa pine, Douglas-fir, and western larch trees that were abundant in this area. Past timber harvest resulted in the near complete removal of large, mature trees (green tree replacements) in many of the stands entered. Timber harvest also fragmented large blocks of suitable habitat for PCE species. Likewise, merchantable snags and downed wood were also removed, burned, or otherwise disposed of. The extensive road network in the analysis area (largely a result of past harvest) has impacted snag densities by increasing accessibility of the area to firewood cutting. Firewood cutting has impacted snag habitat in close proximity to open roads. Fire suppression has resulted in dense, multi-strata stands. Snag densities in these stands are generally higher than less dense ponderosa pine stands. Downed wood densities in these areas likely decreased as a result of the fire; however, as snags begin to fall in the next 10 years, downed wood densities would increase

Future projects with a potential to affect snag and downed wood habitat include underburning. Prescribed burning has the potential to consume existing snags and downed logs and create additional snags in treated stands. Prescribed fire also has the potential to create snags of all size classes within the affected area. Snags created by prescribed fire would provide PCE habitat and increase snag densities (as singles and clumps) in burned portions of the analysis area. Underburning would be timed to create a low intensity ground fire. A portion of existing downed wood (generally smaller diameter fine fuels) would be consumed by a low intensity underburn of the type proposed.

Due to the low level of effect that is expected under all alternatives, it is not expected that adverse cumulative effects on snag and downed wood habitat and the species that depend on these habitats would result when combined with the residual and anticipated effects of past, present, and reasonably foreseeable future activities.

Affected Environment - Featured Species – Northern Goshawk

The northern goshawk inhabits conifer-dominated forests. Goshawks utilize a wide range of forest structural conditions, often hunting prey in more open stands, yet relying on mature to old growth structure for nesting and fledging. Nests are commonly on north aspects in drainages with dense canopy (60-80%), in large trees, and near water or other forest “edges” (Reynolds et al. 1992 and Marshal 1992). Habitat trend information derived from Interior Columbia Basin studies (Wisdom et al. 2000) indicated that about 50% of the watersheds in the Blue Mountains showed a decreasing trend in goshawk habitat and 35% showed an increasing trend. Breeding Bird Survey (BBS) data suggests stable populations in western North America from 1966 through 1995; trend information derived from a study in the southwest indicated a 4% annual decline in populations (Wisdom et al. 2000). On the southern portion of the Blue Mountain Ranger District, known goshawks nest sites are monitored annually. The northern portion receives monitoring sporadically as funds, personnel and projects direct.

Potential nesting habitat, classified as old growth, covers 13% of the analysis area. Overall 90% of the analysis area is forested. One known goshawk territory existed within the project area. The nest tree died and the nest eventually deteriorated. The original nest site and adjacent nesting habitat were surveyed for goshawks 1999 – 2003 and in 2005. No nesting goshawks were identified within or immediately adjacent to that site. No new nest has been located by surveyors. Foraging goshawks have been regularly sighted in the project area. There will be provisions to protect and create a 30-acre nest site and 400-acre post-fledging area (PFA) if a nest is located as per Forest Plan direction, as amended.

Environmental Consequences – Northern Goshawk

See the Old Growth Section of this Chapter for additional effects on goshawks and their preferred nesting habitat.

Alternative 1 - No Action

Direct and Indirect Effects

There would be no direct adverse effects to goshawks from Alternative 1 because no logging or fuels reduction activities would occur. Overstocking may delay development of mature and old growth forest. See Old Growth section for the time it would take to reestablish old growth. Under Alternative 1, the elevated fuel loads increase the risk of an intense burn; stand replacement fire could delay development of nesting habitat.

Alternatives 2, 3, and 4

Direct and Indirect Effects

Under Alternatives 2, 3 and 4, treatment would occur in mature or old growth stands suitable for nesting. Table WL-18 displays the acres of mature and old growth habitat treated and the treatment acres as a percentage of total potential nesting habitat.

Table WL-18. Treatment Acres in Mature and Old Growth Habitat. Treatment Acres as a Percentage of Total Potential Nesting Habitat. Projected OFSS at 50 years by Alternative. Existing OFSS comprises 3% of the Mill Creek subwatershed.

	Alt. 1	Alt 2	Alt 3	Alt 4
Treatment Acres in Mature and Old Growth Habitat	0	451	247	173
% of Potential Nesting Habitat Treated	0%	10%	5%	4%

The action alternatives do not propose any activities adjacent or within the original goshawk nest stand; there would be no direct adverse effects. Treatment would occur in stands suitable for nesting, although as a percentage of total potential nesting habitat, the amount of habitat affected is relatively small, less than 10%. Following treatment, stands are less likely to support nesting goshawks. Construction of temporary roads would fragment mature and old growth habitat.

Potential nesting habitat would be monitored annually for goshawk activity as needed. If active nest sites are identified within or immediately adjacent to the project area, management activities would be prohibited within ½ mile of the nest sites from April 1 to September 30 to avoid disturbing goshawks during the breeding season.

Harvest would alter foraging habitat by reducing canopy and possibly shifting prey assemblages from canopy gleaners to open forest type birds. Because goshawks will prey on primary cavity excavators, retention of dead wood habits will help improve goshawk foraging habitat. Goshawks prey on a variety of small mammal species as well. Adult goshawks foraging in the area are not likely to be disturbed by project activities.

Research (Reynolds et al. 1992 and Marshal 1992) varies on conclusions as to the effects of harvest in and adjacent to nest stands and whether or not goshawks will use these stands following harvest. Several studies (Marshal 1992) have suggested that selection harvest of trees can reduce nesting; however, goshawk management recommendations by Reynolds et al. (1992) do not exclude timber harvest.

Prescribed burning could also reduce cover, but generally burning kills smaller trees and would have minimal effect on canopy cover. As with timber harvest, seasonal restriction would be applied to burning activities if nesting goshawks are identified.

The action alternatives close or decommission roads. Generally, road closures reduce the potential for disturbance of nesting birds.

All Alternatives

Cumulative Effects

All of the activities in Appendix D have been considered for their cumulative effects on northern goshawk. The following discussion focuses on those past, ongoing and reasonable foreseeable future activities that may contribute adverse effects to the species or its habitat.

Nesting habitat is typically the limiting factor for goshawks. Past timber harvest reduced mature and old growth habitat preferred for nesting and fledging. Since 1993, the Forest Plan as amended has directed the Malheur National Forest to conduct timber sales in a manner that moves stands towards OFMS and OFSS structural stages, and timber sales planned since that time should not have contributed to loss of mature and old growth forest.

Adjacent private lands have been logged. In the past these timber stands have generally not provided nesting habitat for goshawks. These stands are not being managed for old growth conditions, and therefore are not expected to provide nesting habitat in the future.

Forage is not considered a factor limiting goshawk population viability, and consequently cumulative changes to foraging habitat, whether positive or negative, would not contribute to a measurable change in goshawk populations.

Goshawks are highly sensitive to disturbance during the breeding season. When seasonal restrictions on management activities were disregarded in the past, breeding success may have been reduced. Since 1990, seasonal restrictions on activities have been regularly used in the vicinity of occupied nests. Suitable nesting habitat is to be monitored annually; if monitoring identifies occupied nesting habitat, seasonal restrictions would be applied to all management activities.

In the short-term, the three action alternatives would not contribute to cumulative losses of mature and old growth habitat because stands treated would still function as old growth though canopy cover would be reduced. In the long-term, the action alternatives would contribute positively to cumulative effects by accelerating the development of old growth, i.e. goshawk nesting habitat. Cumulatively, management actions are not expected to reduce population viability.

Summary

Neither the No Action alternative nor the action alternatives are expected to affect populations or viability of northern goshawks. Past harvest already reduced or eliminated nesting habitat in the Crawford area. Harvest would treat less than 10% of the potential nesting habitat in the subwatershed. Mature and old growth stands suitable for nesting would be surveyed annually for goshawk nesting activity. If new nest sites are identified within or immediately adjacent to the project area, silvicultural prescriptions would be modified as needed and seasonal restrictions would be applied to management activities to avoid disturbing goshawks during the breeding season.

Affected Environment – Featured Species – Blue Grouse

Blue grouse inhabit coniferous forests intermixed with grassy or scabby openings. They use large mistletoe infected Douglas-fir trees, generally located within the upper 1/3 of slopes, as winter roosts.

Habitat trend information derived from Interior Columbia Basin studies (Wisdom et al. 2000) indicated that about 80% of the watersheds in the Blue Mountains showed a decreasing trend in blue grouse habitat and 10% showed an increasing trend. Declines in source habitat are primarily attributed to a reduction in late seral forest. No population data is available, but populations are likely lower than they were historically (Wisdom et al. 2000).

Environmental Consequences – Featured Species – Blue Grouse

Alternative 1 -No Action

Direct, Indirect, and Cumulative Effects

Under the No Action Alternative, there would be no direct or indirect effects to winter roost habitat. Habitat conditions would remain the same in the short-to mid-term. Over the long-term, increased stand densities and related stress could result in increased mistletoe and therefore increased winter roost habitat. Populations of blue grouse would be maintained.

Past harvest has reduced the mixed conifer old growth that provide grouse habitat. There would be no harvest that would be cumulative to past actions. Refer to Appendix D for a description of past, present, and reasonably foreseeable future activities.

Alternatives 2, 3, and 4

Direct, Indirect, and Cumulative Effects

Under the action alternatives, harvest of trees potentially providing winter roost habitat could occur. As directed by the Forest Plan, design features would be incorporated into harvest prescriptions to maintain winter roost habitat. Populations of blue grouse would be maintained.

All of the past, ongoing, and foreseeable future projects in Appendix D have been considered for their cumulative effects to blue grouse and their habitat. Past harvest and thinning, fire suppression, and personal use firewood cutting have affected the quality and quantity of winter roost habitat in the project area. Past harvest and thinning reduced stand densities and in some cases selectively removed infected trees that would have otherwise provided potential winter roosting habitat.

Because design features would be included in all harvest and prescribed burning projects on Forest Service lands to help protect winter roost habitat, cumulative adverse effects would not be expected to reduce population viability of blue grouse.

Affected Environment -Threatened, Endangered and Sensitive

Table WL-19 summarizes habitat and species information for threatened, endangered and sensitive (TES) species that are suspected on the Malheur National Forest. Habitat/species presence calls focuses on the Mill Creek subwatershed and surrounding area as appropriate. Effects determinations are summarized for the No Action and action alternatives. More detailed

discussions of habitat and effects follow the table. The discussion summarizes information in the Crawford Wildlife Biological Evaluation located in the Project Record.

Table WL-19. Threatened, Endangered, and Sensitive Wildlife Species Summary

Terrestrial Species						
Gray Wolf <i>Canis lupus</i>	E	HD/S	NE	NE	NE	NE
Northern Bald Eagle <i>Haliaeetus leucocephalus</i>	T	HN/N	NE	NE	NE	NE
North American Lynx <i>Lynx canadensis</i>	T	HN	NE	NE	NE	NE
American Peregrine Falcon <i>Falco peregrinus anatum</i>	S	HN/N	NI	NI	NI	NI
California Wolverine <i>Gulo gulo luteus</i>	S	HD/S	NI	NI	NI	NI
Pygmy Rabbit <i>Brachylagus idahoensis</i>	S	HN/N	NI	NI	NI	NI
Pacific Fisher <i>Martes pennanti</i>	S	HD/N	NI	NI	NI	NI
Western Sage Grouse <i>Centrocercus urophasianus phaios</i>	S	HN/N	NI	NI	NI	NI
Gray Flycatcher <i>Empidonax wrightii</i>	S	HN/N	NI	NI	NI	NI
Bobolink <i>Dolichonyx oryzivorus</i>	S	HN/N	NI	NI	NI	NI
Upland Sandpiper <i>Bartramia longicauda</i>	S	HN/N	NI	NI	NI	NI
Tricolored Blackbird <i>Agelaius tricolor</i>	S	HN/N	NI	NI	NI	NI
Bufflehead <i>Bucephala albeola</i>	S	HN/N	NI	NI	NI	NI

Existing Condition – Bald Eagle (Threatened)

Bald eagle (*Haliaeetus leucocephalus*) nests are usually in multistoried, predominantly coniferous stands with old growth components near water bodies which support adequate food supply. The nearest suspected nest site is 19 miles from the project area. Potential nesting habitat occurs along the Middle Fork of John Day River.

On the Malheur National Forest, bald eagles congregate at winter roost sites in mature forest stands. There are no defined winter roosts in or adjacent to the project area. Winter roost occurs about eight miles southeast of the project area.

Effects Determination – Bald Eagle

Alternative 1 -No Action

Under the No Action Alternative, there would be no new management activities; therefore, there should be no direct, indirect or cumulative effects to bald eagles or their habitat.

Alternative 2, 3, and 4

No action alternatives proposed would affect bald eagle habitat along the Middle Fork of the John Day River, since the proposed activities are not planned in riparian areas. No large trees

would be harvested with the exception of incidental snags that pose hazards along roads and landings. A *no effect* determination was given.

Existing Condition – Gray Wolf (Endangered)

Historically, wolves (*Canis lupus*) occupied all habitats on this Forest, but are currently considered extirpated. The Blue Mountains provide suitable habitats for wolves based on evidence of a wolf captured in 1999 on the Malheur Forest and returned to Idaho. Current flights to locate radio-collared wolves have not confirmed any evidence of wolves in Oregon. Flights occurred over the Malheur National Forest in April 2006 (Miller, pers. comm. 06)

Effects Determination – Gray Wolf

All Alternatives

Wolves are limited by prey availability and are threatened by negative interactions with humans. Generally, land management activities are compatible with wolf protection and recovery, especially actions that maintain ungulate populations. Despite good populations of ungulates on the Malheur National Forest, no wolf populations currently exist and no denning habitat has been located, therefore a *no effect* determination was stated in the BE (Biological Evaluation).

Existing Condition – Canada Lynx (Threatened)

Potential lynx (*Lynx canadensis*) habitat on the Malheur National Forest is defined as stands above 5,000 feet that are subalpine fir, lodgepole pine, Engelmann spruce, or moist grand fir types. Lynx require a mix of early and late seral habitats to meet their food and cover needs. Research indicates that lynx need approximately 10 to 15 square miles of high quality habitat to support a functional home range (Ruggiero et al. 1994). The Mill Creek subwatershed contains very little lynx habitat. There was no primary lynx habitat within the project area and only approximately 950 acres of secondary lodgepole habitat existed. It was concluded the Crawford Project area would function as dispersal habitat for lynx.

Although there are several unconfirmed sightings of lynx in Grant County, there is no indication that lynx occurs in the project area and three years of field surveys did not detect lynx.

Effects Determination – Canada Lynx

All Alternatives

Because lynx habitat is so limited in the project area, both now and historically, there would be no direct, indirect or cumulative effects expected from any of the alternatives. There is potential that the project area provides connectivity between the two lynx analysis units (LAUs). Use would be incidental and not prolonged due to the lack of prey species. Vegetation treatments are planned to allow connectivity of dispersal habitat and would not impede movement by lynx and other carnivores. A *no effect* determination was stated for all action and no action alternatives.

Existing Condition –Wolverine (Sensitive)

Wolverines (*Gulo gulo*) were always rare in Oregon, although recent sightings, tracks, and collected remains document their continued presence at low densities in the state. Current

distribution appears to be restricted to isolated wilderness areas. There is no source habitat for wolverine in the project area. There are no subalpine forest types with or without talus surrounded by trees in or adjacent to this area. The closest source habitat is approximately 10 miles from the proposed project site.

The likelihood of wolverine using or frequenting the area is expected to be very low. The Crawford Project Area may be used as dispersal habitat for wolverine.

Effects Determination - Wolverine

All Alternatives

There are no confirmed records of wolverine occurring in the project area; therefore, there would be no direct effect to this species.

Dispersal habitat for wolverine would be maintained with application of the Regional Foresters Amendment #2 connectivity requirements for late old structure stands. Potential prey species and associated habitat would be maintained including decayed components such as snags and downed logs. Temporary roads would not be constructed in roadless areas and the recreation activities were not anticipated to increase from any of the proposed alternatives, therefore a *no impact* determination was stated.

Existing Condition Pacific Fisher (Sensitive)

Fisher (*Martes pennanti*) prefer habitat in later successional stages in the mesic conifer with greater than 40% canopy. Historically fisher occupied most coniferous forests in Oregon of low to mid-elevations with large snags, logs, and decadent trees. This species is not known to occur in the project area. Surveys show that fishers are limited to two small and disjunctive populations in southwestern Oregon. Habitat within the project area is present in conifer stands in the northeastern portion and consists of approximately 400 acres of suitable habitat.

Effects Determination – Pacific Fisher

All Alternatives

The project area does not contain adequate habitat type and structure for fisher. Fisher may disperse through the Crawford area in search for suitable habitat. Connectivity throughout the project area would be maintained following guidelines in the Regional Foresters Amendment #2. Prescribed fire prescriptions would maintain downed logs and snags that fisher may use. The most probable dispersal habitat in the northern portion of Crawford Project Area would not receive prescribed fire and most of the treatment area is in the drier plant association groups not suitable for fisher. No impact determination was stated for all alternatives.

Affected Environment - Species of Concern - Landbirds Including Neotropical Migratory Birds (NTMB)

Neotropical migratory birds breed in temperate North America and spend the winter primarily south of the United States-Mexico border. Of the 225 migratory birds that are known to occur in the western hemisphere, about 102 are known to breed in Oregon and about 82 are known to breed on the Malheur National Forest. They include a large group of species, including many

raptors, cavity excavators, warblers and other songbirds, with diverse habitat needs spanning nearly all plant community types and successional stages. Long-term population data on many of these birds indicate downward population trends although not all species populations are declining (Sharp 1996, Saab and Rich 1997, Altman 2000, USFWS 2002). Habitat loss is considered the primary factor in decline of neotropical migratory birds.

In 2000, the Oregon-Washington Chapter of Partners in Flight published its Northern Rocky Mountains Bird Conservation Plan (Altman 2000). The Plan provides conservation recommendations for the various species of landbirds that occupy the Oregon and Washington portions of the Interior Columbia Basin. The Plan identified the following priority habitats for landbird conservation: old-growth dry forest, old growth moist forest, riparian woodland and shrubland, and unique habitats including alpine and subalpine forests, shrub-steppe, montane meadow and aspen habitats. The Conservation Plan also identified burned old forest as a limited habitat due to fire suppression. Many of the avian species/habitats identified in the Northern Rocky Mountains Bird Conservation Plan (Altman 2000), are also addressed in the USFWS's Birds of Conservation Concern (USFWS 2002).

Table WL-20 lists those priority habitats and associated focal species that would be expected in the project area. Existing condition and effects discussions will focus on changes to priority habitats, and less on the individual species that use these habitats. No alpine or subalpine habitats are present. The analysis area contains only 180 acres of moist forest and no treatment is proposed; therefore, effects to old growth moist forest will not be discussed.

Table WL-20. Neotropical Migratory Birds – Focal Species found in the Project Area by Habitat Type and Acres of Habitat

Habitat Type	Habitat Feature/Conservation Focus	Focal Species
Dry Forest Types	Large patches of old forest with large trees and snags - i.e., Old Forest Single Stratum (OFSS)	White-headed woodpecker
	OFSS with interspersions grassy openings and dense thickets	Flammulated owl
	OFSS - open understory with regenerating pines	Chipping sparrow
	Patches of burned old forest	Lewis' woodpecker
Riparian Woodland	Large snags	Lewis' woodpecker
	Canopy foliage cover	Red-eyed vireo
	Understory foliage and structure	Veery
Riparian Shrubland	Dense willow/alder shrub patches	Willow flycatcher
Montane Meadow	Wet/dry meadows	Upland sandpiper
Aspen	Aspen large trees/snags with regeneration	Red-naped sapsucker
Steppe Shrublands	Steppe shrublands	Vesper sparrow

Table WL-21 lists species identified in the USFWS’s Birds of Conservation Concern (USFWS 2002), Bird Conservation Regions (BCR) 10. The Crawford Project Area is best characterized by BCR 10, the Northern Rockies Region. Effects on species listed in Tables WL-21 will be analyzed in the context of changes in high priority habitats/focal species listed in Table WL-20.

Table WL-21. List of species of BCR 10, Northern Rockies Region, species status as present or absent from the Project Area, and how each species is addressed in this report.

Species	Presence /Absence	Reason for Absence/Where Addressed If Present
Swainson's Hawk	Absent	Habitat Not Affected by Proposed Activities
Ferruginous Hawk	Absent	Habitat Not Affected by Proposed Activities
Golden Eagle	Present	Habitat Not Affected by Proposed Activities
Peregrine Falcon	Absent	No Suitable Habitat
Prairie Falcon	Absent	No Suitable Habitat
Yellow Rail	Absent	No Suitable Habitat
American Golden-Plover	Absent	Outside Range
Snowy Plover	Absent	Outside Range
Mountain Plover	Absent	Outside Range
Solitary Sandpiper	Absent	Outside Range
Upland Sandpiper	Absent	No Suitable Habitat
Whimbrel	Absent	Outside Range
Long-Billed Curlew	Absent	No Suitable Habitat
Marbled Godwit	Absent	Outside Range
Sanderling	Absent	Outside Range
Wilson's Phalarope	Absent	No Suitable Habitat
Yellow-Billed Cuckoo	Absent	Outside Range
Flammulated Owl	Present	Landbird Discussion
Black Swift	Absent	Outside Range
Lewis' Woodpecker	Absent	No Suitable Habitat
Williamson's Sapsucker	Present	MIS - Primary Cavity Excavator Discussion
Red-Naped Sapsucker	Present	MIS - Primary Cavity Excavator Discussion
White-Headed Woodpecker	Present	MIS - Primary Cavity Excavator Discussion
Loggerhead Shrike	Absent	No Suitable Habitat
Pygmy Nuthatch	Present	Landbird Discussion
Virginia's Warbler	Absent	Outside Range
Brewer's Sparrow	Present	Habitat Not Affected by Proposed Activities
McCown's Longspur	Absent	Outside Range

Some neotropical migratory birds respond positively to logging, thinning and prescribed burning, while others respond negatively. Existing habitat conditions are described for the Mill Creek subwatershed. The following sections summarize the effects of the project on the high priority habitats listed in WL-20.

Dry Forests

The hot-dry and warm-dry biophysical environments refer to the dry ponderosa pine dominated habitats and the dry mixed conifer habitats, i.e., conifer stands of ponderosa pine, Douglas-fir, and/or grand fir. Over 70% of the analysis area is in the hot-dry and warm-dry biophysical environments. In addition, some cold dry biophysical environments, particularly those in grand fir/grouse huckleberry plant associations, are currently overstocked, multi-strata stands; historically many of these sites were also dominated by OFSS stands.

The Conservation Strategy (Altman 2000) identifies four habitat components of the dry forest types that are important to landbirds: OFSS, OFSS with patches of regenerating pines, OFSS with grassy openings, and burned habitats (see Table WL-20). Large-scale declines in OFSS have raised concern for such species as the white-headed woodpecker, flammulated owl, chipping sparrow, white-breasted nuthatch, pygmy nuthatch, Williamson's sapsucker, and Lewis' woodpecker. These bird species have likely suffered some of the greatest population declines and range retractions (Altman 2000).

OFSS habitat is quite deficit in the Mill Creek subwatershed, particularly in the warm-dry and hot-dry biophysical environments. In the analysis area, OFSS occurs on 3% (289 acres) and 0% (0 acres) of the warm-dry and hot-dry biophysical environments, respectively. Historically, this habitat type occurred on 15-55% and 20-70% of the warm-dry and hot-dry biophysical environments, respectively. Young Forest Multi-strata (YFMS) and Understory Re-Initiation (UR) habitats with low canopy coverage (<30% canopy closure) likely provide the opening/thicket/regeneration conditions used by flammulated owl or chipping sparrow. A query of habitat data in the Forest GIS database identified about 1,750 acres of potential habitat for these species. Burned old forest is lacking, as fire suppression has all but eliminated the influence of this disturbance factor in the analysis area; therefore, post-fire habitats for species such as the Lewis' woodpecker are absent.

Riparian Woodlands and Shrublands

Riparian woodlands and shrub habitats are typified by the presence of hardwood tree and shrub species, along with associated wetland herbaceous species. Water is obviously an important component of these habitats, whether it is in the form of standing wetlands, spring and seeps, or flowing water (rivers and streams). Although these habitats generally comprise only a small portion of the landscape, they usually have a disproportionately high level of avian diversity and density when compared to surrounding upland habitats.

The Conservation Strategy (Altman 2000) identifies three habitat components within the riparian woodlands and one within the riparian shrub habitats that are important to many landbirds. They include large snags, canopy foliage cover, understory shrub cover, and dense shrub patches (see Table WL-20). In addition, the Conservation Strategy identifies aspen and montane grasslands as unique habitats important to landbirds. In the Crawford area, many of these habitats are associated with riparian areas or ephemeral draws, so they are included in this section.

Within the project area, riparian woodlands and shrublands are generally associated with Category 1 streams (.09 miles) and Category 2 streams (6.29 miles), and include segments of the Middle Fork John Day River, Mill and Crawford Creeks. Priority hardwood habitats include cottonwood, aspen, willow and alder. All four of these components are generally deficient in the project area due to past management activities, including timber harvest, livestock grazing and fire suppression.

Few cottonwood trees exist, and there is little historical data to indicate whether this species ever actually occupied much of the area. Due to the limited extent of cottonwood, this discussion will not focus on Lewis' woodpecker/cottonwood snag habitats in the riparian discussion. Effects to Lewis' woodpecker are discussed in the Primary Cavity Excavator and Landbird sections – Dry Forest Habitats.

Dense willow canopies historically dominated riparian shrublands; today, shrubs are generally degraded or absent. Because riparian habitats are in generally poor condition, landbird species diversity and population densities are likely reduced. Red-eyed vireo veery, and willow flycatcher habitat is likely reduced from historic conditions.

Small, remnant aspen stands are scattered over approximately 40 acres and are found in Category 1, 2 and 4 streams and ephemeral draws; most aspen stands are old and decadent, exhibit poor vigor, and lack regeneration. Of the 22 aspen stands in Mill Creek Subwatershed, two stands (2.54 acres) are considered to be in “fair” condition. Eleven stands (30.2 acres) are in “poor” condition and nine stands (7.43 acres) are in “very poor” condition. Heavy grazing by domestic livestock and browsing by deer and elk often inhibit hardwood regeneration.

Degraded riparian habitats have likely affected such landbird species as Lewis' woodpecker, red-naped sapsucker, downy woodpecker, red-eyed vireo, willow flycatcher, veery, ash-throated flycatcher, tree swallow, house wren, swainson's thrush, calliope hummingbird, song sparrow, spotted towhee, western wood pewee, warbling vireo, American redstart, orange-crowned warbler, and mountain chickadee. Landbird species that could benefit from improvements in riparian habitat include almost every bird species residing or migrating through Oregon.

Shrub-steppe Habitats

Shrub-steppe habitats are comprised primarily of dry woodlands, shrublands and grasslands. Dry shrublands/grasslands comprise approximately 12% of the analysis area. Size ranges from 1 acre to 254 acres with the the largest expanses occurring primarily on private land. These shrub-steppe habitats are relatively small with the average size less than 10 acres. The larger grasslands and shrublands are on private lands. Grasslands and shrublands on public lands are smaller and do not meet the habitat needs of upland sandpipers, the focal species for this habitat type. Livestock grazing, fire and road construction have impacted habitat quality. Conifer encroachment along the edge of openings may have reduced the extent of these habitats.

Small openings are also scattered throughout the forested areas, and can include both grasslands and shrublands. Shrub species include sagebrush as well as mountain mahogany and bitterbrush; these areas provide additional habitat for landbird species that use dry shrub-steppe habitats.

Species that use these habitats include vesper sparrow, Brewer's sparrow, lark sparrow, and long-billed curlew.

Environmental Consequences- Species of Concern - Landbirds Including Neotropical Migratory Birds (NTMB)

Alternative 1 - No Action

Direct and Indirect Effects

Dry Forests

With the implementation of Alternative 1, there would be no direct effects to the various neotropical migratory/landbird species inhabiting the project area. Habitat modifications would not occur, nor would individuals be directly affected, as no activities are proposed under this alternative. Habitat conditions would remain unchanged in the short- and mid- term, as described in the existing condition section. Species distributions, densities, and overall population levels would remain relatively unchanged in the short- and mid- term.

Indirectly, implementation of the No Action Alternative would affect some neotropical migratory bird species in the long-term. The quantity and quality of habitat of OFSS habitats is currently poor due to past management and other factors within the analysis area. By selecting this alternative, options and opportunities to create and enhance OFSS habitats for adapted species would be foregone, and thus affect these species indirectly. These open, mature ponderosa pine habitats were once abundant in the warm-dry and hot-dry biophysical environments in the Mill Creek subwatershed. As described in the existing condition section, habitat for the white-headed woodpecker, flammulated owl, chipping sparrow, white-breasted nuthatch, pygmy nuthatch, Williamson's sapsucker, and Lewis' woodpecker is lacking throughout the analysis area. This alternative would fail to restore habitat for these species in the short-, mid-, and long-term.

Riparian Woodlands and Shrublands

With the implementation of Alternative 1, there would be no direct effects to the various neotropical migratory/landbird species that utilize riparian areas. Riparian conditions would be as described in the existing condition section. Shrub condition would likely remain static or improve. Mature aspen trees would continue to decline and regeneration would be low or nonexistent. By selecting this alternative, options and opportunities to close or decommission roads in riparian areas would be forgone, and thus affect these species indirectly. By forgoing prescribed burning, riparian areas would remain at high risk to stand replacing fire that could eliminate habitat.

Degraded riparian habitats would continue to affect use by riparian landbird species such as Lewis' woodpecker, red-naped sapsucker, downy woodpecker, red-eyed vireo, willow flycatcher, veery, ash-throated flycatcher, tree swallow, house wren, swainson's thrush, calliope hummingbird, song sparrow, spotted towhee, western wood pewee, warbling vireo, American redstart, orange-crowned warbler, and mountain chickadee.

Shrub-steppe Habitats

With the implementation of Alternative 1, there would be no direct effects to shrub-steppe habitats or to the landbird species that use them. Habitat conditions would be as described in the existing condition section. Species such as vesper sparrow, Brewer's sparrow, lark sparrow and long-billed curlew would be expected to continue to use the area.

Alternatives 2, 3, and 4

Direct and Indirect Effects

Dry Forests

Chapter 1 identified a need to develop historic levels of OFSS structure habitat in the project area. In the Mill Creek subwatershed, OFSS occurs on 3% and 0% of the warm-dry and hot-dry biophysical environments, respectively. Historically, this habitat type occurred on 15-55% and 20-70% of the warm-dry and hot-dry biophysical environments, respectively. In addition, some cold dry biophysical environments, particularly those in grand fir/grouse huckleberry plant associations, are currently overstocked, multi-strata stands; historically many of these sites were also dominated by OFSS stands.

Table WL-22 displays acres of OFMS conversion, OFSS maintenance and OFSS development. Descriptions are described below the table. OFSS treatments would benefit species that utilize these habitats including the white-headed woodpecker and flammulated owl. Table WL-22 also displays the percentage of the Mill Creek Subwatershed that would classify as OFSS in 50 years; the Forest Vegetation Simulator (FVS) model and fire behavior extension was used to make these projections and are intended to be used as a comparison tool between alternatives.

Table WL-22. OFSS Treatments. Acres of OFSS Development by Alternative. Projected OFSS at 50 years by Alternative. Existing OFSS comprises 3% of the Mill Creek Subwatershed.

	Alt. 1	Alt 2	Alt 3	Alt 4
Treatment Acres in OFMS - OFMS to OFSS conversion	0	44	40	39
Treatment Acres in OFSS – OFSS Maintenance	0	17	14	6
Treatment Acres - OFSS Development¹	0	2,130	1,571	750
% of Mill Creek Subwatershed in OFSS in 50 years	15%	27%	24%	15%

¹Thinning acres in YFMS, UR, SECC, and SEOC stands.

The quickest method to create OFSS is to convert OFMS stands directly into OFSS stands by thinning from below. Treatments are proposed in hot-dry, warm-dry, cool dry and cold dry biophysical environments. In the warm-dry biophysical environments, only OFSS stands would be treated; the warm-dry OFMS structural stage is currently below HRV, so treatment would not occur. OFMS/OFFS conversion treatments would move stands towards OFSS but not necessarily change structural stage classification in one harvest entry. In OFSS maintenance treatments, stands already classify as OFSS; thinning would remove understory trees that have grown in due to fire suppression. Following treatment, stands would be more open and better

mimic historic conditions. Table WL-22 displays acres treated; acres do not vary significantly between alternatives and treat only a small percentage of the total OFMS/OFSS acres in the subwatershed, i.e., about 2%. Locally, treatments at such levels would improve habitat for species such as the white-headed woodpecker, flammulated owl and chipping sparrow; at the landscape level, treatment levels would be insignificant.

Proposed OFSS development treatments would have a much greater influence on these species. The three action alternatives prescribe commercial and/or precommercial thinning of mid-successional stands (YFMS, UR, SECC, and SEOC) to help develop OFSS habitat over the mid- to long-term. The majority of the proposed thinning units are in the warm-dry biophysical environment. OFSS development in treated stands would depend upon the current availability of large diameter trees (21+ inch dbh), the thinning intensity, and the resultant time it takes for small diameter trees to grow into large diameter trees. Shelterwood harvest would also be used to shift multi-strata stands back towards single-stratum stands.

Table WL-22 indicates that Alternative 2, followed by Alternative 3, would implement the most OFSS development treatments. Although proposed thinning would be intended to benefit OFSS-dependent species in the mid- to long-term, some habitats may actually be used soon after treatment. In the short-term, canopy cover would be reduced and herbaceous vegetation and shrub growth would be stimulated. Populations of OFSS-dependent species would be expected to increase. Alternative 4 is restricted to precommercial thinning of small diameter trees, and therefore, does little to accelerate growth of residual trees; although treatment would open understories and improve habitat for white-headed woodpeckers, development of OFSS would likely take longer than under Alternatives 2 and 3. Under all action alternatives, prescribed burning would be utilized in many of these stands to maintain open conditions.

Prescribed fire has the potential to impact landbirds species both directly and indirectly. Of greatest concern would be implementation of spring burning actions where the effects of direct mortality as well as the loss of and or disturbance to nests and nesting activities could result in adverse effects to individuals or numbers, depending on the scale of the activities, as well as the timing.

Neotropical migratory birds tend to nest on the ground, in shrub layers or within the lower or mid-canopies of trees. Generally, breeding season on the Malheur National Forest extends from mid-April to mid-July, with nesting occurring from mid-May through mid-July (Adamus et al. 2001).

Birds that nest on the ground, on shrubs, or within lower tree canopies would be vulnerable to loss of nest productivity from prescribed burning if the activities occur during the nesting season. Although breeding adults could be killed during burning operations, most adult birds regularly escape the direct effects of the burn by simply leaving. However, disturbance from burning activities could lead to nest abandonment and subsequent loss of nestlings.

Nests, eggs and nestlings could be directly destroyed. Turner (2001) found a 20% loss of human-installed ground nests during low-intensity spring prescribed fires, results of local burns are expected to be less because human-installed nests were distributed at greater densities than natural nests would be. Spring prescribed fire may cause some mortality of young in early nests; however, it would not necessarily have a devastating effect on bird populations (R. Sallabanks, personal communication 2003). If a nest burns, in most cases, breeding opportunities would still be available. Neotropical migratory birds appear to be fairly resilient to spring prescribed

burning, with re-nesting in remaining habitat common among birds that suffer early-season nest failure (R. Sallabanks, personal communication 2003).

Although spring wildfires occurred infrequently, spring burning is being considered for several reasons. In some areas, unnaturally high fuel loads preclude initial fall burns; high intensity fires could result in the undesirable loss of large trees and snags, canopy cover and other key habitat components. In the spring, moisture levels are typically higher; therefore, reducing fire intensity and providing easier, safer and less costly and potentially damaging control options. Under existing conditions, spring burning can be implemented in a way that mimics historic conditions. Low intensity fires create a mosaic of burned areas with non-burn areas that may function as refugia for breeding birds. If burning is conducted early enough in the spring, the degree of impact is minimized for migratory birds that have not initiated nesting activities.

Once spring burning reduces fuel loads, fall burns can then be safely implemented during future entries to better mimic what is believed to be the natural fire history of the area. Fall burning would have little direct effect on bird mortality, because even young birds would be developed enough to fly and escape a fire.

In any one year, burning would be limited to 3,000 acres or 19% of the forested area within the analysis area, and some of the burning may occur in the fall. Because prescribed fire would be expected to burn in a mosaic, even within the burn units, ground vegetation would be reduced but not entirely eliminated. Burning objectives are targeted to burn as much as 60% to 80% of a burn unit; the 60% level is expected in the spring and the 80% level in the fall due to the differing moisture conditions. By adjusting acres to account for untreated acres, spring burning would affect only 1,800 acres or 11% of the forested acres in any one year. Tree mortality levels would be even lower; for trees less than 5 inches dbh, tree mortality could be as much as 35%, but in most burning operations would be expected to range from 5% to 15%. In areas where no overstory exists, mortality of natural regeneration would be restricted to 10% in areas one acre or greater. Consequently, direct impacts to breeding birds in any single year would be fairly limited.

Although some large diameter trees would be killed, it is not the objective of this prescribed burn to kill dominant and codominant trees; killing of trees 10 inches dbh and greater would be expected to range from 1% to 2%. Creation of additional large diameter snags would provide habitat for Lewis' woodpecker and other primary and secondary cavity excavators. Prescribed fire would reduce the number of soft snags; however, there would be an "exchange of dead trees" with some overstory trees being killed and new snags being created. This effect is described to a greater extent in the Primary Cavity Excavator section.

The direct loss of adult birds and young from prescribed burning would likely be less of an effect to bird populations than the loss of habitat (R. Sallabanks, personal communication 2003). In the first few years after burning, understory trees, shrubs and forbs would be reduced or removed, reducing nesting and feeding habitat for species that use the lower forest layers. Because of changes to habitat, effects to birds could continue into the following seasons with reduced or improved recruitment throughout the area (Altman 2002). Ground vegetation tends to sprout vigorously from the roots if the above ground portions are killed by fire, although it might take 2 to 5 years for grasses, sedges and forbs to return to their pre-fire abundance and volume (USDA 2000). Shrub recovery may take 2 to 15 years. Species that respond favorably to fire include pinegrass, elk sedge, rose, snowberry, ceanothus, serviceberry, chokecherry and currant. Effects

to larger shrublands, i.e., those $\frac{1}{4}$ acre in size or greater, would be minimized by only allowing fire with low flame lengths through these areas; shrublands would burn in a mosaic.

As stated previously, prescribed burning would burn a maximum of 3,000 acres per year. Previous calculations discussed direct effects to nesting birds in a single year. To discuss indirect loss of habitat, one needs to look at effects over multiple years. Assuming 80% of the ground is burned, consecutive years of burning, and recovery of herbaceous vegetation in 3 years, burning could affect understory habitats on as much as 38% to 50% of the forested acres at any one time. These calculations only estimate the portion of the landscape that could be affected at any time. It does not mean that all understory trees would be lost on these acres; as stated previously, most burning operations would be expected to kill 5% to 15% of the trees less than 5" dbh.

The action alternatives would be expected to shift stands from Old Forest Multi-strata (OFMS) and Young Forest Multiple Stratum (YFMS) stands towards Old Forest Single Stratum (OFSS) increasing habitat for species such as the white-headed woodpecker. The flammulated owl is a focal species for OFSS with a mosaic of grassy openings and dense thickets habitat. This habitat would increase with this alternative. Understory burning would reduce the amount of roost and hiding cover thickets, but increase the amount of open areas in which these owls hunt. Untreated patches at least 2 acres in size would be retained on 10% of the acres, where available. This design feature would maintain small, dense thickets and regenerating pine to the benefit of flammulated owls. In addition, prescribed burning and thinning would open up canopies and promote new conifer regeneration over the next 30 years. Chipping sparrow habitat would increase. They are a focal species for OFSS with a mosaic of open understory and regenerating pines. Burned old forest habitat for Lewis' woodpecker may increase, although there may be an exchange of snags with some existing snags being burned while new ones are being created (see primary Cavity Excavators – Snags and Down Wood). Lewis' woodpecker is most often associated with stand replacement burns with soft snags and a shrub component of > 13% cover. Lewis' woodpecker habitat would stay the same or improve.

Reductions in understory vegetation are likely to adversely affect species that prefer dense canopies such as the red-breasted nuthatch, American robin, and spotted towhee, referred to as non-target species. The Northern Rocky Mountains Bird Conservation Plan (Altman 2000) considers the alteration/loss of habitat for non-target species to be of low concern because:

- Non-target species are opportunistically present in dry forest sites, and generally not of conservation concern in this habitat because of their primary association with other forest types,
- The long-term benefit of habitat enhancement for target dry forest species outweighs the impacts of habitat loss for non-target species, and
- Restoration of dry forest habitats is among the highest priorities for bird conservation in western North America.

Treatments proposed represent a positive attempt to manage stands for dry forest restoration. Prescribed burning and timber harvest would be expected to improve habitats for those species of landbirds, including neotropical migratory species that are at highest risk.

Temporary road construction would reduce habitat in the short-term. Alternative 2 would construct 8.2 miles of road; Alternative 3 would construct 1.2 miles; Alternative 4 would

construct 0 miles. Roads would be ripped and seeded when work is completed. Conifers would likely seed in on most sites but may take 10 to 30 years to become reestablished. Acres of habitat affected would be considered incidental compared to habitat acres being treated by harvest and prescribed burning. All alternatives would decommission 17.8 miles of road also restoring habitat in the mid-term.

Table WL-22 displays the percentage of the Mill Creek subwatershed that would classify as OFSS in 50 years. Currently, about 3% of the subwatershed classifies as OFSS. Under Alternatives 2 and 3, 27% and 24% of the subwatershed would be expected to classify as OFSS in 50 years compared to 15% under the No Action Alternative. Alternative 4 does little to accelerate growth of residual trees; development of OFSS over time would be similar to levels expected under the No Action Alternative. Populations of species that use OFSS, including habitat for the white-headed woodpecker, flammulated owl, chipping sparrow, white-breasted nuthatch, pygmy nuthatch, Williamson's sapsucker, and Lewis' woodpecker, would be expected to increase under all alternatives, but available habitat would be substantially higher under Alternatives 2 and 3.

Riparian Woodlands and Shrublands

Timber harvest units, landings, and temporary roads would not be located in Riparian Habitat Conservation Areas (RHCAs) under any of the action alternatives. Restricting these activities to areas outside of RHCAs would prevent adverse impacts to riparian habitats.

Haul routes would occur in RHCAs. There would be about 5.5 miles of haul route along RHCA roads. Felling of danger trees for human safety along haul routes in RHCAs has the potential to reduce wildlife snags. All trees felled for safety reasons would be kept on site. Road maintenance/reconstruction activities would occur along haul routes in RHCAs. Road maintenance/reconstruction activities would not result in removal of trees because existing road prisms would not be widened. Where danger trees need to be felled for safety reasons they would be kept on site to meet woody debris objectives. Felling of danger trees could reduce habitat for Lewis' woodpecker and other species that depend on snags, but losses would be considered incidental (see Primary Cavity Excavator Section for addition effects of snag reduction on woodpecker species).

Prescribed fire activities would occur in RHCAs. Burning activities would mimic low intensity fires that are characteristic of natural burning patterns that tend to occur in riparian areas. This would be accomplished by not actively lighting fires in RHCAs while allowing fires to back into RHCAs from adjacent upslope areas. This technique would result in a patchy distribution of burned and unburned areas in RHCAs based on the Forest's experience with past prescribe burning activities in RHCAs using the same technique. Using these techniques, mortality of understory trees would occur in burned patches but few overstory trees would be killed. Fire intensities will not be high enough to consume trees or large downed wood. The reduction in stocking densities following burning activities would increase the vigor of larger trees in the overstory. Small openings in canopy cover may induce establishment of shrubs, grass and forbs species to the benefits of riparian landbirds. Adverse effects of prescribed burning on nesting and foraging habitat would be as described in the dry forest section; effects would likely be reduced because fire intensities would be reduced.

Road decommissioning activities would occur under all action alternatives. About 5.8 miles of road would be decommissioned within RHCAs including about 1.6 miles adjacent to Crawford

Creek. Proposed decommissioning activities would consist of removal of one culvert on FSR 2620156, ripping and seeding herbaceous vegetation, spreading woody debris and slash over the former roadbed, and installing drainage structures to discourage unauthorized motorized vehicle use and ensure proper drainage occurs over time. Conifers would be planted in decommissioned road segments in RHCAs as part of the decommissioning process. Road closure/decommissioning activities would not result in removal of trees. Road closures in RHCAs would also reduce potential disturbance to landbirds.

This project does not treat any aspen stands. Aspen habitat would continue to decline as described in the existing condition section. A variety of landbird species use aspen habitats, including red-naped sapsucker, Williamson's sapsucker, Lewis' woodpecker, downy woodpecker, northern flicker, tree swallow, house wren, mountain bluebird, northern pygmy owl, white-breasted nuthatch, flammulated owl, Hammond's flycatcher, chestnut-backed chickadee, great gray owl, blue grouse, long-eared owl, rufous hummingbird, and broad-tail hummingbird. Effects to species would be low, given the limited amount of habitat in this area. Adverse effects are not a result of management activities proposed under this project.

Given the low level of management activity in RHCAs, the action alternatives would have negligible effects on riparian landbirds.

Shrub-steppe Habitats

Prescribed fire is not proposed in any larger expanses of open shrublands or grasslands, although a small amount of light burning may occur along the fringes of these habitats and in small inclusions scattered throughout the forested areas. Smaller openings in forested environments, ½ acre or greater, project design would limit burn intensity to flame lengths one foot or less in height. At this burn intensity, any shrubland areas burned would do so in a mosaic of burned and unburned patches. Unburned islands of sagebrush can retain habitat features vital to associated species, such as vesper sparrow. In studies in Idaho, (Peterson and Best 1997), prescribed burns killed about 50% of the shrubs; total bird abundance declined significantly in the first year after fire, and then rebounded in years two and three to levels similar to those in unburned areas. Scattered loss of shrubs is not expected to have significant impacts on shrub-steppe habitats or the landbird species that use them.

Neotropical migratory species that utilize these habitats would not be adversely affected. Effects would be as described for the No Action Alternative.

All Alternatives

Cumulative Effects

All of the activities in Appendix D have been considered for their cumulative effects on neotropical migratory birds. The following discussion focuses on those past, ongoing and reasonable foreseeable future activities that may contribute adverse effects to the landbirds or their habitat.

Every management action within the scope of control of the Forest Service has tradeoffs. Every action (including no action) would affect populations of landbirds, including NTMB species, differently: some species positively, others negatively, and perhaps others neutrally. The decision on which forest practices to use may depend on the species targeted for management.

Habitat loss is considered the primary factor in decline of neotropical migratory birds. Previous sections identified high priority habitats for conservation of neotropical migratory birds: old-growth dry forest including burn habitats, riparian woodland and shrubland, montane meadow, aspen habitats, and shrub-steppe habitats. For the Crawford Project, the Northern Rocky Mountains Bird Conservation Plan (Altman 2000) was the primary source used to determine target species for management. Restoring historic habitats is assumed to be the best strategy for assuring local viability of landbird species.

In the Crawford Project Area, bird species that historically preferred open, park-like ponderosa pine forests and open mixed conifer stands have been negatively affected by forest management practices that emphasized extensive even-aged management, fire exclusion or suppression, and continuous or long-term grazing (Altman 2000). These practices produced a closed forest of dense, young to mid-aged trees with limited understory diversity, fragmented landscapes and, removed much of the structure that provided diversity at the stand-level and at the landscape-level.

Cumulatively, this project combined with other recent and ongoing prescribed burning and understory thinning would help restore dry forest habitats, benefiting the landbird species that use them. All ongoing projects have considered design features in the Northern Rocky Mountains Bird Conservation Plan (low intensity and severity burns, retention of snags and large trees, and mosaic patterns with refuge areas of untreated habitat among others), which should allow for restoration while reducing short-term impacts on nesting birds.

Cumulative effects on mature and old growth coniferous forest, particularly OFSS habitats, are discussed in the Old Growth section, and conclude that the action alternatives would have varying positive effects for mature and old growth habitat and for the species that use those habitats. Cumulative effects to snags and down logs are discussed in the Primary Cavity Excavator Species section. This project includes design features to protect snags and down logs; overall, changes in deadwood habitats would be considered incidental.

Riparian vegetation within and adjacent to the project area has been altered by a variety of management activities, including timber harvest, railway and road construction, and mining and livestock. Many years of livestock grazing, primarily earlier in this century, concentrated use in riparian areas. Livestock grazing also negatively affected grasslands by reducing native species' abundance and diversity. Fire suppression allowed encroachment of conifers, which shaded out hardwoods such as aspen. The condition of some riparian areas and grasslands has been improved by new management practices and restoration activities in more recent years, but many are still not fully restored to conditions that are most suitable for associated native wildlife species. In the last 15 years, stream restoration work in the analysis area has helped to improve riparian conditions. Course wood placement in Crawford Creek, 16 Gulch and their tributaries, and culvert/bridge replacement and planting on creeks along Highway 26 have all been beneficial to riparian areas and the species they support. Cumulatively, these actions will help improve riparian health to the benefit of neotropical migratory birds. Prescribed burning and road decommissioning in the Crawford Project is expected contribute positively to riparian areas.

Shrub-steppe habitats have probably changed due to 100 years of fire suppression. Other conifer species have encroached on these habitats, reducing their size. On residual acres, juniper density probably has increased. Livestock grazing, primarily early in the century, may have caused changes in shrub, grass and forb composition or abundance. Under the Crawford Project,

prescribed burning avoids most of these habitats; design features have been included in the action alternatives to minimize effects in forest openings.

Current levels of noxious weeds in the project area are below threshold levels that can cause measurable changes in terrestrial habitat. Over the long-term, habitat may be degraded by encroaching noxious weeds if they are not controlled.

Future projects would have to abide by existing management direction to maintain or enhance mature and old growth habitat, maintain snags and down log standards, and protect or enhance riparian areas, grassland and woodland communities. Future planning will consider potential effects to neotropical migratory birds.

Action alternatives propose few to no activities within riparian areas, aspen stands, shrublands and grasslands, habitats considered a high priority for landbird conservation. Restoration of dry forest habitats, particularly OFSS habitats, would improve conditions for landbirds that rely on these habitats. Cumulatively, this project when combined with current management practices would not be expected to reduce viability of any landbird species including neotropical migratory species; rather, proposed management would likely improve species richness.

Consistency with Direction and Regulations

Forest Plan, Management Area 13 (MA-13) provides for the management of old growth through a network of DOG/ROG areas. Each DOG/ROG is specifically managed for one of two Management Indicator Species (MIS) for OFMS: pileated woodpecker or pine marten. ROGs are established to counter possible catastrophic damage or deterioration of the DOGs. The Forest Plan directs continued review of DOG/ROG areas, with adjustments to boundaries as appropriate to ensure suitable levels of old growth habitat are provided for species dependent upon them and to ensure those units meet Forest Plan Standards and Guidelines. Under the Crawford Project, the Forest Plan would be non-significantly amended to adjust existing DOG boundaries and to establish appropriate ROGs and PWFAs.

Regional Forester's Eastside Forest Plans Amendment #2 (USDA 1995) amended the Forest Plan to manage late and old structure (LOS) stands within the Historic Range of Variability (HRV). HRV is a landscape level assessment of structural stage; Forest Plan Amendment #2 applies to LOS stands both inside and outside of the DOG/ROG network. Under the Crawford Project, harvest and prescribed burning projects were designed to move the project area towards the historic balance of OFSS and OFMS. In addition, Amendment #2 directs land managers to maintain connectivity between LOS habitats to allow the free movement of old growth wildlife species. This project establishes connectivity corridors between LOS within the Mill Creek Subwatershed and to LOS in adjacent subwatersheds. Management activities within ROGs, PWFAs, and connectivity corridors meet Forest Plan direction, as amended.

The Forest Plan standard for cover in summer range is 20% total cover with at least 12% in satisfactory cover and 5% in marginal cover. Currently, the Mill Creek subwatershed has 49.8% total cover, 2.7% satisfactory cover and 47.1% marginal cover. Satisfactory cover is below Forest Plan standards. Alternative 2 would require a non-significant Forest Plan Amendment to further reduce satisfactory cover. Alternatives 1, 3, and 4 do not further reduce satisfactory cover

Snags and large down logs do not meet Forest Plan standards as a result of past management. In the action alternatives, mitigation has been incorporated to protect existing snags and large down

logs that contribute to the Forest Plan standards. Only incidental losses of additional deadwood habitats would be expected from the action alternatives.

For northern goshawks, all alternatives are consistent with the Forest Plan and the Regional Forester's Eastside Forest Plan Amendment #2. Mature and old growth stands suitable for nesting, would be monitored annually for nesting activity. If new nest sites are identified within or immediately adjacent to the project area, management activities would be prohibited within ½ mile of the nest sites from April 1 to September 30 to avoid disturbing goshawks during the breeding season.

All alternatives are consistent with the 1918 Migratory Bird Treaty Act (MBTA) and the Migratory Bird Executive Order 13186. Alternatives were designed under current Forest Service policy for landbirds. The Northern Rocky Mountains Bird Conservation Plan (Altman 2000) and the U.S. Fish and Wildlife Service's Birds of Conservation Concern (USFWS 2002) were reviewed for effects disclosure. Vegetation management cannot completely avoid unintentional take of birds, no matter what mitigations are imposed on the activities. Mitigation, such as retention of snags and down logs, retention of live trees, and avoidance of riparian areas, grasslands and juniper woodlands proposed in this project will minimize take of migratory birds.

All alternatives are consistent with the Endangered Species Act (see Biological Evaluation available in the Project Record). Alternatives are expected to have **No Effect** on threatened and endangered species. Based on these effects calls, consultation with the US Fish and Wildlife Service was not considered necessary.

Irreversible and Irrecoverable Commitments of Resources

There are no irreversible or irretrievable commitments of resources associated with wildlife or wildlife habitat that may result from the implementation of alternatives.

Sensitive Plants

Introduction

The following section discusses only the effects of the No Action Alternative and activities proposed as part of the Proposed Action (Alternative 2) on sensitive species. The effects determination for alternatives 3 and 4 are the same as for the Proposed Action, since these alternatives treat the same areas but fewer acres and less impacting treatments as Alternative 2. For example, Alternative 4 would not commercially thin, but would use pre-commercial thinning, fuel treatments, and underburning.

A biological evaluation (BE) describes and displays effects to proposed, endangered, threatened, and sensitive floral species associated with the Crawford Project on the Blue Mountain Ranger District of the Malheur National Forest (see Project File).

This section summarizes the existing condition and effects described in the BE and are contingent upon implementation of mitigation measures, identified below. No sensitive plants were located during surveys. Potential effects are based on potential habitat.

Table SP – 1. Sensitive Plant BE Effects Summary

Sensitive Species	Occurrence in Project Area	Habitat Status	Alt 1 (No Action)	Alternatives 2, 3, and 4
<i>Achnatherum hendersonii</i> ³ Henderson's ricegrass	Not Found	Present	NI	NI
<i>Achnatherum wallowensis</i> Wallowa ricegrass	Not Found	Present	NI	NI
<i>Astragalus diaphanus</i> var. <i>diurnus</i> South Fork John Day milkvetch	Not Found	Not Present	NI	NI
<i>Astragalus tegetariodes</i> Deschutes milkvetch	Not Found	Not Present	NI	NI
<i>Botrychium ascendens</i> upswept moonwort	Not Found	Present	MIIH	MIIH/BI
<i>Botrychium crenulatum</i> crenulate moonwort	Not Found	Present	MIIH	MIIH/BI
<i>Botrychium lanceolatum</i> lance-leaf moonwort	Not Found	Present	MIIH	MIIH/BI
<i>Botrychium minganense</i> Mingan moonwort	Not Found	Present	MIIH	MIIH/BI
<i>Botrychium montanum</i> mountain moonwort	Not Found	Present	MIIH	MIIH/BI
<i>Botrychium pinnatum</i> pinnate moonwort	Not Found	Present	MIIH	MIIH/BI
<i>Calochortus longebarbatus</i> var. <i>peckii</i> long-bearded sego lily	Not Found	Not Present	NI	NI
<i>Camissonia pygmaea</i> dwarf evening primrose	Not Found	Not Present	NI	NI
<i>Carex backii</i>	Not Found	Present	MIIH	MIIH/BI
<i>Carex idaho</i> Idaho sedge (formerly <i>C. parryana</i>)	Not Found	Present	NI	NI
<i>Carex interior</i> inland sedge	Suspected	Present	MIIH	MIIH/BI
<i>Cypripedium fasciculatum</i> clustered lady slipper	Suspected	Present	MIIH	MIIH/BI
<i>Dermatocarpon luridum</i> Silverskin lichen	Not Found	Not Present	NI	NI
<i>Leptogium burnetiae</i> var. <i>hirsutum</i> hairy skin lichen	Not Found	Not Present	NI	NI
<i>Listera borealis</i> northern twayblade	Not Found	Present	MIIH	MIIH
<i>Lomatium erythrocarpum</i> redfruit desert parsley	Not Found	Not Present	NI	NI
<i>Lomatium ravenii</i> Raven's Lomatium	Not Found	Not Present	NI	NI
<i>Luina serpentina</i> colonial luina	Not Found	Not Present	NI	NI
<i>Mimulus evanescens</i> vanishing monkeyflower	Not Found	Not Present	NI	NI

³ *Achnatherum hendersonii* & *A. wallowensis* are similar species considered under the same common name - *Oryzopsis hendersonii*.

Sensitive Species	Occurrence in Project Area	Habitat Status	Alt 1 (No Action)	Alternatives 2, 3, and 4
<i>Pellaea bridgesii</i> Bridge's cliff-brake	Not Found	Present	NI	NI
<i>Phacelia minutissima</i> least phacelia	Suspected	Present	NI	MIIH
<i>Pleuropogon oregonus</i> Oregon semaphore grass	Not Found	Not Present	NI	NI
<i>Thelypodium euosmum</i> arrow-leaved thelypody	Not Found	Not Present	NI	NI

Design Measures

- To protect *Phacelia minutissima* habitat, areas supporting false hellebore (*Veratrum californicum*), should be avoided with vehicles and heavy equipment even if they dry out late in the season.
- To protect *Carex idahoensis* habitat, prescribed burning should only produce only low to moderate fire severity so rhizomes will survive and sprout after the burn.
- To protect *Achnatherum* species habitat, vehicles and off-road equipment should avoid scabland areas.

Regulatory Framework

The National Forest Management Act states that federal agencies need to maintain viable populations of all desired native plant species. Consequently, Forest Service Manual direction requires that the Regional Forester maintain a list of sensitive plants which includes species listed as threatened and endangered, those proposed for listing under the Endangered Species Act, and sensitive species. As a result, the Land and Resource Management Plan for the Malheur National Forest⁴ requires all proposed projects assess the potential impact of activities on the habitat of sensitive plant species, and perform a biological field evaluation when sensitive species are present.

Analysis Methods

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 the Malheur Forest sensitive plants are described in an unpublished, draft document, Sensitive Plants of the Umatilla, and Malheur National Forests, (Umatilla NF Botanical Group), 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 were surveyed by the controlled intuitive meander method, a survey of the most likely areas and the travel routes walked between

⁴ Referred to as the Forest Plan

high priority sites. Field surveyors also surveyed specific areas because structures were proposed. All surveys were completed during periods when individual plants could be identified, during the 1998, 2000, 2002, and 2005 field seasons. No sensitive species were found in the project area, although more habitat exists than was surveyed, especially for *Achnatherum*, *Botrychium*, and *Carex* species.

Surveys were completed during June and July, 1999 by Jean Wood, District Botanist, over a much larger project area that included the Upper Middle Fork Watershed north of the U.S. Highway 26. The R6 Sensitive Species List changed in 2004 and additional surveys were completed within proposed harvest and burning areas during June through August, 2005 by Julie Gibson, Biological Science Technician, and Nancy Hafer, present District Botanist. Surveys were performed within areas considered to have potential habitat. No sensitive plants were documented within this project area. Since alternatives that propose activities will treat fewer acres or propose activities that may be less impacting to sensitive plants than the Proposed Action, the effects are considered to be addressed under the Proposed Action assessment.

Affected Environment

There are three, general habitat groups capable of supporting Blue Mountain Ranger District sensitive species: harsh, rocky habitats, seasonally moist areas, and riparian areas. Most have few if any trees, but the clustered lady slipper orchid has been found in forested areas that provide needed shade.

Habitat for most of these plants is not abundant because of their special habitat requirements. The 1998, Upper Middle Fork John Day Watershed Analysis documented only incidental amounts of the non-forested plant associations. These habitats include seasonally moist meadow grasslands, dry land bunchgrasses, sagebrush and mountain mahogany shrublands, and sparsely vegetated sites with a high percentage of rock.

Riparian area habitats are the most numerous. There are three major drainages in the project area: Middle Fork John Day River, Crawford Creek, Mill Creek. The Middle Fork John Day River is the only true perennial stream in the analysis area. Both Crawford and Mill Creeks are generally dry later in the mid to late summer.

Riparian habitats are also present as wet and seasonally moist meadows, and seeps and springs. The northeast portion of the analysis area contains Crawford, Lobelia, Pie, and Japanese Meadows, where native species still dominate. Phipps Meadow, a lower elevation meadow, has significant amounts of *Poa pratensis*, and various levels of native sedges and rushes. While long term range plots and field observations indicate meadow conditions are generally improving, lodgepole pine have become denser around these habitats and have grown into meadows and other riparian habitats.

Potential Plant Habitats

Fifteen sensitive plant species from the Regional Forester's listing of plants designated as sensitive (USDA, July 2004) are considered to have potential habitat on the Blue Mountain Ranger District, were identified as having potential habitat within the analysis area. Table SP-2 displays these species by scientific and common names.

Sensitive Plant Species List for the Blue Mountain Ranger

District

Scientific Name	Common Name
<i>Achnatherum hendersonii</i>	Henderson's ricegrass
<i>Achnatherum wallowaensis</i>	Wallowa ricegrass
<i>Astragalus diaphanus</i> var. <i>diurnus</i>	South Fork John Day milkvetch
<i>Astragalus tegetariodes</i>	Deschutes milkvetch
<i>Botrychium ascendens</i>	upswept moonwort
<i>Botrychium crenulatum</i>	dainty moonwort
<i>Botrychium lanceolatum</i>	triangle moonwort
<i>Botrychium minganense</i>	mingan moonwort
<i>Botrychium montanum</i>	mountain moonwort
<i>Botrychium pinnatum</i>	northwestern moonwort
<i>Calochortus longebarbatus</i> var. <i>peckii</i>	long-bearded sego lily
<i>Camissonia pygmaea</i>	dwarf evening-primrose
<i>Carex backii</i>	Back's sedge
<i>Carex idahoa</i>	Idaho sedge
<i>Carex interior</i>	inland Sedge
<i>Cypripedium fasciculatum</i>	clustered lady slipper
<i>Dermatocarpon luridum</i>	silverskin lichen
<i>Leptogium burnetiae</i> var. <i>hirsutum</i>	hairy skin lichen
<i>Listera borealis</i>	northern twayblade
<i>Lomatium erythrocarpum</i>	red-fruited lomatium
<i>Lomatium ravenii</i>	Raven's lomatium
<i>Luina serpentina</i>	colonial luina
<i>Mimulus evanescens</i>	fleeting monkeyflower
<i>Pellaea bridgesii</i>	Bridge's cliff-brake
<i>Phacelia minutissima</i>	least phacelia
<i>Pleuropogon oregonus</i>	Oregon semaphore grass
<i>Thelypodium eucosmum</i>	arrow-leaved thelypod

Environmental Consequences

In this section, the Biological Evaluation effects determination is given for the group of species with similar habitats, and the individual species descriptions and more detailed project effects follow.

Species Associated with Dry, Harsh Habitat

Achnatherum hendersonii, *Achnatherum wallowensis*, and *Pellaea bridgesii* are found in rock outcrops, talus slopes, rocky scabs in ponderosa pine stands, or grass steppe habitats. Since both species occupy similar habitat, they are treated together in this document under the common epithet of Henderson's ricegrass. No species have been documented within the analysis area or elsewhere on the Blue Mountain Ranger District.

All Alternatives - Effects Determination

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.

Achnatherum hendersonii* and *A. wallowensis (Henderson's ricegrass)

No plants were located, so it is assumed that no populations of either species exist within the analysis area. Potential habitat was found at several sites within the project area during field surveys in the summer of 1999.

Henderson's ricegrass is a strongly tufted perennial that has been found on the Ochoco NF at elevations from 4100 to 5400 ft. It reproduces from seed, and known populations contain few plants. 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.

Direct Effects and Indirect Effects

These grasses would probably not be affected by either prescribed burning or timber management and connected activities. It is unlikely that potential habitat will be affected by burning as scablands support too little vegetation to carry a fire. Although vehicles and heavy equipment could damage potential habitat in scabland areas, Forest Plan standards and general water quality best management practices control equipment use and limit soil compaction and soil disturbance in these fragile soil types.

Cumulative Effects

Historically scablands scattered within forested areas have been used for yarding and log landings. Activities have removed and reduced native vegetation, compacted soils, and altered runoff and moisture retention patterns on some potential habitat. Grazing, which is likely to remove the seed crop as well as impact individual clumps, is the greatest threat to these species' survival. There is ample evidence that another ricegrass *Achnatherum hymenoides*, a Native American food source, was far more abundant in the Blue Mountain/Great Basin ecosystems before the introduction of European cattle (Murphey, 1959). It seems likely that the same may have been true for these two local endemic species, since their preferred habitat has historically seen heavy grazing.

Pellaea bridgesii (Bridge's cliff-brake)

There are small areas of potential habitat, but no plants of Bridge's cliff-brake have been found within the analysis area or the Forest.

Pellaea bridgesii is a small, evergreen fern that favors the rocky substrate of outcrops and talus slopes of metamorphic and igneous origin, especially granite types. The plant favors south or east aspects on the upper third of slopes within elevations ranging from about 4000 to 9500 feet and has been found in 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 fern. Reproduction of this small fern is accomplished by the dispersal of spores on the wind and pollinators are not required.

Direct Effects and Indirect

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.

Cumulative Effects

Past road construction and mining activities may have affected some *Pelalea bridgesii* habitat, but because of Forest Plan standards that apply to thin soil areas, it is unlikely that future activities would be planned within this habitat.

Species Associated with Seasonally Moist Habitat

No species have been documented within the analysis area, but one population of *Phacelia minutissima* has been found on the Blue Mountain Ranger District.

Carex idahoa and *Phacelia minutissima* are found in areas where localized moisture is only available in the spring. Habitat is found within forested stands, veratrum meadows, and grass-steppe habitats.

All Alternatives - Effects Determination

The proposed activities could impact individuals or habitat of least *Phacelia*, but not Idaho sedge. However, activities would not contribute to a trend towards federal listing or cause a loss of viability to either species.

***Carex idahoa* (Idaho sedge)**

No populations of *Carex idahoa* have been found within the analysis area, although there are several areas of potential habitat.

This sedge is loosely tufted 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.

Idaho sedge 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. It can reproduce via creeping rhizomes, and by seed production. Because it is wind-pollinated, it requires no pollinator insects.

Direct and Indirect Effects

Because of its habitat, *Carex idahoa* is not likely to be affected by logging or thinning activities, as long as vehicles and machinery avoid meadows.

Prescribed burning would probably not negatively affect habitat. Although there is no information about the effects of fire on Idaho sedge, because it grows in the driest associations of meadows, its habitat could be affected. If fire severity is low to moderate the creeping rhizomes will probably survive and sprout after the burn.

Noxious weeds, knapweeds in particular, are a threat, capable of spreading rapidly in this species' preferred habitat.

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 the loss of beaver created wetlands may also have reduced potential habitat.

Phacelia minutissima (least Phacelia)

No populations of *Phacelia minutissima* have been found within the analysis area, although abundant habitat is present.

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 seasonally moist. It is known from the Wallowas, from the Aldrich Mountains, and from one upland site, near 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 vernal 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*).

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.

Direct, Indirect, and Cumulative Effects

Timber harvest activities have little effect on least phacelia as long as these avoid wet meadows and habitat. Meadows supporting *Veratrum californicum*, even if they dry out late in the season, should be avoided with vehicles and heavy equipment.

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 and the related growth of forbs, shrubs, and hardwoods that can provide the required shade will ensure continuity of habitat.

Because the population documented in the upper Camp Creek area has continued to produce new plants after various disturbances, proposed activities would not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species because adaptive management should continue the improved trend in riparian habitat. This may even be a beneficial impact.

Species Associated with Riparian Habitat

Botrychium ascendens, *Botrychium crenulatum*, *Botrychium lanceolatum*, *Botrychium minganense*, *Botrychium montanum*, *Botrychium pinnatum*, *Carex interior*, *Cypripedium fasciculatum*, and *Listera borealis* are found in or near perennially moist ground at the edges of riparian areas, including swamps and wet meadows, seeps, springs, or streams. No plants have been documented within the analysis area, but all six botrychium species, *Carex interior*, and *Listera borealis* have been documented on the Blue Mountain Ranger District.

Effects Determination

The alternatives will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.

Alternative 1 - No action

Because this alternative increases susceptibility to high intensity fire, fires may adversely impact *Botrychium*, *Carex backii*, *Carex interior*, *Cypripedium fasciculatum*, and *Listera borealis* habitat by removing shade, damaging rhizomes, or reducing or temporarily eliminating necessary mycorrhizal associations.

Alternative 2, 3, and 4

Since *Cypripedium fasciculatum* has not been found within the analysis area, the proposed activities will not impact individuals, but may beneficially impact habitat.

Botrychium Species (Moonworts)

Botrychium ascendens, *Botrychium crenulatum*, *Botrychium lanceolatum*, *Botrychium minganense*, *Botrychium montanum*, *Botrychium pinnatum*

None of the six *Botrychium* species have been documented within the project area, but have been found on the Blue Mountain Ranger District. Since these species have common habitat requirements and are frequently found growing together, all *Botrychium* species with occurrence potential on the district are treated under a single analysis.

*Botrychium*s, also known as moonworts 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, these species 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 growth are not yet understood.

These 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 5000 and 7500 feet elevation. Preferred habitat of these species is perennially moist ground at the edges of small streams, wet meadows, springs, and small seeps within forest openings. Even the smallest spring or seep provides good potential habitat, especially above 4500 feet elevation.

Plants often favor 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 habitat sites, as are the mossy openings around springs in mixed conifer forest that includes sub-alpine 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. Reproduction of these plants is accomplished by the dispersal of spores by wind and water, and pollinators are not required.

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. Although the plants are quite small and are difficult to find, their habitat is easy to identify and protector avoid during management activities.

Direct and Indirect Effects

Because sites capable of supporting botrychiums are usually classifiable as riparian, they should not be affected by harvest activities. For the same reason, prescribed fire is unlikely to damage potential habitat or any plants that may be present. Because the six sensitive species considered here have a broad distribution on the continent, and because more of them are being found each year as intensive surveys are conducted in appropriate habitats, any possible impacts to individuals from this project would not jeopardize the survival of the species as a whole.

Loss of individual above-ground stems, by herbivores, unseasonable frost, or mechanical damage, may not harm plants in the long run, considering that they do not appear above ground every year, and probably rely on nutrients obtained from the mycorrhizal connections to persist. However, ground disturbing activities, such as soil displacement by logging and yarding activities, would reduce the quality of habitat, and could disrupt mycorrhizal connections.

Changes in moisture availability, loss of ground water sources or hydrological changes, are probably the most potentially damaging to moonwort populations. Although existing plants may have the capacity to survive droughty periods, ample moisture is required to establish mycorrhizal connections, and initiate germination and establishment of new plants.

The effects of fire are not clearly understood. 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 due to burning 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 the shade that many populations favor could also affect long term survival of these species. It is not known what consequences such fire effects might have, or whether an existing population could persist under these circumstances.

Cumulative Effects

Past activities have diverted water and reduced the size of wetted areas or eliminated sites capable of supporting botrychiums, effectively eliminating potential habitat. These activities include constructing roads, constructing irrigation ditches, altering water flow by constructing water developments for livestock or mining use, or upstream and upslope hydrologic disturbances. The Forest Plan, as amended by PACFISH, should adequately protect potential habitat.

***Carex backii* (Back's sedge)**

No *Carex backii* plants have been documented within the project area but other potential habitat probably exists as very small seeps in forested areas that are not always mapped.

Carex interior is 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. It is known to inhabit saturated riparian areas with year-round surface water, such as swamps and wet meadows associated with seeps, springs, or streams.

Direct, Indirect, and Cumulative Effects

Timber harvest and prescribed burning are the management activities most likely to affect *Carex backii*. Logging activities are only likely to have a direct 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.

Because *Carex backii* grows in moist areas, it is unlikely to be affected by fire. However, if fire were to run through its habitat, individual plants might be killed. Also, fire in any shady riparian area could reduce overstory cover, thereby at least temporarily degrading habitat and reducing the opportunities for Back's sedge to establish and/or survive.

***Carex interior* (Interior Sedge)**

No *Carex interior* has been documented within the project area but other potential habitat probably exists as small seeps in forested areas that are not always mapped.

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, however, it is apparently uncommon in Oregon. It is known to inhabit 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, but can survive with small amounts of shade. *Carex interior* is not rhizomatous and reproduces only by seed.

Direct and Indirect Effects

Inland sedge grows in very wet habitats that are unlikely to be affected by prescribed fire. If fire did creep into an area where this sedge grows, it would likely only affect the above ground portions of the plant. The rhizomes embedded in wet mud can probably survive all but the most severe fires, allowing the plants to sprout rapidly after a burn.

Activities using heavy equipment, logging and road construction, can harm fragile, wet soils on which *Carex interior* grows. Because of its location in wet areas, its habitat is often protected from mechanical disturbance by Forest Plan standards.

Cumulative Effects

Canopy closure and dense shade from conifers resulting from years of fire suppression may well have reduced potential habitat, and may have caused existing populations to shrink.

Heavy domestic livestock grazing and wild ungulate use may have decreased the abundance of this sedge across the landscape. Like other sedges, *Carex interior* remains palatable fairly late in the summer and may become preferred forage when other plants are drying and late season grazing can remove the seed crop, negatively impacting this species' reproduction. Excessive use by ungulates can also harm the fragile, wet soils this sedge inhabits.

Water developments such as cattle troughs and ditches for mining and irrigation have decreased wet meadow habitat. Lowered 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*

Cypripedium fasciculatum (clustered lady-slipper)

No plants of clustered lady's-slipper have been documented within the analysis area or the Forest. Because its potential habitat includes most of the moist forest and dry forest, it is impractical to survey all of it. Therefore, searches have been limited to representative samples of the most likely looking habitat.

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. However, it is doubtful this species is present on the Blue Mtn. Ranger District. It has only been found on the northern portion of the Umatilla NF in areas that supply more humidity or cooler overall temperatures than are available on the Blue Mtn. District.

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, *C. montanum*.

C. 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 the 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.

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. 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.

Direct and Indirect Effects

Ground disturbing activities such as logging operations and the construction of fire-lines would adversely affect habitat and any individual plants encountered. However, since this orchid has a widespread distribution, the species as a whole would probably not be severely impacted.

Response of *C. fasciculatum* to fire depends on burn intensity. 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). Because the single new bud on each plant is starting to grow by April (Harrod, unpublished report), plants are likely to be highly susceptible to spring burning. By late summer or fall, the above-ground portions have died, and the underground rhizomes have gone dormant, so are probably more fire resistant. Prescribed fire that results in partial duff retention and little

or no reduction of the dominant conifer overstory is beneficial to *C. fasciculatum* habitat because shade is retained while the threat of high intensity fire is reduced.

Possible effects of fire on pollinators of *C. fasciculatum* are unknown.

Cumulative Effects

Since there seems to be limited *Cyrripedium fasciculatum* habitat on the Blue Mountain Ranger District, even past timber management activities that reduced tree density using seed tree or regeneration treatments may not have affected potential habitat. The same is probably true for the disruption of mycorrhizal connections caused by mechanical treatments associated with reducing compaction and restoring normal hydrologic function (temporary roads and landings). Changes to timber management activities since the 1996 Regional Foresters' East-Side Forest Plans Amendment have reduced impacts to any potential lady'slipper habitat. Silvicultural prescriptions now focus mostly on removing the smaller, under-story trees and have greatly reduced the more soil disturbing mechanical ripping treatments.

As a result of successful fire suppression activities, duff and organic litter has increased in some forested habitats, resulting in altered fire regimes over landscape size areas. This change in fire behavior poses an increased threat to individual rhizomes growing in that duff because such accumulations can burn long and hot in a wildfire. Catastrophic fire could also adversely impact the lady's-slipper habitat by removing tree cover, and thereby the shade that this species requires for survival.

***Listera borealis* (northern twayblade)**

Listera borealis has not been documented within the project area, but has been found on the Blue Mountain and Prairie City Ranger Districts.

Listera borealis, northern twayblade, is a perennial orchid of moist forests. Its distribution ranges from Alaska and northern Canada, south into the Rocky Mountains to northern Wyoming and Utah. It is known in the Blue Mountains of eastern Oregon from the Willowa and Greenhorn ranges. It is common in the north, but becomes quite scarce, with widely separated occurrences, near the southern extreme of its range. Known populations in the U.S. range in elevation from 3000 to 6500 feet.

Listera borealis is typically found in moist coniferous forest, either along streams, or in dryish humus. It occurs from mid elevations to subalpine and alpine slopes. It inhabits cold air drainages, usually at streamside at lower elevations, but is not restricted to streamside at higher elevations. It most often grows with spruce (*Picea engelmannii*), subalpine fir (*Abies lasiocarpa*), and Douglas fir (*Pseudotsuga menziesii*) in the inland northwest. Most occurrences are associated with old growth forest with a tree canopy cover of greater than 60%. Low slope (less than 10 %), continuous moss cover, and organically rich substrate with a thick duff layer are other common features of *L. borealis* habitat (Cronquist et al, 1977; Hitchcock et al, 1969; Salstrom & Gamon, 1993).

Listera borealis typically flowers in June and requires insect pollination, though pollinator species are not known. Like other orchids, *L. borealis* requires a fungal symbiont for seed germination and growth. The plant may then remain as an underground "mycorrhizome" for several years before it produces a photosynthetic stem. It may take another dozen years before the plant produces a flowering stem, judging from studies of similar species (Salstrom & Gamon, 1993).

Threats to *Listera borealis* include direct mechanical damage by human activities and by grazing animals, changes in local hydrology, decrease in canopy cover, and site contamination by soluble minerals from mining activities. According to Salstrom & Gamon (1993), the capacity of the fungal relationship to turn pathogenic towards the orchid as soil nitrogen increases may mean that fertilizer application, including manure and urine from cattle, could have severely detrimental impacts on *L. borealis* populations. For this reason, cattle use of *L. borealis* sites may prove more of a threat than is indicated from simple mechanical damage to visible plants.

Direct and Indirect Effects

No populations of *Listera borealis* have been found within the analysis area.

Direct effects to *Listera borealis* include mechanical damage by ground disturbing activities such as timber harvest, road construction, and fireline construction.

Indirect effects to existing *L. borealis* populations include hydrologic changes and decrease in canopy cover.

Cumulative Effects

Since many forested stands are outside the historical range of variability they would remain at risk to large-scale disturbances by insects, disease, and eventually wildfire. Wildfires could drastically alter tree cover over landscape sized areas. Canopy removal and changes in hydrology associated with historic placer and dredge mining has likely reduced potential habitat for *L. borealis* in the Blue Mountains, along with associated soil contamination from mining processes.

Consistency with Direction and Regulations

All alternatives are consistent with the Forest Plan and other direction with respect to sensitive plants.

Irreversible and Irretrievable Commitments

There are no irreversible and irretrievable commitments of resources that may result from the alternatives with respect to sensitive plants.

Invasive Plants

Regulatory Framework

Forest Service Strategies, Regulations, and Policies Related to Invasive Weed

- **Malheur National Forest Land and Resource Management Plan**
This analysis is tiered to the Malheur National Forest Land and Resource Management Plan which was amended by the Pacific Northwest Regional Final Environmental Impact Statement for the Invasive Plant Program, 2005, hereby referred to as the R6 2005 FEIS. The R6 2005 FEIS culminated in a Record of Decision (R6 2005 ROD) that amended the Malheur National Forest Plan by adding management direction relative to invasive plants.

- **1988 Record of Decision for Managing Competing and Unwanted Vegetation (1988 ROD) and the 1989 Mediated Agreement**
- **National Strategy and Implementation Plan for Invasive Species Management**
The Forest Service strategy for invasive and non-native invasive plant management.
National Interagency "Pulling Together" Strategy
A National Strategy for Invasive Plant Management.
- **Federal Noxious Weed Act**
P.L. 93-629, Sec 2, Jan 3, 1975, 88 Stat.2148, and as amended
P.L. 101-624, title XIV, Sec 1453, Nov, 8, 1990, 104 Stat. 3611
- **Invasive Species Executive Order, Feb 3, 1999**
An Executive Order to prevent the introduction of invasive species, provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause.
- **Forest Service National Noxious Weed Direction, FSM 2080**

Oregon Invasive Weeds Laws

- Chapter 452-Vector and Weed Control
- Chapter 561-State Department of Agriculture
- Chapter 570-Plants: Inspection, Quarantine, Pest and Weed Control
- Noxious Weed Quarantine; OAR 603-52-1200

Analysis Methods

The analysis area for evaluating existing invasive weed populations is consistent with the project area (Mill Creek Subwatershed, north of Highway 26), with the exception of noteworthy adjacent infestations or infestations in rock source sites and road rights of ways along proposed haul routes. Invasive weeds will be discussed based on inventoried and known invasive weed sites that occur in the Project area. Invasive weed surveys have been conducted throughout the Malheur National Forest. All documented weed sites from these surveys are recorded in a National data base, Natural Resources Information System (NRIS). The database includes individual site records indicating the location, size of infestation, plant numbers and density, type of past treatment implemented, recommended follow-up treatments and effectiveness. The NRIS data base along with weed surveys completed in 2005 were used to identify weed sites within the Crawford Project area.

Location, site density and size, weed species and characteristics, the potential and rate of spread, along with soil disturbance will be the basis for this analysis. Other measures or elements discussed for evaluating the alternatives:

- Miles of temporary road.
- Miles of log haul and road maintenance.
- Acres of timber harvest and tree cutting treatments
- Acres of prescribed burning

Affected Environment

The Blue Mountain Ranger District personnel periodically identify new invasive weed infestations and report occurrences to the District weed specialist for inclusion into the national/forest/district database, Natural Resources Information System (NRIS). This database includes individual species site records that include location and size of infestation, plant numbers and density, type of treatment implemented, follow-up treatments and effectiveness of treatments. Invasive weed species occurring in the proposed project area are Canada thistle (*Cirsium arvense*), dalmation toadflax (*Linaria dalmatica*), diffuse and spotted knapweeds (*Centaurea* sp.), houndstongue (*Cynoglossum officinale*), St. John's wort (*Hypericum perforatum*), whitetop (*Cardaria draba*), and yellow starthistle (*Centaurea solstitialis*). These invasive plants infest approximately 218 acres in 90 sites (Table I-1). These infestations can be vectors for the spread of weeds into other areas in the project area and beyond.

Table I-1, Summary of Known Invasive Weed Species in the Project Area

COMMON NAME	Number of Sites	Largest Site (acres)	ACRES
CANADA THISTLE	34	23.0	174
DALMATIAN TOADFLAX	11	0.4	2
DIFFUSE KNAPWEED	18	3.9	8
HOUNDSTONGUE	5	3.7	4
SPOTTED KNAPWEED	6	3.3	5
ST. JOHNSWORT	13	47.7	24
WHITETOP	2	0.1	0.2
YELLOW STARThISTLE	1	0.4	0.4
Total	90		217.6

These known weed infestations are primarily located along roads, old logging units and landings, recreational use areas, rock-pits and other disturbed areas. Some vectors of past and ongoing spread of invasive plants are:

- Seeds becoming attached to fur of wildlife and domestic livestock as they pass through existing infestations and then falling off at another location.
- Seeds and weed propagules being transported by vehicles and machinery that have been operated in infested area.
- Management actions that disturb soils and reduce competing vegetation therefore making more desirable sites for invasive plant establishment.

The species of greatest concern (Grant County A & T Noxious Weeds List) within the project area are Spotted Knapweed, Diffuse Knapweed, Yellow Star Thistle, St. Johnswort and Houndstongue. These weeds can spread quickly, crowding out native plants, and are difficult to eradicate once established. High priority weeds are considered such because they are invasive, persistent, and prolific reproducers. They displace desirable vegetation, and presently occur in infestations at scales which are feasible to treat.

Currently the populations of low priority (Grant County listed B) invasive weed species, such as Canada Thistle, Whitetop, and Dalmatian Toadflax, are so extensive in Grant County that they

are not treated, except in special circumstances such as whitetop. Whitetop on the Forest and in the project area are small and can be treated effectively along with other higher priority plants. These lower priority invasive weeds tend to be less persistent and aggressive than the high priority weeds, and may give way to healthy desirable vegetative species over time. Many times low priority weeds are treated in conjunction with high priority weeds. Because these weeds are less abundant on the Forest than on other areas of Grant County the smaller infestations are being treated.

The Malheur Forest is presently utilizing manual methods of treating (controlling) invasive plants. Therefore treatment emphasis has been on those species with infestations small enough to treat with a limited work force. This means that much of the Canada thistle and St. Johnswort in the project area have not been treated while the majority of the other species have been. No invasive weed sites were treated in the project area in 2006. In 2005 the following species were treated in the project area by manual methods:

Table I-2, Summary of Invasive Plants Treated in 2005 on the Crawford Project Area

COMMON NAME	In Project Area		Treated	
	Number of Sites	ACRES	Number of Sites	ACRES
CANADA THISTLE	34	174		
DALMATIAN TOADFLAX	11	2	1	0.2
DIFFUSE KNAPWEED	18	8		
HOUNDSTONGUE	5	4		
SPOTTED KNAPWEED	6	5		
ST. JOHNSWORT	13	24	2	53.1
WHITETOP	2	0.2		
YELLOW STAR THISTLE	1	0.4		
Total	90	217.6		53.3

Manual methods involve grubbing or cutting with hand tools/weed eaters, twice during the growing season. Grubbing uses hand tools to cut stems or tap roots below the ground surface (1-2"). Cutting severs heads from the root above the ground level. Both are effective in controlling or slowing the spread of targeted weed species, however may not be effective methods of eradication. Eradication by this method has been successful only on the early stages of infestation. Manual control methods are highly labor intensive and often require repeated treatments within the same or subsequent growing season to be effective. In addition, depending on the site, species, and degree of plant maturity, manual practices may also involve the collection of plant residue by bagging or piling and burning.

As the weed infestations are treated the adjacent areas are monitored to determine if any new invasive plants have become established. Infestations are recorded in the NRIS data base as they are located. This monitoring takes place annually. The amount of monitoring varies from year to year based on available funding.

Based on ocular observations by the District Weed Specialist (conversation with, 2006), that has been involved in treating invasive weeds over the last three years, there does not appear to be any appreciable change in size of those sites that are treated manually on an annual bases.

The Malheur National Forest has started a NEPA analysis of a plan for treatment of invasive plants Forest wide. This plan will include the use of herbicides as well as other control methods. This analysis is expected to be completed by October of 2007. Some of the infestations within the Crawford project area may be proposed for treatment. A proposed action has not been developed to date, therefore possible treatment methods, species, site locations, and acres are not known at this time.

Environmental Consequence

Alternative 1 – No Action

Direct and Indirect Effects

Annual monitoring and treatment of invasive weeds would continue in the project area. The potential for spread is expected to stay the same as it presently is. Other uses of the Forest such as hunting, grazing, and firewood cutting, will continue to contribute to the spread of invasive weeds as they have in the past.

This alternative has the least potential risk for invasive weed propagule transport and spread compared to the other three alternatives (2, 3 or 4).

Because fire has not been permitted to perform its natural role of frequent under burning, forest stand density has increased and vigor has diminished. This diminished health has contributed to more frequent outbreaks of insects and disease epidemics that have further increased the probability of large stand replacing fires (Hall 1980). Without the proposed prescribed (low intensity) burn this process will continue as the interval between fires increases and the fuel loads increases. The lengthening of fire intervals has contributed to fires burning more severely in communities where fire once passed through with less severity owing to lighter fuels. (Johnson 1998) When this area does burn the intensity (severity) of the fire may be more than if it was burned now under more controlled circumstances. The more severe the fire the more risk of producing favorable conditions for invasive weed spread and establishment of new infestations. The no action alternative would maintain conditions which pose a risk of future high severity fire.

Cumulative Effects

Past and ongoing actions, such as timber sales, fire suppression, livestock grazing, road construction, fire wood cutting, road maintenance, and recreation uses (refer to Appendix D for more information about these actions), have introduced invasive weed populations within the project area. The Forest's weed management program consisting of annual surveys combined with mechanical and hand pulling treatments will continue. The amount of treatment, in the project area, will vary annually based on funding and Forest priorities.

There are several foreseeable activities that would occur within the project area which can and do provide a moderate to high probability of the introduction and spread of invasive weed propagules. These reasonably foreseeable future activities include (but are not limited to) motorized and nonmotorized recreation, road maintenance, livestock grazing, firewood, fire suppression, and associated rangeland improvement projects and resource enhancement projects.

Upon completion in 2007 of the Malheur Forest's NEPA analysis and plan for treatment of invasive plants Forest wide, additional weed treatments may occur in the project area. A proposed action has not been developed to date, therefore possible treatment methods, species, site locations, and acres are not known at this time.

All Action Alternatives

Direct and Indirect Effects

Activities associated with timber harvest, site preparation for planting, road maintenance, and temporary road construction all disturb the soil to some degree. Ground-disturbing activity would increase the risk for spread of non-native, invasive plants because if seeds are introduced they can germinate more readily than if the soil surface was intact (Gelbard & Belnap 2003; Silveri et al. 2001). This weed seed could come from a nearby weed patch, be carried in soil clinging to equipment, or be introduced from some other source (birds, animals, recreation). Contractors mobilizing equipment from other areas have the potential to introduce new invasive weeds into the area, and invasive weeds may increase in commercially thinned areas due to the transport of weed propagules along existing access roads. With the design measures (refer to "Management Requirements, Constraints, and Design Measures" in Chapter 2) and monitoring protocols incorporated into this project to reduce invasive weed spread the potential for invasive weed spread is expected to be minor. The potential risk for invasive weed propagule introduction and spread, due to these activities, will vary between alternatives as the amount of acres and types of activities proposed varies.

Because of the possible direct contact with weed propagules and possibly disturbing soils within and immediately adjacent to the infestation those commercial harvest units proposed in Alternatives 2 and 3 containing invasive weed have more potential for promoting the spread of invasive weeds than do units without them. Although the acres of harvest treatments (Commercial Thinning and Shelterwood) vary between alternatives 2 and 3 the acres of weeds within the harvest units are the same. Twelve of the proposed harvest units in alternatives 2 and 3 (Units 22, 24, 60, 62, 68, 80, 82, 116, 118, 120, 126, 148) contain populations of invasive weeds ranging from .2 acres to 14.4 acres in size. Table I-3 summarizes the acres of weeds within proposed harvest units.

Table I-3, Summary of Acres of Invasive Plants within Harvest Units (Alternatives 2 and 3)

COMMON NAME	In Project Area		Acres within Harvest Units
	Number of Sites	ACRES	
CANADA THISTLE	34	174	31
DALMATIAN TOADFLAX	11	2	0.3
DIFFUSE KNAPWEED	18	8	0.2
HOUNDSTONGUE	5	4	2
SPOTTED KNAPWEED	6	5	0
ST. JOHNSWORT	13	24	8
WHITETOP	2	0.2	0
YELLOW STAR THISTLE	1	0.4	0
Total	90	217.6	41.5

Alternative 4 does not propose commercial harvest activities, eliminating the potential for spread of existing weed sites from logging activities.

All action alternatives propose grapple piling activities. Grapple piling activities are proposed within some of the areas proposed for commercial harvest in Alternatives 2 (877 acres) and Alternative 3 (631 acres). Although alternative 4 does not propose commercial harvest, grapple piling is proposed to treat existing fuel and precommercial thinning slash on approximately 649 acres. Heavy equipment is used during grapple piling activities creating some soil disturbance and contact with existing weed sites, increasing the potential for weed spread within treatment areas.

All action alternatives propose varying amounts of precommercial thinning (PCT). PCT operations do not use heavy equipment such as used in tree harvest activities. Thus, there is very little to no soil disturbance expected minimizing the risk of promoting the spread of invasive weeds. But, as the acres of thinning increases although slight the risk of spreading weeds increases. Alternative 2 proposes the greatest number of acres of precommercial thinning at 935 acres. Alternatives 3 (666 acres) and 4 (795 acres) propose slightly fewer acres and offer a slightly lower risk of weed spread.

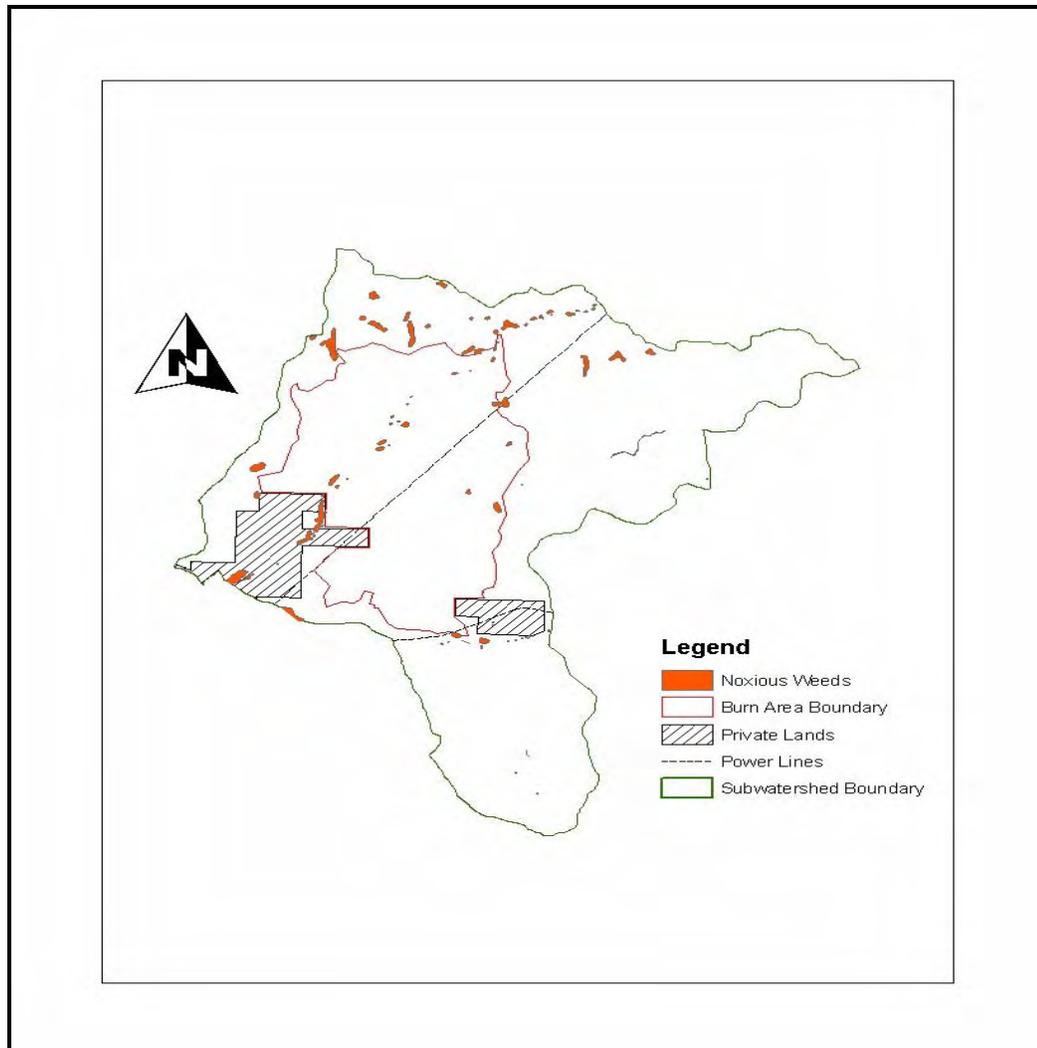
Prescribed burning may increase invasive weed populations (Maret and Wilson 2000, and Briese 1996). Burned areas do provide nutrients and space for invasive weeds to establish. However, fire is expected to be low intensity which reduces the risk of increasing weed populations. A monitoring study done in the Malheur National Forest noted that an increase in invasive weeds was closely related to the intensity of a fire. Lower intensity fires had fewer weeds develop on the site (Kerns et al. 2006). Therefore, because low intensity fires are proposed in this project the risk of producing conditions for invasive weeds increases are minor and certainly less that if the fire was a wildfire. All three action alternatives will burn the same amount of acres (5,300) therefore the risk is the same for all three. It is expected that when the invasive weeds are burned the risk of spread in close vicinity to the site is at more risk of weed establishment than an area burned further away. What distance from the perimeter of the infestation is at risk more is not known. It would depend on the differences in resiliency to fire of the weed and surrounding vegetation, soils, and fire intensity. Because the areas of weeds within the prescribed burn area

are the same in all three action alternatives there is no expected difference in risk of spread between alternatives due to fire being applied directly to the known invasive weed infestations. Following (Table I-4) is a summary of known acres of weeds within the prescribed burn unit. Figure I-1 shows the location of weed sites within the burn unit.

Table I-4, Summary of Acres of Known Invasive Weeds in Rx Burn

COMMON NAME	In Project Area		Acres within Rx Burn
	Number of Sites	ACRES	
CANADA THISTLE	34	174	20
DALMATIAN TOADFLAX	11	2	0.7
DIFFUSE KNAPWEED	18	8	2
HOUNDSTONGUE	5	4	0
SPOTTED KNAPWEED	6	5	0.08
ST. JOHNSWORT	13	24	8
WHITETOP	2	0.2	0
YELLOW STAR THISTLE	1	0.4	.3
Total	90	217.6	31.1

Figure I- 1, Locations of Known Weeds in Rx Burn Area



All Action Alternatives

Cumulative Effects

Past actions such as timber sales, fire suppression, livestock grazing, road construction, fire wood cutting, road maintenance, and recreation uses (refer to Appendix D for more information about these actions), have increased invasive weed populations within the project area.

The potential for invasive weed spread is expected to increase in the short term due to the proposed activities. Proposed design measures listed in Table 2.11 will help reduce the magnitude of spread. Post-project surveys of the area annually for 1 to 5 years would provide for early detection and treatment if weeds do establish in the project area.

The Forest's weed management program consisting of annual surveys combined with mechanical and hand pulling treatments will continue in the future. The amount of treatment, in the project area, will vary annually based on funding and Forest priorities. Certain invasive weed populations will continue to expand, regardless of the alternative chosen, due to natural increase of existing populations from all the complex ways these species are spread. However, other species that occupy limited area (plus other species that are not yet here) will be managed to the extent possible to stop the spread by the Forest's weed management program.

Cumulatively there are several activities that occur within the Project Area which can and do provide a moderate to high probability of the introduction and spread of invasive weed propagules. These reasonably foreseeable future activities include (but are not limited to): domestic livestock grazing, mining, motorized and nonmotorized recreation, road construction and maintenance, and resource enhancement projects. As identified in the Range Resources Report for the Crawford Project, all action alternatives could increase the level of accessibility and use by domestic livestock (as well as wildlife and recreationists), increasing the transport of weed seeds by these vectors. This increased accessibility could result in cumulative spread of invasive weeds.

Upon completion in 2007 of the Malheur Forest's NEPA analysis and plan for treatment of invasive plants Forest wide, additional weed treatments may occur in the Project Area. A proposed action has not been developed to date, therefore possible treatment methods, species, site locations, and acres are not known at this time.

Consistency with Direction and Regulations

All alternatives are consistent with Forestwide standards for invasive weeds, including Forest plan modifications made by the Pacific Northwest Region Invasive Plant Program FEIS.

Irreversible and Irretrievable Commitments of Resources

There are no irreversible and irretrievable commitments of resources that may result from implementing the alternatives with respect to invasive weed management.

Rangeland Resources

Regulatory Framework

Laws, regulations, and policies direct Forest Service rangeland management.

Laws

The authority to protect, manage, and administer the National Forest System, and other lands under Forest Service administration for range management purposes, is found in the following acts:

- Granger-Thye Act of 1950 - authorizes the Forest Service to issue grazing permits and use grazing receipts for range improvements; provides direction on establishment of local grazing advisory boards and other purposes.
- The Multiple Use Sustained Yield Act of 1960 - establishes the policy and purpose of the National Forests to provide for multiple-use and sustained yield of products and services.
- Forest and Range Renewable Resources Planning Act of 1974 - establishes public land policy and guidelines for the management, protection, development, and enhancement of the public lands.
- Public Rangelands Improvement Act of 1978 - establishes and reaffirms the national policy and commitment to inventory and identify current public rangeland conditions and trends; manage, maintain and improve the condition of public rangelands so that they become as productive as feasible for all rangeland values in accordance with management objectives and the land use planning process; charge a fee for public grazing use which is equitable; continue the policy of protecting wild free-roaming horses and burros from capture, branding, harassment, or death, while at the same time facilitating the removal and disposal of excess wild free-roaming horses and burros which pose a threat to themselves and their habitat and to other rangeland values.
 - Section 8 of the Public Rangelands Improvement Act (PRIA) of 1978 – this section allows for consultation and cooperation in the development and execution of allotment management plans for grazing permits.
- The Rescission Act of 1995 (Public Law 104-19) - required each National Forest to establish and adhere to a schedule for completing NEPA analysis and decisions on all grazing allotments within a 15 year period.

Regulations

Regulations governing range management on the National Forests are found primarily at 36 CFR 222. In addition, policy relating to range resources and coordination of range activities of the USDA agencies and other executive agencies, organizations, and individuals is included in the following:

- Secretary's Administrative Order of August 1963, Administration of Lands Under Title III of the Bankhead-Jones Farm Tenant Act; Establishment of National Grasslands.
- Departmental Regulation, Number 9500-5 - dated December 15, 1983; Subject: Policy on Range.

Policies

Forest Service's Rangeland Management Manuals and Handbooks.

- **FSM 2200** – this manual summarizes laws and regulations governing rangeland management and forest planning.
- **FSH 2209.13 – Grazing Permit Administration Handbook**

Management Direction

The **Malheur National Forest Land and Resource Management Plan** (USDA Forest Service 1990) provides general direction, objectives, and goals for the management of forestwide resources.

Forest Goals for range resources: (Forest Plan, pg. IV-2)

- Provide a sustained production of palatable forage for grazing by livestock and dependent wildlife species.
- Manage rangelands to meet the needs of other resources and uses at a level which is responsive to site-specific objectives.
- Permit livestock use on suitable range when the permittee manages livestock using prescribed practices.

Basic management direction is described in the Forest Plan as Management Areas (MAs).

The **Forest Plan was amended in 1995 by PACFISH & INFISH** to provide interim direction to maintain management options for anadromous and native fish habitat while the Forest Service developed long-term management strategies.

The **Malheur National Forest Post Fire Grazing Interim Guidelines** (2003) is an interim providing direction that establishes minimum timeframes that an area would be rested from grazing following a fire (wild and prescribed fires).

Analysis Methods

The analysis area for evaluating rangeland resources is consistent with the Crawford Project Area. This report provides basic rangeland resource information within the Project Area. However discussions may at times divide the project area into two subunits (2 separate grazing allotments and their respective pastures) for the purpose of addressing specific environmental consequences, administrative impacts or effects, or impacts to permittees.

Information was gathered from various sources; condition and trend transects, permanent camera points, Proper Functioning Condition Assessments (USDI, 1993), riparian vegetation assessment surveys (Winward & modified Winward), multiple indicator monitoring, Area 3 Ecologists

notes, analysis completed for the Draft Middle Fork Grazing EIS (1950), grazing files containing the history of the allotments/pastures, past permittee performance & compliance, on the ground knowledge of area, conversations with permittees, and professional judgment.

Affected Environment

This section provides an overview of current existing forested and non-forested rangelands, riparian vegetation resources, and upland forested and as they relate to forage availability for domestic livestock grazing.

General Rangeland Vegetation Conditions

Ground vegetation and shrub species vary throughout the project area from small areas of grass and shrub steppe at lower elevations near the Middle Fork John Day River, through meadows and riparian shrub stands, to the species adapted to survival under forest canopy from open ponderosa pine stands to the heavy shade of higher elevation fir forests. Upland vegetation makes up approximately 95 percent (or more) of the acres in the project area, whereas the riparian plant communities in the project area account for 5 percent (or less) of the total acres.

Non-forested upland habitats dominated by grasses in the project area cover a small percentage of the landscape. They include a few larger scablands (areas of “very shallow, very stone soils”, most commonly over basalt bedrock [Anderson et al, 1998]) that support both shrub land and grassland plant associations. Also present are numerous smaller dry forest openings and several subalpine mosaics of grasses and sagebrush.

Non-forested habitats at lower elevations include scabland inclusions in the forest, riparian meadows, and occasional rock outcrops. Shrubs such as low sage or rigid sage dominate some non-forest areas, while grass communities predominate on others. Both of these potentially species-rich habitat types have been degraded by past management practices, with loss of some of the native bunchgrasses, and subsequently of the soil that used to support them. Those that were most degraded now support populations of cheatgrass (*Bromus tectorum*) and tarweed (*Madia glomerata*) to varying degrees.

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.

Many shrubs are dependent on gaps in the forest canopy for both establishment and maximum growth, and tend to be sparsely represented in much of the planning area due to historic fire suppression and current canopy closure (e.g. mountain mahogany, Scouler willow, snowbush ceanothus).

In Area Ecologist's, Charlie Johnson's, notes from the mid 1990s he characterizes the land within the project area as outside the normal range of variation. He asserts key factors influencing this are based on disturbances that have been either too severe or due to the lack of maintenance disturbance processes. Fire is the element of the ecosystem, which has had the most profound influence on the quality of the plant communities following the intensive grazing period. Where overgrazing was rampant in many parts of the southern Blue Mountains in the first half of the century, the effects of curtailment of fire over time from having its normal cycle of activity in the communities has been pronounced during the past 50 years. Although his

report was generated for grazing permit renewal or continuation, he adds the health of the land relates to the incursions by administrative projects to harvest trees. This has been intensive on most areas. The removal of larger trees coupled with removal of fire from the ecosystem has led to promotion of later seral tree species when fire seral tree species were favored in the removal. These plant communities are now far outside the natural range of variation, which effects the overall forest and rangeland health and production. (Charles G. Johnson, Jr; Summary Report for Rangeland Health on Selected Allotments, 6/6/95).

General Riparian Vegetative Conditions

The riparian vegetation in the project area ranges from cool moist conifer-dominated and moist meadow communities in the upper stream reaches, to mixed conifer/hardwood types in the middle elevation reaches, to grass/sedge dominated communities in the lower elevation wider valley bottoms. Hardwoods (primarily alder) in these upper reaches are generally limited to areas where there are natural or created openings in the canopy. Mid-elevation reaches currently show the most predominant effects of past management activities; lack of fire, historic harvest, livestock grazing, big game browsing and poor road location. These hardwoods often show reduced vigor due to the effects of excessive browsing pressures and lack of natural disturbances such as fire or beaver.

Wider valley bottoms lower in the watershed sustain wet meadow grass communities consisting of various sedges and rushes. These riparian areas are generally preferred by domestic livestock due to their productivity, gentle slopes and proximity to water. In some areas native grass species are largely displaced due to a combination of factors, which include changes in water table levels.

A few wet meadows in the upper and mid elevations (Lobelia, Pie, and Japanese Meadows) in the Blue Mountain Allotment still support a large proportion of native grasses and forbs (Upper Middle Fork John Day River Watershed Analysis Report, 1998 and personal observations with species composition information).

Some streamside roads limit the vegetative production and potential along creeks where roadbeds occupy significant portions of the historic floodplains; Crawford Creek is a good example.

Aspen clones occur in isolated small areas of localized high soil moisture, such as riparian zones, ephemeral wet draws, wet meadows, and areas of groundwater seeps. Communities are most commonly found in the mid-elevations (4500-5500 ft.). The current aspen populations are predominantly mature to over mature with little structural or age diversity. The present successional processes have led to diminished patch size and loss of vertical structural diversity. Browsing by domestic livestock, deer and elk has exacerbated the stagnant condition of most aspen clones within the Crawford Project area.

Forested Understory Vegetation Conditions

Prior to European-American settlement of this area, fire played a dominant role in shaping the landscape. Current policies of fire suppression have significantly altered the ecosystem. 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. Much of the densely stocked forest stands have succumbed to insects, disease and reduced vigor because of over crowding. Where significant tree mortality has occurred, fallen trees often restrict the movement of livestock, thereby further limiting the amount of forage produced and available for domestic livestock.

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.

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, with little seed set or vegetative reproduction.

Dry forest has generally sustained more alteration of its understory due to the combination of loss of regular fires, past management practices, and current populations of wild ungulates, therefore is the most changed from its historic condition. Native understory grasses and forbs in dry forest environments are adapted to short fire return intervals, and common species such as pinegrass (*Calamagrostis rubescens*), Elk sedge (*Carex geyeri*), blue wildrye (*Elymus glaucus*), tailcup lupine (*Lupinus caudatus*), and heartleaf arnica (*Arnica cordifolia*) are stimulated by low intensity burns, especially where adequate light is available. Canopy gaps and a mosaic pattern of forest openings enhance opportunities for the growth of such species of the forest floor. The alteration of natural fire regimes has resulted in uncharacteristically dense shade from the overstory in areas heavily stocked with climax tree species, with a resulting decrease in grass cover and resultant forage availability.

Since most understory shrubs, both riparian and upland, are early seral, they are also dependent on a mosaic forest pattern and overstory gaps to provide the light-rich environment that they need in order to establish. Most are either dependent on top-kill by fire to remove diseased older stems and stimulate regrowth, or require the scarified substrate created by fire to germinate seed. The alteration of natural disturbance regimes in the last 100 years, combined with use by ungulates, has resulted in degraded shrub communities throughout the analysis area.

Native grass and forb species are still predominant in the dry forest, but in areas have been mixed with exotic species introduced to stabilize soils along roads, skid trails, and landing sites, while enhancing domestic livestock forage. Some of these same disturbed locations now host populations of noxious weeds.

Grazing Allotments

Two grazing allotments, Upper Middle Fork (UMFA) and Blue Mountain (BMA), are within the Project Area (Table RL-1).

Table RL-1, Rangeland Information for the Project Area

Allotment	Unit	Pasture & Total Allot. Acres	Acres in Project Area
Blue Mountain	Crawford	8,431	7,482
	Idaho Creek	9,796	96
	East Summit	1,196	62
	West Summit	2,320	1,879
	Squaw Creek	124	26
	TOTAL		21,867
Upper Middle Fork	Butte	13,334	0
	Caribou	9,592	0
	Austin	4,408	3,402
	Deerhorn	13,854	527
	Lower Vinegar	7,001	0
	Upper Vinegar	5,569	0
	River	111	0
	Shop	133	0
	Tailing	47	0
	TOTAL		54,049

Blue Mountain Allotment

The Blue Mountain Allotment lies between Highway 7 Highway 26 (See Figure RL-1). The current situation in this allotment, as indicated by stream surveys and evaluation of data in year-end reports, shows that the past management system has paid off with riparian areas in an upward trend (MFJD River BA 1999-2005, UMFJDR Watershed Assessment, 1992).

The Blue Mountain allotment is now comprised of six pastures; 2 large ones (Idaho & Crawford), three smaller ones (West Summit, Squaw, East Summit) and a recently added small riparian pasture (Upper Phipps). The current ten year term grazing permit authorizes 163 cow/calf pair on the Blue Mountain Allotment from June 16 until October 9 each year.

In the past the permittee has voluntarily reduced the number of livestock on the Blue Mountain Allotment to accommodate annual fluctuations in allotment forage/water conditions. In recent years (for various reasons) the Blue Mountain Allotment has not been grazed by domestic livestock (2003-2006).

Rangeland vegetative cover for the allotment consists of bluebunch wheatgrass plant communities, pinegrass-elksedge communities and Idaho Fescue. Rangeland conditions on the Blue Mountain Allotment can generally be described as good to excellent with an upward trend. Numerous Meadows on this allotment provide the majority of the forage. Crawford Meadow was evaluated by a range technician in 1998. A condition and trend transect within this meadow which was established in 1956 was re-read. The rangeland was judged to be in "excellent"

condition. Another transect (established 1960) was read in Pie Meadow. The rangeland condition in this meadow was "good". Based on Forest Service records, most of the rangelands on the Blue Mountain Allotment have an upward trend however, with effective wildland fire prevention/suppression and reduced forest management forested lands are expanding and overstory crown cover is increasing over time.

Generally the forested upland portions of this allotment are becoming increasingly overstocked with ponderosa pine, Douglas fir, white fir and lodgepole pine resulted in a loss of area suitable to cattle grazing and has resulted in reduced forage production. Some of these stands also have limited access to livestock due to dense undergrowth of small sized trees and brush as well as downed dead timber. Lack of fire and timber harvest has the potential effect of concentrating livestock and wildlife grazing onto fewer total acres of the allotment. The majority of riparian areas within this allotment have displayed dramatic improvement in riparian health and aquatic functionality. Both hardwood and conifer stands are recovering along the streams (MFJD River BA, UMFJDR Watershed Assessment, 1992).

Upper Middle Fork Allotment

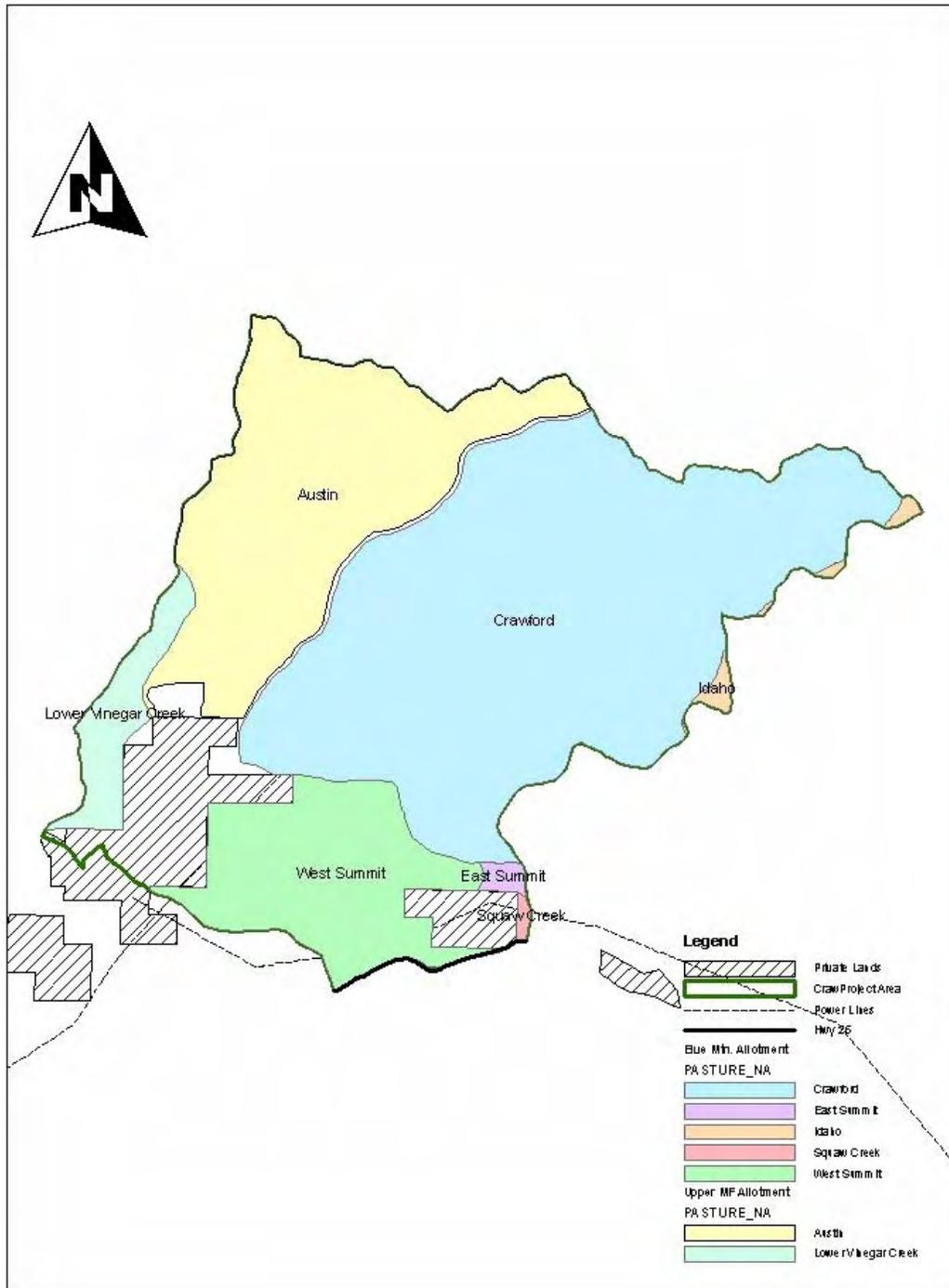
The Upper Middle Fork allotment (UMF) is located near the head of the Middle Fork John Day River, north and west of Highway 7 (See Figure RL-1). The river divides this allotment in nearly two equal pieces, one north of the river and the other to the south. Currently 473 cow/calf pair are authorized to graze from June 1 until October 15.

Over 45 miles of fence have been constructed on the Upper Middle Fork Allotment to improve livestock distribution and facilitate further control of timing, duration and intensity of use. The current fence/pasture configuration has six major pastures; Austin, Lower Vinegar, Upper Vinegar, Caribou, Deerhorn, and Butte; two smaller ones left over from range evaluation project research; Blackeye and Ragged Rocks, with 3 riparian pastures on the river; Shop, River and Tailings.

During the last fifteen years, this allotment has had 7 years of rest, with the most recent rest period being 2004 thru 2006.

Vegetative cover for this allotment varies greatly, as with topography. Elevation ranges in from 3600-8100 feet. Vegetative sites vary from open ponderosa pine stands at lower elevations to mixed conifer over story stand in mid elevation and alpine/shrub lands. Each of these timbered types supports an herbaceous under story of forage in varying quantities depending on canopy closure. There are pockets of dry meadows, moist meadows, and scablands scattered throughout the allotment.

Figure RL-1, Insert Map Showing grazing allotment in relation to project area



Environmental Effects

Alternative 1 – No Action

Direct/Indirect Effects

Current grazing practices would continue on all allotments in the Project Area. The No Action Alternative would have no overall short-term impact on the range resource or range permittees. However, mid to long-term effects of the no action alternative may result in a reduction in forage availability and distribution of livestock due to increased vegetation shading and duff layer accumulations.

If no action is taken and resources are left to continue within the analysis area at the present regression, forage quality and production will decline, reducing the quantity of primary, secondary and suitable rangeland over time. There would be a decreased likelihood that the area could be managed in the long term toward open forest conditions, consistent with the historic range of variability. This would have a negative cumulative effect on available forage. The amount of forage developed within dense ponderosa pine/ fir is well below forage quantities associated with an open forest that is consistent with the historic range of variability. Forest stocking levels will continue to increase, along with conifer encroachment into meadows, grasslands and riparian areas. Less forage availability in the upland area would increase use by ungulates (both domestic and wildlife) in more open riparian areas and have potential detrimental impacts to fisheries as well as aquatic resources.

In the long term, as forest health declines, the abundance of downed logs is likely to present more physical difficulties to livestock grazing operations. Long-term accumulations of woody debris may impede the movement of cattle and permittee ability to distribute livestock use. Some minor increased in maintenance costs may be incurred by the permittee in the long-term as the forest ages to repair fences damaged from falling snags and maintain fence right-of-ways.

With no action many of the forested hot-dry and warm-dry biophysical environments will remain outside of the "Historical Range of Variability (HRV), with overstocked stands that cannot be sustained in the long-term. Because fire has not been permitted to perform its natural role of frequent under burning, forest stand density has increased and vigor has diminished. This diminished health has contributed to more frequent outbreaks of insects and disease epidemics that have further increased the probability of large stand replacing fires (Hall 1980).

Alternatives 2, 3, and 4

Direct/Indirect Effect

Forest stand cutting treatments and prescribed burning would positively affect both in the short- and long-term range conditions by reducing conifer density in stands, reducing ground fuel loading that restricts livestock movement, and increasing transitory range forage.

Commercial harvesting and pre-commercial thinning treatments will increase available forage for livestock. The amount of forage increase varies between alternatives depending on the acres treated and type treatment. The differences in forage increases between types of treatment is the more the treatment opens a stand of trees (reduces tree canopy cover) the more availability of sun and nutrients are to forage producing herbaceous species. Thus a shelterwood treatment opens a

stand more than a commercial thinning treatment and both of these treatments opens the stand more than a pre-commercial treatment.

Densely shaded stands opened up by thinning or harvest cuts will allow herbaceous forage production to increase, especially that of pinegrass, elk sedge and dry site bunchgrasses (Idaho fescue, bluebunch wheatgrass). Cover of the palatable shrub, bitterbrush, has no doubt declined in recent years as stands have closed and shade increased. This “light sensitive” shrub should increase after treatment, on environments where it was previously suppressed by shade. Forage production will begin to improve rapidly with the reduction of competition for light, and higher yields may continue for a decade or more depending on light conditions in this “transitory range” environment. Open grown feed is more palatable. This higher quality forage is preferred by livestock which will attract and encourage more use in open areas. This should improve livestock distribution over the pastures. It may also reduce pressure on riparian zones early in the season, especially if management is used to encourage this action. Livestock management/herding will be improved with more open vegetation since livestock movement is less restricted and stock are much more visible to ranchers. The anticipated flush in livestock forage production could be a positive impact on the rancher (permittee) economic situation, especially if open stands can be maintained over time, as in historic periods, by future forest management.

Table RL-2, Commercial Harvest by Allotment

Allotment	Unit	Commercial Harvest Alternative 1	Commercial Harvest Alternative 2	Commercial Harvest Alternative 3	Commercial Harvest Alternative 4
Blue Mountain	Crawford	0	721	358	0
	Idaho Creek	0	0	0	0
	East Summit	0	0	0	0
	West Summit	0	514	455	0
	Squaw Creek	0	0	0	0
	TOTAL		0	1,235	813
Upper Middle Fork	Butte	0	0	0	0
	Caribou	0	0	0	0
	Austin	0	900	621	0
	Deerhorn	0	0	0	0
	Lower Vinegar	0	101	76	0
	Upper Vinegar	0	0	0	0
	River	0	0	0	0
	Shop	0	0	0	0
	Tailing	0	0	0	0
	TOTAL		0	1,001	697

The fuel reduction activities in all alternatives will have a beneficial effect for livestock grazing on approximately 5,300 acres. Even though the scheduling of the burn operations will be coordinated with the grazing permittee this activity is likely to create some disruption of his grazing operations and increase his operation costs in the short-term. This will be complicated more by the need to rest the burn area for at least one growing season following the burn (Forest Post Burn Guidelines, 2003). Areas burned will be evaluated to determine if additional rest is

needed to promote the establishment of bunch grasses and other herbaceous vegetation. Prescribed burn operations will be coordinated with the Grazing Permittee and the Rangeland Management Specialist administering the affected allotments. Where possible the burning would be fitted to the grazing systems being used on the affected allotments to minimize impacts to the permittee's ranch operations. Several other design measures have been added to reduce impacts to permittee operations and improvements. These measures are listed in Table 2.13 in Chapter 2.

Long term effects of this prescribed burning on rangeland management are positive. Higher forage yields and availability on upland sites may result in more AUMS to be harvested, held in reserve, or take some pressure off riparian zones by better distributing livestock. Because of the large size of the grazing pastures in the planning area, the staggered and varied treatments of this transitory range will 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 will redistribute grazing effects in a more uniform scope across the pasture.

Access for livestock and personnel will be much better, livestock visibility and herding will be greatly improved. Long-term maintenance costs may be reduced due to improved access along fences and water sources.

Treatments would also reduce and eliminate dead and down woody material and would enable increased livestock distribution resulting in improved utilization of forage, water, and salt. With the projected increase in the quantity of available forage there is increased potential to reduce impacts on riparian herbaceous and hardwood species.

Table RL-3, Prescribed Burning Acres by Allotment

Allotment	Unit	Prescribed Burning Acres Alternative 1	Prescribed Burning Acres Alternatives 2, 3, 4
Blue Mountain	Crawford	0	2,465
	Idaho Creek	0	0
	East Summit	0	0
	West Summit	0	1,199
	Squaw Creek	0	0
TOTAL		0	3,664
Upper Middle Fork	Butte	0	0
	Caribou	0	0
	Austin	0	1,451
	Deerhorn	0	0
	Lower Vinegar	0	0
	Upper Vinegar	0	0
	River	0	0
	Shop	0	0
	Tailing	0	0
	TOTAL		0

Cumulative Effects

Past actions in or near the project area include timber management, fire suppression, grazing, recreation, firewood cutting, big-game management, riparian enhancement, road and facilities construction and maintenance, and road closures. All activities have influenced the current forest composition and structure, and the management infrastructure of the area. Thus, these activities are still reflected, with individual variance, in the current condition of the areas natural resources and human environmental values. The following list identifies past, present, and future projects within the Project Area that have the potential affect the rangeland resource and allotment administration as a whole:

- Past harvest activities consisting of various harvesting methods starting in the railroad logging era (early 1900's). The majority of the project area was harvested within the last century. Logging generally had a beneficial impact on range resources, especially regeneration harvesting and commercial thinning that occurred between 1978 and 1993. Approximately 4,000 acres were harvested in the Mill Creek subwatershed during that period.
- Forest Service road building starting in the 1920's improved access into the project area for grazing management, timber harvest and fire suppression.
- Road closures in the early to mid 1990's reduced the miles of road available for allotment management.
- Fire suppression over the last 50 to 60 years (1950 to present). Fire suppression as resulted in a general decrease in forage availability.

Alternative 1 - No Action

Past activities have had both positive and negative impacts on range resources. Past timber harvest and fire suppression have converted forests from early seral species to a higher proportion of late seral species. Stand densities and multi-layer canopies also increased across the forests generally reducing the forage availability. Commercial thinning and regeneration harvesting in the 1980' and 1990's resulted in small scale changes in the timber stand densities, which has also improved range forage availability.

With no mechanical or prescribed fire treatments, the forested stands in the Project Area would remain at risk to disturbances by insects, disease, or wildfire that are larger in scale and severity than happened historically. There would be no change to the existing condition and there would be no additional cumulative effects from this project.

The ongoing and foreseeable actions listed in Appendix D would most likely still occur. These actions would cumulatively affect range resources in the project area to a very limited extent. Use of National Forest roads, summer recreation activities, and administration of special use permits may disturb and influence livestock movement. Sometimes gates are left open allowing livestock to breach areas, sometimes causing problems with utilization.

Alternatives 2, 3, and 4

Cumulative effects of past, present, and foreseeable actions in association with the proposed action would generally have a positive effect on transition range availability and livestock

distribution in the affected allotments. Commercial thinning and regeneration harvesting in the 1980' and 1990's resulted in small but positive improvement in range forage availability. Proposed commercial harvest, pre-commercial thinning, and fuel treatments will generally have a positive impact on all range resources reducing the overstory and allowing forage species to increase. All action alternatives would improve livestock distribution, and long-term protection of range improvements.

Past road closures have impacted grazing permittee access for allotment activities. The few roads proposed for closure would have minimal additive impact on grazing permittee access needs. Over 90% of the roads proposed for decommissioning are already closed. Occasional travel permits on closed roads may be granted to permittees for range improvement maintenance.

Ongoing and foreseeable actions taking place in the project area include hiking, camping, horseback riding, off-road vehicle use, fishing, hunting, firewood cutting, and special use permit administration. These actions would cumulatively affect range resources in the project area to a very limited extent. Motorized vehicle use in the area may disturb and influence livestock movement to some extent.

Consistency with Direction and Regulations

All alternatives are consistent with Forestwide standards for rangeland resources.

Range permittees were contacted during scoping to solicit comments on activities.

Irreversible and Irretrievable Commitments of Resources

There are no irreversible and irretrievable commitments of resources that may result from implementing the alternatives with respect to rangeland management.

Recreation

Introduction

This section addresses affects on dispersed campsites, and trails in the Crawford Project area. Effects to Recreation are measured in terms of whether alternatives meet the Recreation Objectives outlined in the Forest Plan. These effects can be direct, indirect, or cumulative.

Forest visitors desire or expect specific types of recreational experiences and settings. Recreational opportunities are described in this recreation analysis in relationship to the Crawford Planning Area. This analysis describes the existing conditions of trails; and the administrative and dispersed sites in the Crawford Planning Area. Analysis of the affects of proposed activities on those recreation resources is also provided.

Guidelines from the Malheur National Forest Land and Resource Management Plan 1990 are used to determine the condition of facilities and dispersed campsites.

Recreation Opportunity Spectrum (ROS)

The National Forest System lands encompassed within the Crawford Planning area have been inventoried using the ROS system to determine what recreation opportunities and settings are available to visitors. Currently the area meets Roaded Modified and Roaded Natural. Management direction for recreation as outlined in the Forest Plan is to continue to maintain existing ROS settings.

Areas within the roaded natural classification are characterized by predominately natural-appearing environments as viewed from sensitive roads and trails, with interaction between users being moderate. Evidence of human activity varies from area to area and includes livestock grazing and timber harvest. Roads and motorized equipment and vehicles are common.

Areas within the roaded modified classification are characterized by substantially modified natural environments. Roads, landing, slash and debris may be strongly dominant from within, yet remain subordinate from distant roads and highways. There is moderate to heavy evidence of other use on the main road with low to moderate evidence of other use on arterial roads.

The ROS is a framework for a change in resource management uses, policies, and actions on recreation opportunities so that they can be better identified and, when adverse, mitigated or prevented. Recreation opportunities were defined as the combination of biological, physical, social, and managerial conditions that give recreational value to a place. The ROS gives particular attention to the settings in which these uses and activities have occurred. This has the advantage of focusing attention and action on resource settings and conditions. For example, sound is a physical phenomenon susceptible to objective, quantitative measurement. When either the level of sound, or the particular form of sound, is judged as inappropriate or unacceptable, they are defined as “noise,” a measure of importance. Sound is reflected across different kinds of recreation settings (ranging, for example, from a highly developed campground to a wilderness), where one finds that what constitutes “noise” changes dramatically.

The ROS framework therefore can help managers in thinking about, and developing appropriate management responses for, a particular type of impact. It forces an explicit consideration of assumptions (e.g., the idea of “no impact”), it requires managers to think across functional and jurisdictional boundaries (e.g., what types of sounds, their origin), and it provides the opportunity for consideration of alternatives (e.g., banning the source, buffering its effects, altering its timing, informing users about it).

Regulatory Framework

The Forest Plan direction is to manage General Forest and Rangeland (MA 1 & 2) to construct, relocate, or protect designated system trails/trailheads and facilities during management activities. To maintain dispersed camping opportunities in a roaded setting and to manage these areas for partial retention and to provide for roaded recreation opportunities.

Administrative Site (MA 19) is to be managed for administrative needs and to consider these sites' historic and architectural values.

Recreation in MA 3A (Non-Anadromous Riparian) is managed as roaded modified but standards include limiting and distributing recreation use as necessary to protect and/or rehabilitate riparian areas.

Trails

Two groomed snowmobile trails in the area include Crawford Creek snowmobile trail #S-258 and Summit Creek snowmobile trail #S-259.

Tipton Bike trail is co-located on 7000449, 7000479, 2620051, 2620, and 2620249 roads.

Manage developed sites as Roaded Modified and Roaded Natural ROS.

Dispersed Sites

The analysis area receives low to moderate dispersed recreation use, which is spread throughout a six month period starting in early May and running through mid-November. There are approximately 20 established dispersed campsites within the Crawford Project Area. Dispersed campsites offer the recreationists a more primitive camping experience. Fall hunting season use is moderate to high with use distributed throughout archery, deer and elk seasons. Hunter use of the dispersed sites varies depending on number of hunting tags for a unit and the number of “new” hunters in the area.

Managed dispersed sites as a roaded modified ROS.

Administrative Sites

There is one administrative site adjacent to the Crawford Planning Area; the Austin House Special Use Permit on State Highway 26.

Other Uses

One Special Use permit is issued every two years for the Bates/Austin Reunion located at Taylor Flats.

Other uses include huckleberry picking, driving for pleasure, viewing scenery. Recreational hunting for shed deer and elk antlers and other activities occur as well.

Analysis Methods

The area analyzed for recreation impacts includes the Crawford Project area and the area to the west adjacent toward Highway 26. This area to the west is included because of the public use centered in this area of the Austin House.

The source of the recreational information is the Forest GIS data base that was compiled from recreational inventory information.

Affected Environment

Snowmobile Trails

Crawford Creek snowmobile trail #S-258 is co-located on the following road: 2620. Summit Creek snowmobile trail #S-259 is co-located with the 2622240, 2620204, 2600207, 2600212, and 2622 roads. Grooming a snowmobile trail consist of compacting snow to a width of approximately 10-12 feet. Grooming is only done with a minimum snow depth of 1-2 feet and does not remove or side cast material. Ground is frozen during this period. No disturbance to soils is expected from this activity, or fisheries resource impacts. At stream crossings the snowmobile groomer would fill the stream with snow for snowmobile and snowmobile groomer access. General maintenance concerns include felling of hazard trees to protect the trail. These two trails are in fairly good shape and require minimal maintenance. Use of these roads during the winter recreational season, is generally December 15th through April 15th (though timing varies with snow conditions).

Snowmobile riding is a popular activity mainly on groomed trails of the Summit and Crawford Creek roads where the Crawford Project Area is proposing activities.

Other family type winter use such as Nordic skiing, snowshoeing, or sledding occur within project area.

Bike Trails

Tipton Summit Trail lies within the Crawford Project Area. There are approximately 9.3 miles of co-located trail on Forest Roads 7000449, 7000479, 2620051, 2620, and 2620249. The route also passes through a gate and on an old railroad grade. Although this route is not extremely difficult, the route is a bit tricky because of the unsigned roads.

Dispersed Camps

Crawford Project area receives low to moderate dispersed recreation use. The dispersed campsites are rustic in nature with common features of meat poles, rock fire rings and benches. User constructed toilets can be found at some sites. Campsites are concentrated primarily in flat areas off main transportation systems where water can be accessed. Many are near springs or creeks. There is a wide range in size and amount of disturbance for all the dispersed camps. Camp size ranges from very small to fairly large. Use of these sites varies throughout the year, with the majority of sites showing heaviest use during the fall hunting season. Where dispersed camp sites are used year after year with concentrated use the ground appears compacted and tends to leave vegetation not as vigorous as non-dispersed used areas; e.g. the concentrated use at the junction of Idaho and Crawford Creeks on Forest Road 2622 for example. Other concentrated use areas are along Forest Roads 2620 and 2622. There are 5 identified dispersed campsites within riparian areas with varied degrees of vegetation and riparian zone damage occurs throughout the project area due to vehicles, sanitation practices, and removal of vegetation in heavily used areas. There are approximately 20 known and documented dispersed campsites scattered throughout the project area. Use of these sites varies throughout the year, with the majority of sites showing heaviest use beginning late August with bow season to fall hunting seasons. There are other dispersed campsites that are currently not recorded in GIS; they

may not be recorded in GIS, because their use has not been consistent or heavy enough to require ongoing management to date.

Administrative Sites

Austin House Special Use Permit Located on U.S. Highway 26 at Austin Junction is adjacent to the Crawford Project Area. Austin House is a private business and residence located on Forest Service land. The permitted area is less than 5 acres and is operated under a Resort Special Use permit with current use as a restaurant, gas station, and post office.

Other Uses

Currently, the Crawford Project area plays an important role by providing settings for various types of outdoor recreation hunting, camping, driving in the woods, hiking and winter activities. Due to ease of access from U.S. Highway 26 and 7, this area is popular with recreationists. Visitors may enjoy the project area for a host of outdoor recreational opportunities. FSR 2620 and 2622 provides the main access for roaded admission from U.S. Highway 26 and 7 into the planning area. The major roads are gravel-surfaced, one-lane, and native surface routes initially developed to provide timber access, which now provides access for recreation type activities. Recreational hunting for shed deer and elk antlers, viewing scenery and enjoying the landscape is a part of all these activities.

One Recreation Event Special Use Permit is issued every two years located at Taylor Flat.

Environmental Consequences

Alternative 1

Direct and Indirect Effects

Methods used to evaluate the effects of the alternatives include: changes in the ROS; harvest in currently important recreation places and recreation sites.

The ROS will not change as a result of this alternative and there will be no harvest effects.

Hunting

The Crawford Project area lies within the Sumpter and Desolation Big Game Management Units. The area is popular during general big game bow seasons and controlled big game hunts. Seasons are in late summer and fall. It is anticipated that Oregon Department of Fish and Wildlife will continue to offer hunting opportunities in this area as part of their management of big game. General bow-hunting and controlled hunts will have similar seasons and numbers of tags. Bow-hunter numbers have increased in recent years and this trend may continue. In the No Action Alternative, no change is anticipated in the diversity of camping styles or use patterns in this area.

Dispersed Camping

No change in the availability of dispersed camping is expected for the typical use in spring, summer and fall.

Fishing

Fishing access and opportunities to fish are expected to remain unchanged. Fishing opportunities, as managed by Oregon Department of Fish and Wildlife, are expected to be unchanged in the No Action alternative.

Trails

Alternative 1, No Action alternative, would result in no change in snowmobile access in this area. The approximately 8.1 miles of existing designated snowmobile routes and approximately 9.3 miles of bike trail would remain with a mix of groomed and ungroomed condition.

Administrative Site

There would be short-term evidence of prescribed burning in other areas of the forest with smoke drifting over the Austin House.

All Uses

The recreational experiences may be affected long-term at some point in time by landscape scale stand replacement fire due to the increasing vulnerability of the vegetation to this risk. With such an occurrence recreation opportunities would likely be eliminated in the short-term, followed by dramatically changed recreation settings, an emphasis on mushroom hunting for one-two years following fire and burning returning within a 2-5 year period. Post-fire snags would create visitor hazards and potentially increase management requirements or limit visitor access for a multi-year period. Such fires have occurred within the last years.

While recreational visits within the project area would remain near the same levels as previous years, under this alternative, traditional use patterns and recreational opportunities would not be impacted.

Cumulative Effects

There are no cumulative effects under the No Action Alternative to recreation activities and opportunities.

Common to Alternatives 2 and 3**Direct and Indirect Effect**

Effects to recreation are measured in terms of change in the ROS. There would be no effect on the ROS class for this area.

Winter Recreation

Snowmobile activity in this area is a mix of travel on groomed and ungroomed designated trails with the majority of use on groomed trails and minimal recreational activity on other area roads. Proposed road closures or decommissioning will not affect existing designated snowmobile trails in the Crawford Project Area in all action alternatives.

Other snowmobile activity is concentrated into open, nearly flat areas and nonforested hillsides in close proximity to designated snowmobile routes. These 'snow play' areas are plentiful in the general area.

If winter logging occurs, plowing of the 2622240, 2600204, 2620 and 2622 Roads would be the expected haul routes. The use of these and other haul routes would be restricted to 'logging use only' during the workweek and 'closed to all' during weekends. Snowmobile activities may temporarily be affected if harvest activities occur in winter. If winter logging does occur, the snow plowing of the haul routes would directly effect approximately 8.1 miles of snowmobile routes. Plowing and working from the 2622240, 2600204, 2620 and 2622 Roads may temporarily interfere with smooth trail crossings or create fragmented travel routes. Haul routes may coincide with designated snowmobile routes. In addition, area closures may be in effect for logging activity hazards near active harvest units, which may affect some cross-country travel. While unlikely that all haul routes and all available units would be active at any one time, it is anticipated that activities would be grouped for efficiency. Coordination with the Burnt River Snowmobile Club will take place for alternate routes and grooming.

Other winter activities, such as snowshoeing or Nordic skiing would likely access the area in the project area via one or more of the groomed snowmobile routes. These activities have minimal numbers of participants in this location due to the limited access compared with similar experiences available in the local area.

Hunting/Camping/Fishing/Hiking

Short-term effect with Alternative 2 and 3, harvest activities may displace some recreationists to new areas to camp, hunt, or to travel due to decreased aesthetic appeal of the Forest resulting in displacing some forest visitors over a broader area on the landscape. Alternatives 2 and 3 will harvest whereas Alternative 4 will not have harvest. Noise may be heard from harvest actions resulting in some impacts on recreationists during this type of activity and may adversely affect the experiences of some people. It is useful to keep in mind that activities vary in importance over time. Therefore, dispersed campsites that are there today may not be in the future. So this data is valid only over an intermediate length of timeframe over the life of this document. Haul routes will be heavily used by logging traffic, creating a higher level of safety concern for the recreating public using roads. Closure of some roads within the project area to public use during logging and hauling activities would improve public safety, but would have a short-term negative effect on recreational access to the area. Long-term effects with Alternative 2 and 3 will provide safe and adequate roaded and trail access for the recreating public, through the cutting of hazard trees. Dispersed recreation will continue to occur in the project area.

Road closures are not expected to greatly impact recreation access. Most roads proposed for decommission are already closed.

It is anticipated that Oregon Department of Fish and Wildlife will continue to offer hunting opportunities in this area as part of their management of big game. General bow-hunting and controlled hunts will have similar seasons and numbers of tags. Bow-hunter numbers have increased in recent years and this trend may continue. It is anticipated that temporary road and/or area closures will be in place during harvest and fuel reduction activities, influencing traffic patterns, recreation use and duration of stay. Associated noise and other disturbances may affect the tranquility of the recreation experience for an individual, regardless of the proximity to the activity. The recreational experiences available may be changed in the short term by harvest and fuel treatment. The possible effects include increased sights and sounds of equipment and people within the planning area during the burning for a short period of time.

Fishing opportunities, as managed by Oregon Department of Fish and Wildlife, are expected to be unchanged in all action alternatives. The recreational experiences available may be changed in the short term by fuel treatment. The possible effects include increased sights and sounds of equipment and people within the planning area during the burning for a short period of time.

The recreational experiences may also be changed in the short term by the smoke caused by the fuel treatment. The possible effects include the apparent smoke affecting someone who has trouble breathing and their vision may be obscured for a short period of time.

Bike Trails

Forest Roads 7000449, 7000479 2620051, 2620240 and 2620 are access roads into harvest units. During harvest activities log haul may conflict with bike users. It is anticipated that temporary road and/or area closures will be in place during harvest and fuel reduction activities, influencing traffic patterns, recreation use and duration of stay. Haul routes will be heavily used by logging traffic causing congestion. This will create a higher level of safety concerns for the recreating public on roads. Signs will be posted to reduce this hazard. Associated noise and other disturbances may affect the tranquility of the recreation experience for an individual, regardless of the proximity to the activity.

Alternatives 4

Direct and Indirect Effects

There would be no effect on the ROS class for this area.

With no harvest activities there would be no log haul that would conflict with bike users. There would be no winter harvest activities so there would be no plowing of the 2622240, 2600204, 2620 and 2622 on groomed snowmobile trails.

Fishing and hunting opportunities, as managed by Oregon Department of Fish and Wildlife, are expected to be unchanged in Alternative 4.

In Alternative 4, high levels of snag habitat may pose safety concerns particularly for those recreationists who enjoy cross-county hiking.

No harvest will occur, so recreationists would not be affected by noise and traffic from harvest; however, noise and traffic from fuels reduction and precommercial thinning activities would occur and could negatively impact recreational experiences. Dispersed sites would remain accessible as described in Alternatives 2 and 3.

Cumulative Effects

In areas where reasonably foreseeable vegetation treatment may occur within or immediately adjacent to a dispersed site, recreationists may not use that site again for many years. If recreationists feel that treatment may disperse animals out of traditional hunting areas, they may decide to hunt elsewhere. Other recreationists could feel that hunting success may increase after treatment of the area. Hunting experience will be changed. As ground cover grows, it will provide more forage for big game animals. Hunting may be less desirable until new under-story vegetation is established. Hunters should anticipate a change in game use due to a loss of cover and changes in forage. Although future recreation use within the project area is difficult to determine, visitation has increased rapidly in the past few years. As the project area changes over time, so may the make-up of visitors and the activities they pursue. Recreationists will have to either adapt to the new situations or seek another area in which to recreate. Burning is planned on a regular basis.

As described above, past activities and occurrences have affected the recreation resource. Past and proposed activities that could affect recreation resources have been analyzed in direct and indirect effects. Recreation activities, including hunting, camping, and other uses, will continue as described above. In review of the list of past, present, and foreseeable actions at the beginning of Chapter 3, no other ongoing or future actions are expected to have a measurable affect on the recreation resource.

Consistency with Direction and Regulations

This proposed project is consistent with Forest Plan direction and regulations. The proposed project will meet Forest Plan Standards for the Recreation (ROS) of roaded natural and roaded modified. Proposed activities are consistent with Forest Plan direction to manage General Forest and Rangeland (MA 1 & 2) to maintain dispersed camping opportunities in a roaded setting and manage these areas for partial retention as roaded natural, and to provide roaded recreation opportunities.

Recreation in MA 3A (Non-Anadromous Riparian) is managed as roaded natural but standards include limiting and distributing recreation use as necessary to protect and/or rehabilitate riparian areas.

In terms of Executive Order 13287, the Austin House Resort is a historic property that was under special use permit prior to this project. This project will not have an effect on the resort.

Irreversible and Irretrievable Commitments of Resources

There are no irreversible and irretrievable commitments associated with the consequences of any of the alternatives analyzed to the recreation resource.

Visuals/Scenery

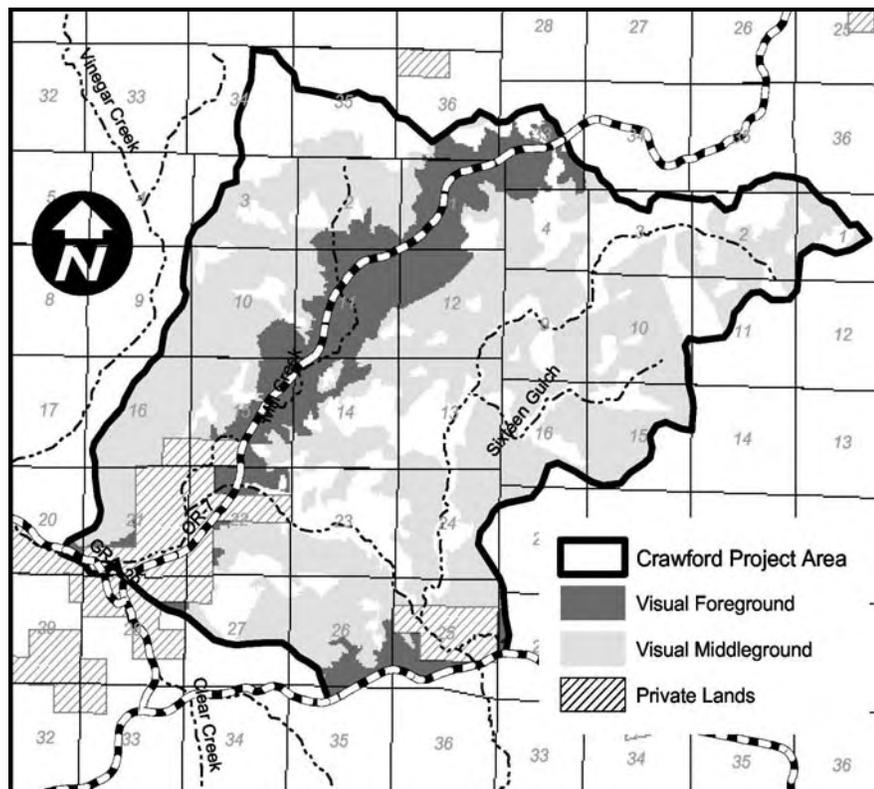
Introduction

Managing the views along highways through National Forest System land is goal identified in the Malheur Forest Plan. Highways 7 and 26 that bisect the Crawford project area are major travel routes in northeast Oregon. These routes are identified as visual corridors in the Malheur Forest Plan.

The topography along these visual corridors ranges from steep and mountainous terrain in the upper elevations to gently rolling slopes and valley bottoms. Dixie Butte and Vinegar Hill are prominent middleground and background features while the two broad valleys near the old Bates mill site and Phipps Meadow dominate foreground corridor views.

The landscapes along the highways within the project area are dominated by expansive forested areas. The condition of these forested areas immediately adjacent the highways have been affected by past timber harvest. Beginning in the early 1900's most of the lower slopes in the viewshed was railroad logged. During these logging operations, most of the large ponderosa pine was removed. These areas are now stocked with younger even-aged small diameter ponderosa pine characterized by black-barked stems.

Figure VS-1. Map of Foreground and Middleground along Highways 7 and 26 – MA 14



Regulatory Framework

Forest Plan

Approximately 57% of the project area is identified in the Malheur Forest Plan as Management Area 14 – Visual Corridors (Forest Plan, pg. IV-108).

The Malheur Forest Plan designated both Highway 26 and 7 as Sensitivity Level I Corridors within Management Area 14. These consist of the visible and potentially visible landscapes along major travel routes where the traveling public has a high-to-medium sensitivity to the scenery. The goal is to manage corridor viewsheds with primary consideration given to their scenic quality and the growth of large diameter trees. Visual quality objectives of retention, partial retention, and modification will be applied while providing for other uses and resources.

Projects occurring within the foreground area should not be visually noticeable to someone traveling along the highways. Middleground activities may be visible, but should be subordinate to the surrounding natural landscape. Background activities can dominate the landscape, but they should borrow from the shape, color, and texture of the area's natural scenery.

Standards (Forest Plan, pg. IV-109)

#11. Emphasize uneven-aged timber management in the foreground distance zones. The overall affect will vary from natural appearing to slightly altered. Manage foregrounds to meet a retention visual quality objective in Sensitivity Level 1 corridors to result in a natural appearing visual condition.

#12. (Correction #1 to Forest Plan, 1/31/1995). No regeneration or overstory removal harvesting activities will occur in the foregrounds of Sensitivity level 1 or 2 Corridors until viewshed corridor plans have been completed. Exception to this may be made, consistent with Forest wide standard #3. Other silvicultural activities, such as salvage harvest, firewood removal, commercial thinning, precommercial thinning, pruning or prescribed fire, may be conducted after the appropriate environmental analysis process has been followed. Visual management objectives will guide the design and implementation of all such activities.

#14. When utilizing even-aged management in the middleground, use the shelterwood regeneration method in the ponderosa pine type, shelterwood and clearcut regeneration in the mixed conifer type, and clearcut regeneration in the lodgepole pine type. Manage middlegrounds as slightly altered (partial retention visual quality objective) in Sensitivity Level 1 corridors and modified (modification visual quality objective) in Sensitivity Level 2 corridors.

#16. Emphasize horizontal diversity of vegetation by developing a sequence of visual experiences to be viewed as one moves through the corridor Apply uneven-aged management by utilizing group selection harvest techniques on small treatment units (1/4 - 2 acres) in foregrounds. Apply even-aged management in treatment units up to 10 acres in partial retention middlegrounds. The desired effect is to have a multi-aged appearance

in the corridor (both Sensitivity Levels 1 and 2) emphasizing uneven-aged timber management (group selection) in the foreground distance zones and even-aged timber management in the middleground distance zones.

Viewshed Corridor Plans

Two viewshed corridor plans, Highway 7 Visual Corridor Plan (1995) and the Highway 26 Viewshed Corridor Plan (2000) have been completed that identify the existing and desired scenic conditions, as well as recommending management opportunities within the corridors. These plans are a Forest Plan requirement prior to most timber harvest. (Forest Plan, pg. IV – 109, #12).

The management opportunities/recommendations for each of the plans are summarized below by design cells (see corridor plans for cell maps):

Highway 7 – Visual Corridor Plan (1995)

General Recommendations:

- Thin foreground and middleground stands to improve stand health and tree vigor.
- Maintain or increase western larch stocking in both foreground and middleground stands.
- Use underburning to discourage the invasion of shade tolerant species in pine stands and to maintain open, grassy understory conditions and park-like stands of old growth pine.
- Use thinning and small created openings on better sites to speed transition to an even-aged condition and to promote rapid growth of dominant trees to a target size of 36”.
- Distribute harvest units to create a mosaic of stocking levels and tree sizes through the design cell. Avoid creating abrupt transitions between thinned and unthinned stands in the foreground.
- Low cut all stumps within 200 feet of the road shoulder.
- Reduce overstocking and promote growth of large diameter trees.
- Within 200 feet of the road, place marking paint on the backside of trees, or use cut tree marking methods. Pull all boundary tags and unit flagging within 200 feet of the highway following harvest activities.
- Avoid ripping areas in the immediate foreground.

Highway 26 Viewshed Corridor Plan (2000)

Cell 4 – Dry Fork of Clear Creek

- Use thinning and prescribed fire to create a more diverse distribution of trees in all diameters. Several stages of continued fire and thinning will be necessary to reach the desired characteristics.
- Open stands to accelerate growth of small and medium diameter pine, encourage clumps of regeneration, and highlight scenic qualities of large ponderosa pine and western larch where present.

Analysis Methods

Management activities such as timber harvesting and prescribed burning can affect forest scenic quality by changing the predominant form, color, line, or texture in a given viewing area. The degree of visibility of these events depends on the interaction of certain elements to the viewers such as:

- Slope and aspect of the land
- Surrounding landscape
- Frequency and duration of view
- Change in forested area and amount of ground disturbance due to logging, road decommissioning, or prescribed burning

These factors have been incorporated into the analysis of the effects of each alternative. The scope of the analysis is limited to the Crawford project area.

Effects to Visual Quality are measured in terms of whether the alternatives meet the Visual Quality Objectives (VQOs) outlined in the Forest Plan. VQOs are minimum guidelines for meeting Forest Plan visual goals. Visual quality is addressed separately by management area (MA); visual quality objectives are different in the visual corridor (MA 14) than those outside the corridor.

The mapping boundaries of the visual foreground and middle ground areas was computer generated using a “seen area” modeling program from selected viewpoints along the highways. The mapping does not consider existing vegetative screening in this modeling.

Existing Conditions

The existing conditions are thoroughly described in the Highways 7 and 26 visual corridors plans. Since these plans were completed respectively in 1995 and 2001, there have been few vegetative changes in the landscapes within the Crawford project area. These few changes include precommercial thinning on private lands near Austin along Highway 7 and prescribed burning on National Forest lands to the south of Highway 26 near the Dry Fork of Clear Creek. After a recovery period of two to three years, these harvest activities now meet partial retention standards and the prescribed burning meets retention standards.

The following is a brief description of these existing conditions identified in the corridor plans that may be affected within the Crawford project area.

Highway 7 Corridor

Cell #2 – Dixie View (MP 1.0 to MP 2.0)

The foreground area is predominately open meadow and pasture lands. Most of the foreground is privately owned. The upland forested stands are even-aged stands of black-barked ponderosa devoid of few large orange barked large ponderosa. The dominate characteristic of the middleground is the appearance of dark green continuously forested hillsides. Bands of western larch provide dramatic cool contrast in the fall.

Cell #3 – Austin Views (MP 2.0 to 3.0)

Most of the foreground area is open river bottom meadow and pastures. Thick stands of black-bark young ponderosa pine frame the other portions of the highway. There are also views through the roadside vegetation of the valley around Austin and the surrounding ridges to the north and west.

Cell #4 – Ponderosa Pine Corridor (MP 3.0 to 5.5)

The foreground is characterized by a long winding corridor of even-aged stands of black-barked ponderosa pine. The gently rolling terrain permits views deep into stands on both sides of the highway. To the south, long distant views of the middleground and background of green, forested ridges are present. Alternations to the natural landscape include a lack of large overstory trees and size class diversity in the foreground pine stands. Middleground stands appear natural to slightly altered. No created openings are visible.

Cell #5 – Eastward Views (MP 5.5 to 6.2)

Foreground views are short; characterized by partially stocked non-forest areas dropping away on the eastside of the highway. Foreground views appear natural except where altered by roadcuts and fences. Middleground and background views dominate this portion of the corridor. Created openings in the middleground are visible, but blend in well with the surrounding landscape. An evenly forested texture is the primary visual feature in the middleground.

Cell #6 – Tipton Summit (MP 6.2 to Forest Boundary – 7.2)

The highway winds through gently rolling terrain passing through a large meadow. The foreground forest vegetation is a mix of multistory true conifer stands and stands with a mix of Douglas fir, ponderosa pine, and larch. Larger diameter trees are present in these stands. Only a small amount of the middleground is visible from this portion of the corridor.

Highway 26 Corridor**Cell #4 – Dry Fork of Clear Creek (MP 191.25 to 193.8)**

The foreground landscape along the north side of this stretch of Highway 26 into the Crawford project area is dominated by even-aged stands of ponderosa pine. These stands appear “managed” with few large trees and few areas of natural shrub and understory regeneration. Large pine stumps persist along the immediate foreground. Overstory removals in the past have left these even-aged stands of “black-barked” middle story pine in relatively uniform spacing. The stands lack the expected open park-like stands of ponderosa pine in warm-dry and hot-dry bioenvironments. Middle ground and background views from this stretch are limited due to the orientation of the road and screening from the foreground vegetation.

Short term – 1- 10 yrs

Long term – 20 – 100 years

Environmental Effects

Alternative 1

Direct and Indirect Effects

Foreground

The forested landscape corridor along the highways would continue to move slowly towards the desired scenic condition. The valued landscape character would continue to appear slightly altered, meeting partial retention standards.

Foreground areas would continue to lack a diversity of scenic experiences common to visual corridors. The regular spaced, even-aged appearance of the ponderosa pine stands would persist. Existing large diameter, orange-bark ponderosa pine trees and western larch would remain partially hidden from view. The existing stumps would continue to be visible.

Middleground/Background

Within the project area, middleground views would continue to appear as continuous canopy texture, with little or no obvious deviation from the valued landscape character, meeting the partial retention standard.

Cumulative Effects

There are no cumulative effects foreseen since there would be no short-term change in foreground or middleground forested landscape due to any ongoing or foreseen cumulative activities identified in Appendix D.

The past timber harvest including road construction has affected the visual quality that resulted in the existing condition being less than the Forest Plan objective of “retention” for the visual corridors along Highways 7 and 26. This includes stumps, skid trails, and logging roads that detract from the natural appearance along the highways. The recent logging on adjacent private lands has increased the magnitude of disturbance along Highway 7 by creating a managed appearance.

Common to Alternatives 2, 3, and 4

Direct and Indirect Effects

Foreground – Prescribed Burning

The 1,132 acres of prescribed burning in the visual foreground would be designed to minimize the visibility of limb and tree bole scorch and mortality to larger trees. Low intensity fire would be allowed to creep through the forested areas adjacent to highways. Tree mortality would be minimal (not exceeding 20%) in the 200' area adjacent the highways. The mortality would be limited to smaller sapling size trees. To ensure the larger pine trees within 200 feet of the highway would not be killed during burning, extra protection measure would be implemented.

But needle scorch on lower branches of trees would be apparent immediately after burning and would persist for one to two years. The degree of visibility would depend on the flame length conditions during the burn. Smoke severity during the burning would depend upon wind conditions, moisture, duration of the burn, and direction of the burn. Overall evidence of fire would be obvious until scorched needles begin to fall after one to two years and understory green-up occurs. Some trees may not show evidences of effects from fire until after the first season. These effects are short-term and would appear slightly altered until re-growth of the understory vegetation occurs within a year after burning. At this time the forested area would again have the current natural appearance.

Middleground/Background – Prescribed Burning

There would be short-term evidence of prescribed burning in forested landscape because of the scattered tree mortality that would show up in the dead topped trees. The scattered dead trees would be evident for a year following prescribed burning. Alternative 2, 3, and 4 proposes the same prescribed burning.

Foreground – Road Decommissioning

There are three roads immediately adjacent Highways 7 and 26 that would be decommissioned: FS 7000043, FS 2620469, and FS 2600200. Alternatives 2, 3, and 4 propose the same road decommissioning. These roads are difficult to view from the highway due to vegetation growing on the road surface or vegetation along the edge of the roadways. All three roads have been closed for a long period of time to motorized vehicles and are not being driven. Since no ground disturbing activities are necessary for the decommissioning, there would be no effect to views within the foreground areas.

Middleground/Background – Road Decommissioning

There would be no impact to the middleground views due to ground disturbing road decommissioning activities proposed in Alternatives 2, 3, or 4. The magnitude of the ground disturbance is very low and the impacted terrain is very flat and largely unseen.

Common to Alternatives 2 and 3

Direct and Indirect Effects

Middleground/Background – Timber Harvest

There would be minimal visible change in middle ground due to the commercial thinning; partial retention standards would be met. The thinning timber harvest would create slight texture change in crown canopies but no created openings (including landing and temporary road construction) would be noticeable to those traveling the highway. The magnitude of harvest between Alternatives 2 and 3 are similar. Alternative 2 proposes middleground harvest on approximately 1,390 acres and Alternative 3 proposes 987 acres of harvest.

Cumulative Effects

There are no cumulative effects foreseen from the timber harvest, prescribed burning, or the road decommissioning since there would be only a short-term change in foreground or middleground forested landscape due to ongoing or foreseen cumulative activities identified in Appendix D.

The past timber harvest including road construction has affected the visual quality that resulted in the existing condition being less than the Forest Plan objection of “retention” for the visual corridors along Highways 7 and 26. This includes stumps, skid trails, and logging roads that detract from the natural appearance along the highways. The recent logging on adjacent private lands has increased the magnitude of disturbance along Highway 7 by creating a managed appearance.

Alternative 2

Direct and Indirect Effects

Foreground – Timber Harvest

In this alternative, management activities would in the long-term create a more scenic and sustainable forest condition along the foreground areas in the Crawford project area. Immediately following the activities, the landscape character would appear slightly altered due to soil disturbance from logging and creation of slash piles. This short-term alteration would meet Forest Plan long-term management goals by providing a natural appearing landscape with large trees.

No created openings due to harvest would occur in the foreground. Harvest would consist of approximately 461 acres of commercial thinning, followed by precommercial thinning and prescribed fire. The harvest would occur along 2.5 miles of Highway 7 (39% of the corridor within the project area) and 0.6 miles along Highway 26 (34%). Thinning would occur in variable densities, creating a more random, uneven-aged appearance in the foreground forested areas. Some areas would appear more open, encouraging pockets of regeneration. Views of large diameter pine and western larch would be accentuated. Growth and vigor of the existing ponderosa pine would be increased, accelerating their transition from black-barked appearance towards a wider fissured bark, typical of larger diameter orange-barked pine.

Logging activity would be obvious for the duration of the harvest lasting two to three months. Noise from mechanical harvesting equipment (chainsaws, skidders, feller bunchers, loaders, and log trucks) would be significant during this period. Additional stumps would be noticeable immediately after harvest. Visibility of stumps would be minimized by low and flush cutting, fire scorch from prescribed burning, and weathering through time. Although landings would be located in unseen areas, slash piles in these locations may be partially visible until the piles are burned. The scorching mortality to the surrounding trees from burning these large piles is limited to less than 20%. The most noticeable short-term impact would be the creation of two temporary roads that have their beginning point on Highway 7. This would create linear roadways that would be seen along this portion of the highway until the road is closed and rehabilitated. However, the duration of the view of the temporary road is very short due to the location of road and limited clearing widths of the roads.

Following the use of these temporary roads, all debris created from the construction including stumps grubbed from the roadway would be removed, the road prism would be reshaped to the existing topography, the ditch along the highway would be restored, rocks and logs will be

placed on the roadway, and small trees will be planted on the roadway. These measures would camouflage the effects of the clearing along the highway.

Alternative 3

Direct and Indirect Effects

Foreground – Timber Harvest

In this alternative, management activities would in the long-term create a more scenic and sustainable forest condition along the foreground areas in the Crawford project area. These effects are similar to those proposed in Alternative 2 except the magnitude of ground disturbance for Alternative 2 is higher. Immediately following the activities, the landscape character would appear slightly altered due to soil disturbance from logging and creation of slash piles. This short-term alteration would meet Forest Plan long-term management goals by providing a natural appearing landscape with large trees.

No created openings due to harvest would occur in the foreground. Harvest would consist of approximately 238 acres of commercial thinning, followed by precommercial thinning and prescribed fire. The harvest would occur along 1.7 miles of Highway 7 (27% of the corridor within the project area) and 0.4 miles along Highway 26 (24%). Thinning would occur in variable densities, creating a more random, uneven-aged appearance in the foreground forested areas. Some areas would appear more open, encouraging pockets of regeneration. Views of large diameter pine and western larch would be accentuated. Growth and vigor of the existing ponderosa pine would be increased, accelerating their transition from black-barked appearance towards a wider fissured bark, typical of larger diameter orange-barked pine.

The effects from logging and temporary road construction are similar to those described in Alternative 2.

Consistency with Direction and Regulations

Visual Corridor – Foreground (MA 14)

The VQO of Retention is met in the long-term by all the alternatives. Currently due to past timber harvest activities, the foreground meets partial retention standards. Alternatives 2 and 3 provide the shortest period to reach the VQO of retention. The commercial thinning would develop more large trees and a more diversified forest conditions by accelerating the tree growth and favoring the establishment of western larch. Alternatives 1 and 4 would take more time develop these conditions due to the slower rate of tree growth.

Visual Corridor – Middleground (MA 14)

The VQO of Partial Retention within the project area would be met with all alternatives. Areas within the project area middleground currently meet partial retention standards. No activities proposed in Alternatives 2, 3, or 4 would change these conditions.

Irreversible and Irretrievable Commitments of Resources

There are no irreversible and irretrievable commitments associated with the consequences of any of the alternatives analyzed to the visual quality or scenic integrity.

Roads/Access

Regulatory Framework

A Sub-Forest roads analysis was completed for the Mill Creek subwatershed. The subwatershed boundary is not the same as project area. Only the portion of the Mill Creek subwatershed north of Highway 26 is identified as the project area. An interdisciplinary process was used involving members of the Blue Mountain Ranger District and Prairie City Ranger District to complete this analysis for the roads analysis. The team was charged with analyzing all of the roads in the area and recommending whether to keep them open, block/close or decommission them. This determination was based on the guidelines included in the Malheur National Forest Roads Analysis dated December 2005. The roads decisions are documented in the Crawford Roads Analysis List with associated maps attached.

Sub-Forest road analyses need to continue to strive to meet long-range road density goals by identifying opportunities to reduce both open road densities and total road densities. Those results of those efforts should focus on reducing the amount of funding needed for road maintenance, reducing road related impacts to fish and reducing the spread of exotic plants and noxious weeds.

The Malheur Forest Plan provides direction to address road density concerns by establishing open road density goals of no greater than 3.2 miles/square mile in summer range, 2.2 miles/square mile in winter range, and 1.5 miles/square mile in wildlife emphasis areas by the end of the first decade (1999). The forest has generally met those open road density goals, as the plan indicates road densities are to be monitored and evaluated on a watershed basis (5th level HUC). However, there are still many subwatersheds (6th level HUC) that have open road densities that exceed these levels. The plan also states that access management planning will strive for 1.5 miles/square mile on summer range and 1.0 miles/square mile on winter range as a long-term goal, “unless these densities do not allow for a healthy and productive forest as envisioned in the desired future condition, or interfere with access to private land.” (Malheur National Forest Roads Analysis, Executive Summary, page iv)

Analysis Method

Each road in the project was field checked and road logs updated to reflect existing conditions. This information was used to update the GIS data base (INFRA Travel Routes).

Affected Environment

This section describes the existing condition and effects on access/travel management and the maintenance of National Forest System roads from activities proposed in each alternative. Road

closures, decommissioning, maintenance, reconstruction, and temporary construction are the proposed activities that would potentially affect access and travel management and maintenance. These activities can affect resources such as wildlife habitat, water quality and fish habitat. The management and maintenance of the open roads comes at a cost to the federal government. The fewer the number of miles of open roads the less cost to the tax payer.

The historic use and access development in the area is well documented in the Upper Middle Fork Watershed Analysis. The road system has evolved over time. The Forest Service was building roads for fire access starting in about 1925, and the area was well roaded by 1950, but the majority of roads 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. All of the analysis area is north of US Highway 26, and can be accessed by turning north onto Forest roads inside the analysis area, or turning onto State Highway 7 at Austin Junction and accessing the analysis area both north and south of the highway. Major developed Forest Service roads that access the analysis area include roads, FSR 2620 and 2622.

An optimum road system supports land management objectives. For the Forest Service, those objectives have markedly changed in recent years. How roads are managed must be reassessed in light of those changes. Expanding road networks have created many opportunities for new uses and activities in national forests, but they also dramatically altered the character of the landscape. The Forest Service must find an appropriate balance between the benefits of access to the national forests and the costs of road-associated effects to ecosystem values. Providing road systems that are safe and responsive to public need, environmentally sound, affordable and efficient to manage is among the agency's top priorities.

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 usually been deferred, because the funds to maintain the roads to standard are simply unavailable. The overall result is that most of the Forest road system is in a downward or deteriorating condition, and this is particularly true for many Level 2 roads, which remain open despite receiving very little maintenance.

There is a total of 113.5 miles of road within the Mill Creek Subwatershed. These roads include Highways 26 and 7, County Roads, and private roads in addition to National Forest System roads.

Existing Open: 50.7miles

Existing Closed: 62.8 miles

The Mill Creek Subwatershed area covers 17,846 acres which equals 27.87 square miles. The existing total road density is 1.8 miles per square mile.

Most of the roads in the Crawford Project planning area will need maintenance to meet current road maintenance objectives and classification standards.

Approximately 10.9 miles of road will need to be reconstructed before project use for Alternatives 2 & 3. Approximately 35.2 miles will need to have maintenance done to them for Alternative 2 and 31.9 miles for Alternative 3.

Included in the maintenance requirements for these roads is the following work that can be performed as maintenance in any contract:

Blade and shape road including existing drain dips and grade sags

- Constructing waterbars/cross ditches
- Seeding
- Spot rocking in wet areas of road
- Brushing
- Remove hazard trees
- Improve existing road junctions to provide adequate access.

The following work is classified as maintenance under the definition listed in the Federal Register but will be listed as reconstruction in any contracts that are signed:

Widening roadbed to meet standard width

- Constructing new drain dips and grade sags
- Major brushing
- Removing large amounts of excess material
- Rocking roadbed and/or drain dips and grade sags
- Road realignment

The accomplishment of this work will make the open roads safer to travel and reduce sedimentation that will improve fish habitat.

Decisions to decommission some of the roads that are not part of the potential minimum primary road system are expected to occur over time as an outcome of sub-Forest level analysis. When those decisions are implemented, any annual and deferred maintenance cost for roads that are decommissioned will be eliminated. Depending on the type road and decommissioning effort, the cost would range from as low as \$1,000 per mile to greater than \$10,000 per mile. But it will likely take a considerable amount of funding over an extended period of time to accomplish a significant decrease in the total miles of classified roads and the associated road maintenance costs. (Malheur National Forest Roads Analysis, April 2005, page 44)

For 2004, the allocated road maintenance budget for planning, construction and maintenance of roads is estimated at \$790,000 (the budget allocation averaged about \$1,000,000 per year from 1997 to 2002). This funding covers many aspects of road maintenance and management including the organization necessary to accomplish the overall program and associated overhead costs. The net result is that only about half of this funding is available to accomplish annual on-the-ground maintenance activities (Reference: Malheur National Forest Roads Analysis, (Road Maintenance Budget 2005, page 30).

Environmental Effects

Alternative 1 – No Action

Direct/Indirect Effects

Under the No Action Alternative, all existing open roads would remain open and left in the same condition they are in now. Access would be provided at existing levels, but there would be no opportunity to close or decommission roads or to improve drainage by installing additional drainage dips, waterbars, or cross ditches. This alternative would continue to deliver sedimentation into streams at the current level or higher and would remain at the same cost to the Federal government to meet road maintenance standards.

The agency would continue to expend limited funds for maintenance of unneeded roads. The amount of funding and opportunities available to complete annual maintenances needs has drastically declined over the past decade. As a result the Forest has a large backlog of deferred maintenance needs, which continue to grow in magnitude.

The most important road related environmental issue is the effects of roads on aquatic resources in general, specifically threatened endangered and sensitive aquatic species. The magnitude of those effects is largely dependent on how well the roads are maintained. This alternative would not provide opportunities available to do any maintenance, which have drastically declined over the past decade.

This alternative would have the least impact on access. The road density within the subwatershed would remain below the 1999 Forest Plan objectives.

Alternative 1 would not follow the Malheur Forest Roads Analysis, dated April 2005, for recommendations.

Cumulative Impacts

Past road construction was very limited prior to 1940, but intensified from then until 1980 to the point where road density exceeded 3.0 to 4.0 miles/square mile on most of the Forest. A lot of roads built during that period were poorly located requiring frequent maintenance. The cumulative effects related to the maintenance costs for the entire road system would remain the same.

There will be ongoing and future actions that could affect roads and access. That includes replacing culverts for fish passage.

Common to Alternatives 2, 3, and 4

Direct /Indirect Effects

All action alternatives include the same number of planned road closures and decommissioning. This was designed to maintain an adequate transportation system for the public and forest management activities such as wildfire suppression. Access to identified dispersed camping sites

was generally not closed unless there were identified problems with the road such as sedimentation.

The distance between open roads after the planned closures or decommissioning is generally not more than one mile.

The majority of roads proposed for decommissioning are currently classified at Maintenance Level (ML) 1, which are currently closed.

With increasing budget constraints, the agency cannot adequately maintain the majority of road miles at their designed maintenance level. Failure to maintain these roads may impair water quality by eroding and/or contributing sedimentation to streams. Closure of these roads would improve water quality, and reduce maintenance costs.

When roads are closed, they are assigned a ML 1 status. Basic custodial maintenance is performed to keep damage to adjacent resources to an acceptable level and to minimally perpetuate the road to facilitate future management activities. Emphasis is given to assuring drainage structures suitable for the runoff pattern are in place and functional prior to closure. These newly closed roads are inspected annually for two or three years to assure the drainage facilities are adequate and self maintaining. Planned road deterioration, such as increased vegetation growth and bank slough to natural slope repose may occur at this level. While these roads are closed to motorized vehicles, they remain open and suitable for non-motorized travel.

Decommissioned roads are permanently closed and no longer maintained. Soil compaction may be reduced where feasible, and cut or fill slopes may be returned to natural contours. Manufactured drainage structures (culverts) are removed. Where appropriate, bank cuts or ditches created by the removal of these structures may be contoured to provide natural drainage and prevent erosion.

Road maintenance activities are proposed to correct erosion problems associated with roads used for commercial harvesting. Direct beneficial effects from this proposed activity would be improved road conditions. Blading road surfaces and cleaning ditches would have no negative impact on access, as roads remain open during these activities.

Within the Mill Creek subwatershed, a total of 51.1 miles of road would remain open for public use, of that 0.9 miles would be closed long term with an earthen berm, slash, sign, or gate. 16.9 miles of closed roads would be decommissioned, and 0.9 miles of open road would be decommissioned. Because of the lack of funding to close or permanently decommission these roads it could take up to five years to complete, but once completed, maintenance should not have to be done again. The Table RA-1 below shows the road closure comparison between alternatives.

These roads would be treated according to the recommendations in the Crawford Roads Analysis, which would reduce the miles of open and closed roads in the subwatershed by **17%** compared to existing conditions and alternative 1. The work that would be done under alternatives 2, 3 and 4 would lower the open road densities and the total road densities and improve fish habitat by closing and/or decommissioning roads in the RHCAs.

Table RA-1. Summary of Proposed Road Closures and Decommissioning Activities

Activity	Measure	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Roads Reopened	Miles	0	1.7	1.7	1.7
Roads Closed	Miles	0	0.9	0.9	0.9
Roads Decommissioned	Miles	0	17.8	17.8	17.8

Note: Rounding road miles during calculations may result in minor (0.1) mile discrepancies between alternatives

New temporary roads, authorized under the timber sale contract would provide access for timber harvest activities. Since temporary roads are not intended to be part of the Forest Transportation system they would be decommissioned after timber sale activities were completed.

Cumulative Effects

Past road construction was very limited prior to 1940, but intensified from then until 1980 to the point where road density exceeded 3.0 to 4.0 miles/square mile on most of the Forest. A lot of roads built during that period were poorly located requiring frequent maintenance. The proposed road closures of these poor located roads would reduce the cumulative effects related to the maintenance costs for the entire road system.

The cumulative effects of these alternatives and road closures that are likely in the future would be a reduction in sedimentation, improve water quality, fewer roads to maintain, less money spent on maintenance, reduce access for all motorized users, increased response time for fire crews, and less disturbance to wildlife.

There will be ongoing and future actions that could affect roads and access. These include replacing culverts for fish passage and removing culverts on roads that will be decommissioned

Alternative 2

Direct/Indirect effects

This alternative proposes the highest level of road maintenance work through timber harvest activities. This alternative would close or decommission roads as part of the work done with the timber harvest activities. 0.4 miles would be closed and 3.1 miles would be decommissioned.

35.2 miles of road maintenance activities are proposed for this alternative. 10.9 miles will need to be reconstructed before timber haul begins. The 8.9 miles of temporary road construction would be utilized through harvest operations and scarified (if needed), and permanently closed at the conclusion of harvest operations. The additional closures and decommissioning would occur over the next 5 years as funding becomes available.

Table RA-2. Road and Access Activity Occurring During Harvest Activities for Alternatives 2 & 3

Activity	Measure	Alt. 2	Alt. 3
Roads Closed	Miles	0.4	0.4
Roads Decommissioned	Miles	3.1	3.1
Road Reconstruction	Miles	10.9	10.9
Road Maintenance	Miles	35.2	31.9
New Road Construction	Miles	0.0	0.0
New Temporary Roads	Miles	8.9	1.5

Note: Rounding road miles during calculations may result in minor (0.1) mile discrepancies between alternatives

Alternative 3

Direct and Indirect effects

This alternative recommends the least amount of temporary road construction work for timber harvest activities. This alternative would close or decommission roads as part of the work done with the timber harvest activities. 0.4 miles would be closed and 3.1 miles would be decommissioned.

Road maintenance totaling 31.9 miles are proposed for this alternative. Approximately 10.9 miles will need to be reconstructed before timber haul begins. The 1.5 miles of temporary road construction would be utilized through harvest operations and scarified (if needed), and permanently closed at the conclusion of harvest operations. The additional closures and decommissioning would occur over the next 5 years as funding becomes available.

Alternative 4

Direct and Indirect effects

Under this alternative, there would be no reconstruction, no temporary road construction and just the ongoing road maintenance. The closures and decommissioning are the same as proposed for Alternatives 2 and 3 and would occur over the next 5 years as funding becomes available.

Consistency with Direction and Regulations

Alternative 1 would not bring this area any closer to meeting the Standards and Guidelines for road densities, fish habitat, or water quality which is contained in the Malheur Forest Plan.

Alternatives 2, 3 and 4 would follow the General Road Management guidelines recommended in the Malheur National Forest Roads Analysis (page 47) and would help move the Forest closer to meeting the guidelines for closing roads.

Irreversible/Irretrievable Effects

All alternatives use rock on roads for spot rocking. This would be an irreversible commitment of rock (considered to be a resource). This rock would come from Source #1 located on the 2646

road in T. 12 S., R. 35.5 E., Section 3 or Source # 2 in T.12 S., R. 35.5 E., Section 4. The rock is already pushed into a pile at both sites.

There would be a short-term loss of productivity where temporary roads are proposed in Alternatives 2 and 3. Those areas would be returned to productivity when the roads are rehabilitated.

Heritage Resources

Regulatory Framework

The legal framework that mandates the Forest to consider the effects of its actions on cultural resources is wide-ranging. In this case, Section 106 of the National Historic Preservation Act (NHPA) of 1966 (amended in 1976, 1980, and 1992) is the foremost legislation that governs the treatment of cultural resources during project planning and implementation. Federal regulations such as 36 CFR 800 (Protection of Historic Properties), 36 CFR 63 (Determination of Eligibility to the National Register of Historic Places), 36 CFR 296 (Protection of Archaeological Resources) and Forest Service Manual 2360 (FSM 2360) clarify and expand upon the NHPA. The Pacific Northwest Region (R6) of the Forest Service, the Advisory Council on Historic Preservation (ACHP), and the Oregon State Historic Preservation Office (SHPO), signed a programmatic agreement (PA) regarding the management of cultural resources on National Forest system lands in 2004. The 2004 PA outlines specific procedures for the identification, evaluation, and protection of cultural resources during activities or projects sponsored by the Forest Service. It also establishes the process that the SHPO utilizes to review Forest Service undertakings for NHPA compliance.

The National Environmental Policy Act (NEPA) of 1969 is also a cultural resource management directive as it calls for agencies to analyze the effects of their actions on sociocultural elements of the environment. Laws such as the National Forest Management Act (NFMA) of 1976, the Archaeological Resources Protection Act (ARPA) of 1979, the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990, Executive Order 13007 (Indian Sacred Sites) Executive Order 13084 (Consultation and Coordination with Indian Tribal Governments), also guide Forest Service decision-making as it relates to Heritage. The American Indian Religious Freedom Act (AIRFA) of 1978 requires that federal agencies consider the impacts of their projects on the free exercise of traditional Indian religions. Executive Order 13175 (EO 13175), Consultation and Coordination with Indian Tribal Governments, November 6, 2000, directs federal agencies to engage in regular and meaningful consultation and collaboration with tribal officials in the development of federal policies that have tribal implications and to strengthen the United States government-to-government relationship with Indian tribes.

The Malheur National Forest Land and Resource Management Plan, the Malheur Forest Inventory Plan (Thomas 1991), and the Programmatic Memorandum of Agreement for Historic Railroad Systems (1986), all have been developed to tier to the previously mentioned laws and corresponding Forest Service manual direction as it sets forth resource management goals, objectives, and standards. Although, the Malheur National Forest was not originally included in the Programmatic Memorandum of Agreement for Historic Railroad Systems (1986), approval was issued Region wide with the 1995 Programmatic Agreement (which preceded the more

recent 2004 Programmatic Agreement). Forest-wide management standards that are pertinent for this cultural resource effects analysis include:

- Conduct a professionally supervised cultural resource survey on National Forest lands to identify cultural resource properties. Use sound survey strategies and the Malheur National Forest Cultural Resource Inventory Survey Design.
- Evaluate the significance of sites by applying the criteria for eligibility to the National Register of Historic Places.
- Consider the effects of all Forest Service undertakings on cultural resources. Coordinate the formulation and evaluation of alternatives with the State cultural resource plan, the State Historic Preservation Office and State Archaeologist, other State and Federal agencies, and with traditional and religious leaders of Native American Indian groups and tribes with historic ties to the project planning area.

Analysis Methods

Cultural resource identification efforts in the vicinity of the project area have focused on two primary types of resources: prehistoric archaeological sites and historic archaeological sites. Cultural resource identification efforts that have been conducted include literature reviews and consultation with Native American tribes and other stakeholders that are historically associated with the area, as well as pedestrian survey. Twelve previous pedestrian cultural resource inventory surveys adequate to today's standards (as defined in Thomas 1991) have been conducted in the Crawford Project Area and the project area's immediate surrounding terrain. The cultural resource inventories which have been concurred by SHPO includes the following: The Summit Weir Construction CRIS 645-89/112, Blue Mountain Stock Ponds CRIS 645-89/122, Wye Timber Sale CRIS 645-89/129, Dan Thin Timber Sale CRIS 645-89/130, Tie Timber Sale CRIS 645-89/132, Spike Timber Sale CRIS 645-90/136, Austin Seed Orchard CRIS 645-90/151, Tipwood Timber Sale CRIS 645-92/175, Summit Creek Analysis Area CRIS 645-93/179, Silviculture 1993 CRIS 645-93/194, Idaho Power Vegetation CRIS 645-95/219, OTEC Fiber Optic Line CRIS 645-95/230 and Crawford Vegetation Management Analysis Area CRIS 645-97/218

Heritage Analysis Area

The Crawford Project area includes all National Forest system lands administered by the Blue Mountain Ranger District that are within the designated boundary established for this project (see Figure 1.1). This boundary area is the Mill Creek subwatershed located on the Blue Mountain Ranger District north of State Highway 26. The Mill Creek subwatershed includes Mill Creek to its confluence with the Middle Fork John Day River (Middle Fork), Crawford Creek to its influence with the Middle Fork, and the Middle Fork from the confluences of Summit Creek and Squaw Creek downstream to the confluence of Bridge Creek. The cultural resources effects analysis will focus on historic properties identified within the Crawford Project area. The proposed action and its alternatives do not have potential to have indirect effects (i.e., visual, auditory, atmospheric) on cultural resources that are distant from the analysis area.

Affected Environment

The Crawford Project area contains the headwaters of the Middle Fork of the John Day River and tributary streams which are part of the John Day River Basin, eventually flowing into the Columbia River. The project area lies within the Blue Mountain Physiographic Region of Eastern Oregon. The topography of the area is mountainous with gentle to moderately steep slopes formed by tectonic activity and subsequent weathering and erosional processes. Primary landforms include ridgetops, mountain slopes, and dissected canyons. Additional physiographical description of the project area is available in the Crawford Project EIS.

Heritage surveys to date have identified 48 cultural properties recorded as sites inside the Crawford Project area. Of the 48 total sites, 18 are prehistoric sites, 15 are historic sites, and 15 are multi-component sites with both historic and prehistoric elements. Twelve of the sites are eligible for the NRHP, 24 are potentially eligible (unevaluated), and 12 are concurred ineligible for inclusion on the NRHP. The Sumpter Valley Railway historic district, which was listed on the National Register of Historic Places in 1987, is also within the planning area.

No information currently exists that suggests that traditional cultural properties of the type characterized by activity or historical happening rather than the necessary presence of artifacts, features or other human modification of the physical environment (i.e., Vision quest sites; specific plant gathering locations necessary for the continuation of a belief or custom), as defined by Parker and King (1998), exist within the Crawford Planning Area. A general concern regarding cultural plant habitat and their protection from the proposed activities was expressed in a letter from the Burns Paiute Cultural Consultant.

Ethnographic Overview with Prehistoric Site Discussion

The Upper Middle Fork John Day River watershed, within which the Crawford Project Area is located, may have been a scene of human activity for 11,000 years before present. This area is located on the boundaries of two of North America's Native American Cultural Areas: the Columbia Plateau and the Great Basin. Peoples from both of these regions occupied the Upper Middle Fork in the prehistoric period. The Confederated Tribes of the Warm Springs ceded the land the project area is located within to the United States by way of treaty in 1855 (United States Congress: Treaty With The Tribes Of Middle Oregon, 1855). Ethnographic information indicates that the Columbia Plateau Umatilla and the Great Basin Northern Paiute were the principal users of the Middle Fork John Day. While the Umatilla used the resources of the area it is said they recognized that the Northern Paiute had a territorial claim (Ray et al. 1938).

Culturally important plant species, such as lomatium, yarrow, wild onion, camas, and various berries, are present in the project area. Virtually every plant in the natural environment had cultural use among the Native American peoples of the region.

Prehistoric Sites in the Project Area

The majority of the cultural properties in the project area include lithic dominated archaeological sites known as "lithic scatters". Sites of this type contain stone artifacts and the residues of their manufacture and rejuvenation and are visible at the surface of the ground. They are primarily

valued due to their potential ability to contribute to scientific or scholarly information to studies of the prehistoric and Protohistoric past (Keyser et al. 1988). The eighteen prehistoric archaeological sites within the planning area are generally small in area, display low levels of surface density, and have assemblages of formed tools that are marked by a low-level of tool class diversity. An exception to the generally small sized lithic scatters is the presence of a site that is in excess of 120 acres which served as a lithic procurement locality and early state reduction workshop. Two other sites in the planning area that exceed 25 acres also display evidence of toolstone procurement and primary reduction activities.

The tool types observed in the lithic scatter sites in conjunction with their surrounding environs suggest that hunter-gatherer activities in the planning area were focused on the extraction of food and industrial resources such as big game, root crops, and toolstone. Intensive on-site processing of resources certainly occurred, as evidenced by the several fragments of groundstone from the planning area, although apparently far less frequently than resource procurement activities. Data from several of these sites indicate a potential for buried archaeological deposits.

Historic Period Overview

The discovery of gold in the 1860s in Canyon Creek at the confluence of the John Day River, led to an influx of fortune hunters in the Blue Mountains. Although the major deposits of gold were found downstream of the Upper Middle Fork subwatershed, mining also took place along the whole length of the Middle Fork John Day River. Wagon roads were built to connect the various mining towns throughout the area. Some homesteads were established in the 1860s with limited agriculture and stock raising to serve the needs of the miners (Mosgrove 1980).

Grazing of livestock has been an important socioeconomic activity in the area. The allotments in the Crawford Project area have historically been grazed by domestic livestock, with intensive sheep grazing in the late 1860s until the 1960s. From the 1940s until the present day, most of the domestic livestock grazing in the area has been dominated by cattle.

The Sumpter Valley Railroad, a narrow gauge railroad, was constructed in 1905 to access the natural resources in this area of the Blue Mountains. This railroad system fostered the industrialization of logging and mining in the Blue Mountains, and enhanced transportation to outside markets and destinations for farmers, ranchers, and travelers. A preponderance of the thirty sites with historic components (15 of these also have prehistoric components) in the project area are related to use of the railroad during its construction and maintenance and the depression era logging operations. Historic site types in the planning area include: can and bottle dumps or debris scatters, log troughs, structural ruins, narrow gauge railway mainline, permanent and temporary railroad spurs, dendroglyphs, roads, springboard tree stumps, and the remains of lumber mills and logging camps.

Environmental Consequences

A project is considered to have an adverse effect on cultural property when it results in the alteration of characteristics that qualify the property for the National Register of Historic Places. The cultural properties that have been identified within the Crawford Project area are eligible or potentially eligible (unevaluated) for the NRHP on the basis of their ability to yield scientific information that is important to studies of prehistory or history. Therefore, proposed activities

that modify the patterning of surface or buried archaeological deposits are considered to result in an adverse effect. Project effects that enhance site stability and the potential effects of a no action alternative are also discussed.

Alternative 1 - No Action

Direct and Indirect Effects

If the no action alternative is pursued, there will be no direct effect on the existing conditions of the cultural resources identified within the Crawford Project area. Forest stands and habitats within and surrounding significant historic properties and areas are potentially important for traditional use by regional tribes and would remain in their existing conditions. However, cultural properties within the Crawford area and in adjacent areas would continue to be in jeopardy of damage or destruction by wildfire under the no action alternative. Selection of the no action alternative will also not enhance habitats that support fisheries, wildlife or plant species that are traditionally important to regional tribes of American Indians. This alternative would not meet the direction set forth in the Malheur National Forest Management Plan (1990), which instructs the Forest to take action to enhance cultural resources in the Middle Fork John Day River area. Also, if access is not reduced as proposed in the action alternatives, archaeological sites may be exposed to elevated levels of surface collecting or vandalism.

Cumulative Effects

Current fuel conditions are partially a result of past human caused cumulative effects such as those listed in Appendix D. The No Action Alternative would not reduce fuel loads across the landscape within the Crawford Project area and not incrementally reduce risks that the resource will experience future severe wildfire events. The threat of severe or moderately-severe wildfire will not contribute to the long-term stability of heritage sites. Therefore, the no action alternative may result in a detrimental cumulative effect to heritage resources.

Common to All Action Alternatives

Direct and Indirect Effects

Timber harvest activities will have no direct effect on any archaeological or historic resources in the Crawford Project area as long as the project design elements are observed. Because ground based logging activities, as proposed in Alternatives 2 and 3 can be detrimental to all site types, all NRHP eligible or potentially eligible cultural sites will be avoided/protected from all ground disturbing activities during commercial harvest activities. Actions necessary for the salvage of dead and dying trees from ground-based logging such as felling, skidding, decking, and slash disposal (i.e., hand-piling/burn and grapple piling/burn activities) may have direct detrimental effects on archaeological deposits situated within the project area. There is one prehistoric lithic scatter that is located within a commercial thinning unit under the action alternatives.

Indirectly, reducing the accumulations of fuels through commercial thinning (Alternatives 2 and 3) will reduce the severity of potential wildfires and will enhance the long term stability of archaeological and historic resources within the Crawford area and also lands adjacent to the analysis area. The risks that cultural resources face from additional severe wildfire events would diminish as standing large diameter fuels are reduced. Reducing the amount of small diameter

fuels in the analysis area through pre-commercial thinning (Alternatives 2, 3 and 4) would also contribute to reducing the risk of severe wildfire recurrence.

The lithic scatter archaeological sites that have been identified in the project area could be damaged by reforestation measures that are conducted in their vicinity under Alternative 2 – the proposed action. Although there are no known archaeological sites within the planned 119 acres to be planted, the proposed action would reforest a shelterwood harvest area by planting conifer tree seedlings. Conversely, lithic oriented archaeological sites that could be located in reforestation units may realize an indirect beneficial effect as reforestation stabilizes erosive soils and reforests understocked areas. Reforestation will expedite the establishment of vegetative cover over exposed archaeological resources and reduce the likelihood that lithic scatters will be impacted by surface collection.

Activities associated with the construction of temporary roads and landings (Alternatives 2 and 3), as well as road closing or decommissioning (Alternatives 2, 3 and 4), can also degrade the integrity of archaeological sites. The action alternatives would construct between 1.5 and 8.9 miles of temporary roads, reconstruct about 10.9 miles, close up to 0.2 miles of road by gating, berming, or signing, decommissioning 17.8 miles, and constructing approximately 111 acres of log landings. Log hauling may occur on Forest Roads 2620000 and 2620498, which travels through an historic property, but this will not result in any additional effects on that site in the form of additional surface disturbances. A temporary road will be constructed across a segment of the Sumpter Valley Railroad, but this temporary road will avoid all wooden tie remnants and the grade will be returned to its previous existing condition after the temporary road is no longer in use. Indirectly, road closures and decommissioning might also protect exposed archaeological resources from artifact collecting and vandalism, to an unknown degree, as access is reduced.

Many of the cultural resource properties within the analysis area are lithic oriented prehistoric sites. Studies have shown that fire exceeding 300 degrees Celsius can damage obsidian hydration layers (Buenger 2003, Solomon 2000). Under the terms of the Management Strategy for the Treatment of Lithic Scatter Sites (Keyser et al., 1988), the deployment of low intensity prescribed fire (less than 300° C.) within the established perimeter of lithic scatter sites will have negligible to minimal effects on the scientific or scholarly values that such sites hold.

The Blue Mountain Ranger District Heritage Program, in consultation with Oregon SHPO (Rotell 2000), has determined that the proposed low-intensity prescribed fires planned for the Crawford Project area should have no direct effect on properties that are eligible or potentially eligible for the National Register of Historic Places. If the prescribed burn remains in prescription, fire intensity would not rise to a level that could initiate or accelerate surface erosion and significantly detract from the scientific or scholarly value of buried archaeological sites. No more than 10 percent of the substrate underlying forest litter and ground cover vegetation is expected to be exposed. Root systems of shrubs, trees, and some grasses should remain intact after the burn. Prescribed burns applied over a landscape scale result in highly variable mosaic burn patterns in which large burned areas are adjacent to areas that are completely unaffected by fire. If implemented as planned the project should, in fact, reduce existing fuels that cover or surround sites and enhance long-term cultural site stability as the risk of wildfire is reduced.

Since concentrated fuels can reach high temperatures, and in turn, affect the integrity of lithic scatter sites, the project design elements do not permit the burning of concentrations of fuels, such as hand piles and burning or grapple piling and burning, within the boundaries of known lithic oriented archaeological properties.

Historic sites that include fire sensitive aboveground features such as architecture, wooden structural remains, and glass and metallic artifacts would be protected through project design criteria. Only two historic sites potentially eligible to the NRHP are located within the prescribed burn area. These sites will be protected during any prescribed burning activities, through avoidance or the application of fire retardant.

Commercial thinning treatments that address the purpose and need may increase the density and distribution of culturally significant plants in the project area. Species that are dependent on riparian habitats such as aspen, chokecherry, and willow will realize the greatest benefits. Adjustments of dedicated old growth and additions to replacement old growth areas, and delineation of pileated woodpecker feeding areas would have no effect on any identified cultural resources.

Cumulative Effects

Previous timber harvest projects, including railroad logging from 1910 to the 1960s, wildfires, mining activities, livestock grazing, Forest and State highway road construction, recreational activities, and firewood cutting have had incremental negative effects on the cultural properties that have been identified within the Crawford Project area. With the implementation of the project design elements for heritage resources, there is minimal risk of additional incremental degradation of the cultural properties associated with the proposed action and its alternatives.

Characteristics of some heritage resource sites, such as portions of the Sumpter Railroad line and its spurs and an historic wagon trail, were compromised beginning in the 1920s when the old grades and trail were converted into roads, including Forest Service roads and State Highway 26, to access the Forest and other communities.

Reasonably foreseeable future activities in the planning area include conifer planting, prescribed fire, livestock grazing, road maintenance, and culvert replacement. Identified cultural properties will be avoided, and project implementation will be halted if it is determined that a cultural property has been damaged or may become damaged. However, most such potential impacts that heritage sites might incur from such foreseeable future actions as conifer planting, prescribed burning, hazard tree removal, and livestock grazing would be mitigated as per Stipulation III. A of the 2004 Programmatic Agreement with Oregon SHPO.

Ground-based logging systems can present some risks to archaeological resources. Since site identification efforts were limited to surface surveys, it is possible that site boundaries may not be delineated with complete accuracy and that efforts to avoid sites during the timber harvest activities may not be entirely successful. It is likewise possible that undocumented archaeological resources in buried contexts may be inadvertently disturbed. Mechanical damage of the archaeological record is irreversible and permanent in duration. This risk is also cumulative, in that it increases in relation to the amount of ground-based logging activities conducted in the area.

The Action Alternatives reduce fuel conditions across the landscape within the Heritage resource area to some extent, and incrementally reduces the risk that the resource will experience future severe wildfire events. Actions reducing the likelihood of a severe or moderately-severe wildfire, will contribute to the long-term stability of cultural properties in the analysis area. The risks of fire-sensitive historic properties sustaining serious damage or destruction from wildfires will diminish as stands move toward a more fire-tolerant composition of species.

Consistency with Direction and Regulation

Heritage and Tribal interests are regulated by federal laws that direct and guide the Forest Service in identifying, evaluating and protecting heritage resources. All of the alternatives would comply with federal laws. The Malheur National Forest Plan tiers to these laws, therefore the proposed action alternatives will meet Forest Plan standards. With the completion of the Heritage inventory under the terms of the 1995 PA with Oregon SHPO and by providing the interdisciplinary team with appropriate input as per NEPA, all relevant laws and regulations have been met.

Irreversible and Irrecoverable Commitments of Resources

There are no irreversible and irretrievable commitments of resources that may result from the alternatives with respect to cultural resources, except for the potential that surface artifacts may be subject to a greater likelihood of looting

Economics/Social

Regulatory Framework

The Malheur Forest Plan includes forest-wide management goals to:

- Provide a sustained flow of timber for lumber, fiber, and/or associated wood products at a level that will contribute to economic stability, while providing for regional and national needs.
- Contribute to the social/economic health of communities, which are significantly affected by national forest management.
- Provide an economic return to the public.
- Provide and utilize wood fiber in the form of sawtimber, fiber, and/or associated wood products, while minimizing losses and maximizing outputs in a cost-effective manner, consistent with the various resource objectives and environmental standards.

The Code of Federal Regulations (CFR) is a codification of the general and permanent rules published in the Federal Register by the Executive departments and agencies of the Federal Government. Minimum specific management requirements are identified in 36 CFR 219.27, to accomplish goals and objectives for the National Forest System. Those management requirements are addressed as follows.

- Section (b) Vegetative Manipulation: (1) Multiple-use; (3) Not chosen for greatest dollar return; (7) Practical transportation, harvest requirements, and preparation and administration.
- Forest Service policy sets a minimum level of financial analysis for project planning (FSH 1909.17).
- The National Environmental Policy Act requires integrated use of the natural and social sciences in all planning and decision-making that affects the human environment. The human environment includes the natural and physical environment, and the relationship of people to the environment (40 CFR 1508.14). Forest Service land management planning regulations require the integration of social science knowledge into forest and regional planning processes (36 CFR 219.5).
- Title 40, Code of Federal Regulations for NEPA (40 CFR 1502.23) addresses non-commodity values, stating “For the purposes of complying with the Act, the weighing of the merits and drawbacks of the various alternatives need not be displayed in a monetary cost-benefit analysis, and should not be, when there are qualitative considerations.”
- 36 CFR 219.3 – National Forest System Land and Management Planning
- Executive Order 12898 (February 11, 1994) on Environmental Justice directs federal agencies to identify and address agency programs that may 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.

Analysis Area

Although individuals and communities over a wide geographic area use national forest resources, the residents and businesses of counties near the forest depend most heavily on the availability of the resources. Consequently, the effects of forest management on social and economic factors are strongest within these areas. For this reason, the Malheur National Forest primary zone of influence is defined as Grant and Harney counties in Oregon.

Analysis Methods

Forest Service Handbook (FSH) 2409.18 provides direction to analyze financial efficiency and, if needed, economic efficiency, to identify the most efficient alternative that achieves the desired objectives of the project. Consideration of the proposal that maximizes net public benefits is an important consideration of the decision-making process.

An economic efficiency analysis was completed. It 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).

Ecosystem functions provide a broad set of ecosystem services, such as clean water or native forest stands which are valuable to both human and nonhuman components of the ecosystem. These ecosystem values may be assessed in economic and noneconomic terms. Economic

valuation provides a partial measure of the full range of ecosystem values in commensurate terms for assessing economic tradeoffs. Noneconomic 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 (2006 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 4% 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.

The tentative advertised bid rates estimated for the Crawford Timber Sale Project reflect the most current volume, price, and cost 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 by 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 for this analysis. The results of that analysis are included in the Project File.

Costs for reforestation and other direct work were developed based on previously experienced costs. Costs for temporary roads and road maintenance were included in the Transaction Evidence Appraisal.

Non-commodity values were not included in this analysis, because these resources are evaluated under the specific resource section (40 CFR 1502.23). Effects on resources are documented in individual resource sections.

Employment and income effects were derived from response coefficients from the input-output model IMPLAN (Impact Analysis for Planning) for the Roadless Social Economical Report for the Malheur National Forest impact zone, and from the forest-level Timber Sale Program Information Reporting System (TSPIRS) analysis in fiscal years 1996 to 1998 (USDA 1998, USDA 2000). Job estimates include temporary, permanent full-time, and part-time employment. The estimates do not include unpaid family workers or sole-proprietors.

Affected Environment

A social and economic analysis entitled *Recovery Efforts 2002 Fires – Draft Environmental Impact Statement: Social and Economic Conditions*, has been completed for the fire recovery

efforts on the Malheur National Forest (Kohrman 2003). This document is incorporated by reference under 40 CFR 1502.21. The document presents social and economic affected-environment information for this analysis. It provides information on human uses, social and economic characteristics, and conflicts among various users and uses of the ecosystem. It also discloses: the health of the relationships among the people (community), the forest, and the larger ecosystem; perceptions and values related to ecosystem management; and recent social and economic trends in the economic region. The focus is primarily on, but not limited to, Grant and Harney counties.

Changes in levels of resource use associated with the Crawford Project may affect the major social and economic characteristics of the surrounding geographic area. The affected area or impact zone for the Malheur National Forest consists of Grant and Harney counties in Oregon. Agriculture, manufacturing (particularly wood products), and retail trade are important sources of employment and income in this region. Grant County, for example, has a low level of economic diversity, a high dependence on federal timber and forage, and a low resiliency for change. Reliance on timber and forage from federal lands is moderate to high in counties in the impact zone (Haynes and Horne 1997).

Many communities are closely tied to the forest in both work activities and recreation. The local communities within an hour or two drive that are anticipated to be directly or indirectly affected by the proposed action, alternatives, and their associated economics include: Prairie City (population 1,080), Burns/Hines (4,565), Dayville (140), John Day/Canyon City (2,740), Long Creek (260), Mount Vernon (650), Monument (150), Seneca (230), Sumpter (175), and Unity (145). Austin, Greenhorn, and Hereford are examples of other smaller communities also located in the vicinity. Larger cities two or more hours away from John Day include: Baker City (10,160), LaGrande (12,795), Ontario (10,680), Bend (52,029), and Pendleton (16,915) (Kohrman 2003).

Employment

Cattle production and forest products provide the core employment for Grant and Harney counties. Forest products industries include 3 major lumber mills and numerous logging companies. Wood products employment totaled 530 direct jobs (i.e. mill workers and loggers) and 131 indirect jobs, approximately 8% of the total non-farm employment in Grant and Harney counties (average annual in 2005). Local government, retail trade, and services employ the most people in Grant and Harney counties (Oregon Employment Department 2003). The area surrounding the Crawford Project area is rural, and has disproportionately high unemployment compared with the Oregon state average and the National average. Grant County is in its sixth consecutive year of declining non-farm employment, and “this is quite possibly the longest ongoing downturn any local labor market area in Oregon has ever experienced” (Kohrman 2003).

Ranchers in Grant County, with federal permits in the analysis area, are highly dependent on forage from federally-managed lands, compared to other counties in the region. The value of cattle reared on forage from federally-managed lands represents more than 10% of total agricultural sales in Grant and Harney counties (Kohrman 2003). Baker, Wheeler, and Malheur counties are rated moderately dependent (3.57% to 10% of total agricultural sales comes from cattle raised on forage from federally-managed lands). Union, Umatilla, Morrow, and Gilliam counties are less dependent (less than 3.57%). 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 ranching operation.

Recreation-based industries, while prevalent elsewhere in the region, have not been a major contributor to the local economies. Recent efforts indicate that the volume of business is only enough to supplement income, rather than provide a primary source of income (Kohrman 2003). The exception is hunting season, which typically draws larger numbers of people into the area. Stores that sell sporting goods benefit during this period. Recreation-based employment is seasonal and service-oriented, with wages at the lower end of the pay scale (Kohrman 2003). Economic activity based on recreation may have limited growth potential for communities in the area (Kohrman 2003). Seasonal limitations, the dispersed nature of recreation within the counties, along with a general lack of large, water-based recreational opportunities, does not create the concentrated numbers of recreationists and readily-identifiable recreation destinations necessary to support many recreation industries (Kohrman 2003).

Historically, government employment and expenditures has provided a degree of stability in rural communities (Kohrman 2003). With reduced Forest Service budgets and work force, and a switch to management emphasis that produces generally lower amounts and value of products, federal workforce and program expenditures has not buffered economic downturns as in the past (Kohrman 2003). This situation, combined with fluctuations in the other base industries, has had a significant effect on the economy (Kohrman 2003).

The communities surrounding the Crawford Project area are considered rural in character, and have a disproportionately high unemployment compared with the Oregon State average of 5.7% and the National average of 4.9 % (seasonally adjusted). Unemployment in Baker County for December 2005 was 7.7%, Grant County – 10.1%, Harney County – 9.7% and Malheur County – 7.4%. (Oregon Employment Department 2005, Unemployment Rates)

Average Wages

Average annual pay per job provides an indication of the quality of jobs in the analysis area. Average income for the affected counties is also below the national and state averages: United States \$37,765, Oregon \$34,446, Baker County \$25,877, Grant County \$25,342, Harney County \$25,612, Malheur County \$25,033 (Oregon Employment Department 2003). Wages in Grant and Harney counties are lower, primarily due to lower wage rates per hour and a larger number of part-time jobs, compared to the state as a whole (Kohrman 2003).

Per Capita Income

Per capita income measures economic well-being, taking into account both population and income changes, although it does not address income distribution. Per capita personal income is total personal income divided by the estimated population. Per capita income in Grant and Harney counties is approximately \$24,967 and \$22,382 (2003 dollars), respectively. These counties lag behind the statewide average of \$29,175 (2003 dollars).

Refer to: Kohrman E. B. 2003, Recovery Efforts 2002 Fires, Social and Economic Conditions, U.S. Department of Agriculture, Forest Service, Malheur, Umatilla, and Wallowa-Whitman National Forest, Social Economic White Paper, for further detailed description of the main social economic characteristics of the area.

Environmental Justice

The population of the area is predominately white, followed by American Indians. The region is sparsely populated, and contains low populations of minorities (5.5% of the Grant County population, 5.4% of Baker County, 9.9% of Harney County, and 31.2% of Malheur County (of which 25.6% is of Hispanic origin with the majority living east of Vale) (Kohrman 2003; United States Census Bureau 2003). The primary American Indian tribes involved are the Burns Paiute and Umatilla. With the exceptions of the Burns Paiute and Hispanics east of Vale, minorities are scattered throughout the counties.

Poverty rates provide some indication of the percentage of the population in surrounding communities with low-incomes. The poverty rate for Grant County is 13.7% and a Harney county is 11.8%. The Oregon statewide average rate of persons living below poverty is 11.6% (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. Asian and Pacific Islanders uses of the area include commercial mushroom harvesting and developed camping associated with this activity. Some 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).

Environmental Consequences

The social and economic effects of the various proposed management alternatives were assessed in terms of viability of harvestable timber, employment supported by the alternatives, and the economic efficiency for relative comparison between alternatives.

Viability of Timber Harvest

Direct/Indirect Effects – All Alternatives

The area proposed for commercial harvest within the Crawford Project area was analyzed to determine the economic viability of harvesting timber, by determining the tentative advertised bid rates per hundred cubic feet (\$/ccf). The tentative advertised bid rates estimated for the Crawford Project reflect the most current volume, price, and cost estimates for this analysis. All alternatives that harvest timber would produce positive bid rates, indicating that the project would provide a viable harvest proposal. Based on this analysis, Alternative 2 provides the highest tentative advertised bid rate at \$55.16/ccf, and therefore the highest potential revenue from the sale of timber. Alternative 3's bid rate is slightly lower, at \$46.07/ccf. Alternatives 1 and 4 would not harvest any merchantable timber, and therefore would not produce any revenue or benefits to wood products industries. Advertised bid rates have fluctuated over the last few years, reflecting the volatility of the timber market. Changes to prices would likely occur at the time of the appraisal, depending on actual market conditions at that time.

The 1990 Malheur National Forest Land and Resource Management Plan (Forest Plan) established an allowable sale quantity (ASQ) for the forest of 38.4 million cubic feet or 211 million board feet (MMBF) average per year. An ASQ is an upper limit for the plan period, not proposals for sale offerings or an assigned target. Actual sale levels depend on factors such as

limitations of modeling, changes in law and regulations, changes in social-economic values, listing of threatened and endangered species, changes in budgets, and site-specific conditions. The Regional Forester amended this plan in 1994, through Amendment No. 2 (Eastside Screens), and by PACFISH and INFISH in 1995, in response to some of these changing factors. The table below compares the Malheur National Forest's annual offered timber volume with its assigned target timber volume for the fiscal years since the 1990 LRMP went into effect. Accomplishment of timber targets is based on volume offered.

Table E-1. Malheur National Forest Timber Offer by Fiscal Year 1991 to 2002

Fiscal Year	Target Volume MMBF	Offered Volume MMBF
1991	229.0	201.6
1992	220.0	100.8
1993	197.0	71.7
1994	101.0	33.1
1995	85.0	66.9
1996	100.0	80.9
1997	110.0	38.9
1998	95.0	77.1
1999	63.5	34.1
2000	45.0	17.5
2001	36.7	15.4
2002	24.2	2.7
2003	26.8	11.8
2004	63.9	46.3
2005	38.0	18.1

In response to a request by then Oregon Governor Kitzhaber, the Blue Mountains Demonstration Area published in 2002 an assessment entitled *Assessment of Timber Availability from Forest Restoration with the Blue Mountains of Oregon* (USDA 2002). The assessment describes management actions over the past decade, current vegetation conditions where a reliable supply of wood could be available, estimations of the quantity and type of forest timber products that may result from forest restoration actions, and a market analysis for potential timber products and the associated economic impacts on individual communities.

This assessment concludes that 71% of the national forest lands in the Blue Mountains of Oregon were not available for substantial and sustainable harvesting of timber. Only minimal amounts of timber would be harvested during restoration treatments of these lands, and prescribed fire may be the primary tool available to accomplish fuels reduction and thinning. This trend would likely continue because there is no anticipated change in management direction. The assessment further concludes that the remaining 29% of the national forest lands that are available for

substantial and sustainable timber harvest (Active Forestry lands) was actively managed over the last three decades. Up to a third of these lands have experienced timber harvest or non-commercial thinning since 1988. Approximately 58% of these Active Forestry lands are currently overstocked; however, nearly half of these overstocked lands are suitable only for non-commercial thinning treatments, yielding only incidental amounts of merchantable timber. This trend is also likely to continue.

Selection of the No Action Alternative 1 or the Precommercial Thinning Alternative 4 has the potential to continue the decline of timber-related employment in the rural communities of Baker, Grant, Harney, and Malheur counties. Alternative 2 would provide short-term (1 to 2 years) economic relief. Alternative 3 would provide short-term (1 to 2 years) economic relief. The amount of local economic relief would be determined by whether the purchaser is local or distant, what mill(s) local or distant actually receives the logs, and the price for lumber.

Cumulative Effects – All Alternatives

These cumulative economic effects could cause cumulative “quality of life” social effects. Continued loss in timber-related jobs could affect the remaining infrastructure and capacity in the local rural communities, and could disrupt the dependent local goods and services industries. Diversification opportunities for these local rural economies are currently limited, and this trend is expected to continue until economical biomass utilization can be further developed (LeVan 1998).

Employment

Direct/Indirect Effects

The primary effect on timber harvest-related employment would occur from commercial harvesting associated with the alternatives over the next two years. Financially viable sales would be necessary to provide opportunities for timber harvest-related employment. Levels of harvest volume by alternative would affect employment and income in several ways:

- *directly* - effects attributable to employment associated with harvesting, logging, and mills and processing plants for sawtimber, pulp, chips, veneer, and plywood;
- *indirectly* - effects attributable to industries that supply materials, equipment, and services to these businesses; and
- *induced* - effects attributable to personal spending by the business owners, employees, and related industries.

No harvest-related activities would occur under Alternative 1 (No Action), and Alternative 4 (Precommercial thin), 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 National Forest System (NFS) lands would continue in the future, and contribute to declines in wood products employment and associated indirect 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.

The overall employment and income effect from the action alternatives 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 two years, associated with the harvesting activities. Alternative 2 would support the highest level of employment, at 114 jobs over the two-year period. An individual county or community in the impact area could experience greater benefits in the short-term (2-3 years), particularly the communities highly specialized in wood products manufacturing. However, 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. The financial viability of the timber sale proposals would influence whether potential purchasers closest to the project area could be competitive with other purchasers, to acquire the majority of the supply of wood. Employment projections would depend on other factors such as market conditions, quality and quantity of the volume offered for sale, timing of the offerings, and financial conditions of local firms.

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. Do to the lack of volume offered in the past several years throughout the Blue Mountains; several mills located in other counties in Northeast Oregon would be potentially interested in the supply of wood offered. Refer to the following table for an illustration of employment effects from timber harvesting by alternative.

Table E – 2. Employment Effects from Timber Harvest by Alternative

Timber-harvest Related Employment and Income (2003\$) by Alternative				
	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Employment				
Total direct, indirect and inducted	0	57	39	0
<i>%change</i>		0%	-31%	0%
Income				
Total direct, indirect and inducted	\$ -	\$ 1,579,917	\$ 1,085,941	\$ -
<i>%change</i>		0%	-31%	0%

Cumulative Effects

Annual timber-related employment supported by timber harvested from the Malheur National Forest for the years 2003-2005 averaged 141 direct jobs. Annual harvest for these years averaged 25 MMBF. Employment supported by commercial harvesting in Alternative 2 would support approximately 26% toward this level of annual employment. Alternative 3 would support approximately, 17%, Alternative 1 and Alternative 4 would not provide harvest opportunities and would not support employment in the impact zone from timber harvesting.

Other employment would continue to occur as a result of other timber sales in progress, domestic-livestock grazing, recreation activities, and other special use receipts across the Forest. Commercial collection of nontimber forest products, such as mushrooms, could continue to occur, although the quantity of harvest is unknown.

Economic Efficiency

Direct/Indirect Effects – All Alternatives

An economic efficiency analysis was completed. It 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).

Measurable and quantifiable economic market benefits identified in the Crawford Project include discounted revenue from timber volume proposed for harvest. Measurable and quantifiable costs at the project level include direct costs to the Forest Service for preparing and administering the commercial timber sales, and implementing other restoration activities including reforestation, decommissioning roads, and rehabilitating skid trails.

Table E – 3. Present net benefit, present net costs, and present net value associated with harvest.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Present Net Benefits				
Timber Value	\$0	\$757,661	\$430,087	\$0
Present Net Costs				
Sale preparation and administration	\$0	\$312,846	\$205,208	\$0
Restoration and mitigation projects	\$0	\$0	\$0	\$0
Fuel Reduction (material 7” to 11”)	\$0	\$0	\$0	\$0
Present Net Value				
Present Net Value	\$0	\$444,815	\$224,879	\$0

Alternative 2 has the greatest present net value \$444,815 of the action alternatives, due to more acres treated thus producing greater volume. Alternative 3 has a lower present net value, \$224,879 it treats less acres producing a lower volume. Costs for sale preparation and administration vary by alternative, based on the amount of timber harvested and acres treated. Alternative 1 and Alternative 4 would have no costs associated with harvesting, although ongoing costs associated with management of the area would continue.

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 unit months, or fish population) is not well-defined or measurable at the project level, in terms that provide meaningful comparisons of commensurate dollar values. Potential benefits include improvements to soil productivity, reduced erosion, water quality improvements in temperature, and terrestrial and aquatic habitat

improvement. Potential improvements in fish habitat would increase fingerling survival rates, overall fish population levels, and recreational fishing opportunities.

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. The economic value of big-game 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.

Other opportunity or externalized costs that would potentially occur include damage to soils from harvest operations in tractor units, resulting in long-term losses in soil productivity and potential timber harvest. These costs are not well-defined or measurable at the project level in terms that provide comparison of commensurate dollar values.

Human Health and Safety

Health effects are limited in scope and duration. This analysis summarizes the human health and safety effects described in other sections of the EIS.

Direct and Indirect Effects - Alternatives 1 and 4

With no commercial activities associated with alternatives 1 and 4 there would be no-change to existing condition.

Direct and Indirect Effects - Alternatives 2 and 3

With commercial timber harvest, the level of road use would increase within the project area and accessing the area. Increases in the level of use on roads will potentially increase the number of encounters between heavy equipment for logging and recreational visitors, and increase the likelihood of accidents in the short-term (2-3 years). Reconstruction design standards for width, brushing, and hazard trees would mitigate potential encounters and provide safer access on current roads in the long-term, after the harvesting activities are concluded. Directional signing and public information about logging activities would lessen encounters and increase safety. Worker health effects and safety from all phases of logging operations would potentially occur. The work environment would be physically demanding and hazardous.

Cumulative Effects – All Alternatives

Because of past, present, and reasonably foreseeable future actions, there are economic and social cumulative effects due to road closures and timber harvest. Due to decreased roads funding for the Malheur National Forest over the past several years, there is a cumulative effect as the Forest continues to reduce road densities in other project areas in order to meet budgetary constraints and other resource needs. The costs of road maintenance and reconstruction would increase in the future, due to further declines in the system. Road closures and decommissioning would probably be considered and implemented in future timber sale areas. Socially, this means the current level of access by roads would decline. Recreation, acquisition of nontimber forest products, and other opportunities dependent on road access, would also decline in areas of the road closure or decommissioning.

Environmental Justice

The analysis focuses on potential effects from the project to minority populations, disabled persons, and low-income groups.

Direct and Indirect Effects - Alternative 1

All current uses of the National Forest System lands would continue, including recreation, 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.

Direct and Indirect Effects - Alternatives 2, 3, and 4

The action alternatives provide a variety of opportunities for potential contracts. 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 road restoration. 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 and precommercial thinning needs would potentially benefit this group.

There is no existing information on how much use the area receives from minority and low-income populations. It is estimated that this area receives limited use because of the road conditions and the number of roads closed to the public. The anticipated direct and indirect social effects to these populations would change proportionally to the rest of the population as a whole due to road reconstruction, road decommissioning, and road closures planned under this EIS. Opportunities for all groups of people to collect species from disturbed and nondisturbed 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.

Consistency with Direction and Regulations

The Forest Plan contains several goal statements:

- Provide a sustained flow of timber for lumber, fiber, and/or associated wood products at a level that will contribute to economic stability, while providing for regional and national needs.
- Contribute to the social/economic health of communities, which are significantly affected by national forest management.
- Provide an economic return to the public.

- Provide and utilize wood fiber in the form of sawtimber, fiber, and/or associated wood products while minimizing losses and maximizing outputs in a cost-effective manner, consistent with the various resource objectives and environmental standards.

Otherwise, management objectives and standards for economics are not specifically addressed in the Forest Plan. This analysis attempts to display the effects to economic efficiency for this project. In this regard, all alternatives are consistent with the Forest Plan.

All economic elements are consistent with current regulations.

CHAPTER 4. CONSULTATION, COORDINATION, REFERENCES, GLOSSARY, AND INDEX

Preparers and Contributors

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

Interdisciplinary Team Members (IDT)

Name	Expertise	Education Degree	Years Experience
Susan Burton	Range Management		
Kim Conlee	Transportation Planning	AA	32
Dean Curtis	Range Management	BS	30
Ryan Falk	District NEPA Coordinator, IDT Leader	BS	22
Nancy Hafer	Botany	BS & BA	29
Patrick Haynal	Archaeology	PhD	28
Richard Larson	Visuals/Scenery & Writer/Editor-Documentation	BS	31
Alan Miller	Fisheries Biology	BS & MS	7
Cheri Miller	Wildlife Biology		
Charlotte McCumber	Timber Sale Implementation, Timber Management Planning, Economics		
Robert (Hersh) McNeil	Soil Science/Hydrology	PhD	16
Russ Riemers	Fuels Management		
Mary Robertson	Archaeology	BS & MS	14
Ken Schuetz	Wildlife Biology	BS & MF	20
Lori Stokes	Fuels Management	BS	16
Richard Vetter	Fisheries Biology		
Shannon Winegar	Recreation	BS	22
Eric Wunz	Silviculture	BS	28
AA-Associate of Arts, BA-Bachelor of Arts, BS-Bachelor of Science, MF-Master of Forestry, MS-Master of Science, PhD-Doctorate			

Extended Team Members, Management, or Reviewers

Carole Holly	Forest Environmental Coordinator
Elaine Kohrman	Economist
Mike Montgomery	Blue Mountain District Ranger
Mike Tatum	Forest Silviculturist

Contributors

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes, and non-Forest Service persons during the development of this environmental impact statement:
Federal, State, and Local Agencies:

- National Oceanic and Atmospheric Administration-Fisheries (NOAA)
- U.S.D.I. Fish and Wildlife Service
- Grant County/Judge Dennis Reynolds
- State Historical Preservation Office (SHPO)
- U.S. Environmental Protection Agency (EPA)
- Tribes:
 - Confederated Tribes of Warm Springs
 - Confederated Tribes of the Umatilla Indian Reservation
 - Burns Paiute Tribe

Public Involvement Summary

Public comments were received after four separate scoping requests. The original analysis began in the fall of 1993, and was called the Flat Analysis. Two scoping efforts were initiated during this season: during November, 1993 to alert hunters to the imminent project and in late October, 1993, to alert the general public. However, the analysis was delayed because of higher priority projects until April 1999, when it was renamed the Crawford Vegetation Management Project.

When the analysis resumed, the Upper Middle Fork John Day Watershed Report and its recommendations were included to define the purpose and need for the project. The formal scoping package was mailed to the public on May 21 and June 17, 1999.

These letters and correspondence are filed in the Crawford Project File.

Additional public comments on the Crawford project were received in 2000 and 2001 during comment period on two different versions of the Crawford Vegetation Management Project EA. The comment letters and Forest Service response to these comments are in the Crawford Project File.

A Decision Notice and FONSI were signed by Bonnie Wood, Malheur Forest Supervisor on April 26, 2002. This decision was appealed and then reviewed by the Appeal Deciding Officer, Richard Sowa. This review revealed that the analysis of cumulative effects was not sufficient to support the decision. The Forest Supervisor was directed to withdraw the decision.

Following the withdrawal of the decision, a Notice of Intent (NOI) was published in the Federal Register on October 9, 2003. The NOI asked for public comment on the scope of the analysis by

November 15, 2003. One comment was received from Doug Heiken, Oregon Natural Resources Council (ONRC). Additional comments were provided by ONRC on January 31, 2006.

The project has been listed in the Malheur National Forest Winter Schedules of Proposed Activities (SOPA) beginning in 2003 and subsequent quarterly SOPA's through the summer of 2006

The analysis work on the Crawford Project was resumed in 2005. This delay was because Forest Planning Teams needed to work on high priority fire recovery projects. A Project Initiation Letter (letter of direction) was issued from the Blue Mountain District Ranger to the Team Leader and IDT on June 21, 2005. The Ranger stated in this letter that because there had already been substantial previous public comments received on past analysis projects in the Crawford area. He felt this public involvement was adequate to continue the analysis without additional scoping. He directed the IDT to review all previous public comments received to date on the Crawford Project and past projects. After this review he asked the IDT to recommend any proposed changes to the key issues for his approval. To meet this direction, the IDT met in December 2005 to review the following:

- Comments received during initial scoping efforts. These comments were used to develop significant key issues in November, 2001 Environmental Assessment (EA).
- Public comments received during 30 day comment periods (November, 2001 EA)
- Appeal points on the November, 2001 Crawford EA and April 26, 2002 Decision Notice
- Comments received on the October 9, 2003 Notice of Intent to Prepare an EIS

Distribution of the Final Environmental Impact Statement

In addition to the public involvement described above, copies have been sent to the following Federal agencies, federally recognized tribes, State and local governments, and organizations representing a wide range of views regarding the project. This environmental impact statement has been distributed to individuals who commented on the DEIS or requested a copy of the document.

Individuals

Linda Driskill

Range Permittees??

Adjacent Landowners??

Organizations, Industry, and Local Agencies

Dan Bishop - Prairie Wood Products

Karen Coulter - League of Wilderness Defenders/Blue Mtn. Biodiversity Project

Ken Evans - KLE Enterprises/Malheur Timber Operators, Inc.

Walt Gentis - Malheur Lumber Company

D. R. Johnson - D. R. Johnson Lumber Company

Doug Heiken - Oregon Natural Resources Council

Asante Riverwind - Sierra Club

Thomas Partin - American Forest Resource Council

Oregon State Agencies

Department of Fish and Wildlife/Habitat Division/Dave McAllister
Planning and Development Section/Parks and Recreation Department
Water Resources Department/Rick Bastasch
Division of State Lands/John Lilly
Department of Geology and Mineral Industries/Dennis Olmstead
Department of Environmental Quality
Department of Land Conservation and Development/Jim Knight
Rural Development Section/Bill Campbell
Executive Department/State Economist/Paul Warner
Oregon Department of Forestry

Tribal Contacts

Burns Paiute Tribe/Tribal Chairman/Dean Adams
Burns Paiute Tribe/Cultural Res. Program/Charisse Snapp
Conf. Tribes of the Umatilla Indian Reservation/Chairman, Board of Trustees/Gary Burke
Conf. Tribes of the Umatilla Indian Reservation/Program Mgr., Env. Planning and Rights
Protection/Rick George
Conf. Tribes of Warm Springs/Tribal Council Chairman/Olney Patt, Jr.
Conf. Tribes of the Umatilla Indian Reservation/Princ. Investigator/THPO, Cult. Res. Prog.
Mgr./Manfred Jaehnig
Conf. Tribes of the Umatilla Indian Reservation/Natural Res. Policy Analyst/Harold Shepard
Conf. Tribes of the Umatilla Indian Reservation/Jim Webster
Conf. Tribes of the Umatilla Indian Reservation/Heritage/Shawn Steinmetz
Conf. Tribes of the Warm Springs Reservation/Cultural Res. Program Mgr./Sally Bird
Conf. Tribes of the Warm Springs Reservation /Fara Ann Currin
Conf. Tribes of the Warm Springs Reservation /Fish & Wildlife Mgr./Terry Luther
Conf. Tribes of the Warm Springs Reservation /Clay Penhollow
Conf. Tribes of the Warm Springs Reservation /Cultural Heritage Committee

Federal Agencies

U.S. Department of Agriculture

National Agricultural Library (3)

Natural Resource Conservation Service/ Environmental Coordinator of Ecological Sciences
Division

USDA APHIS TDP/EAD

U.S. Department of Commerce

Northwest Regional Unit, (Portland, OR) of NOAA Fisheries

U.S. Department of the Interior

Director, Office of Environmental Policy and Compliance (12)

National Marine Fisheries Service, Northwest Region

U.S. Environmental Protection Agency (EPA)

Region 10 EIS Review Coordinator, Seattle (2)

U. S. Department of Defense

U. S. Army Engineer, Northwestern Division

U. S. Coast Guard, Environmental Management

U. S. Department of Energy

Office of NEPA Policy and Compliance

Northwest Power Planning Council

U. S. Department of Transportation

Federal Aviation Administration, Northwest Mountain Region

Federal Highway Administration, Division Administrator, Western Resource Center

Advisory Council on Historic Preservation

Director, Planning and Review, Washington, DC

Federal, State, and Local Officials

Senator Gordon Smith

Senator Ron Wyden

Representative Greg Walden

Governor Ted Kulongoski

Governor's Forest Advisor

State Representative Ted Ferrioli

Grant County Judge Dennis Reynolds

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GLOSSARY

A

Access Management Plan – The development of travel management policies that consider the development, maintenance, and protection of all forest resources.

Affected Environment – The biological, social, economic, and physical aspects of the environment that will or may be changed by proposed actions.

Alternative – A combination of management prescriptions applied in specific amount and locations to achieve a desired management emphasis as expressed in goals and objectives. One of several policies, plans, or projects proposed for decision making. An alternative need not substitute for another in all respects.

Anadromous fish – Those species of fish that mature in the sea and migrate into streams to spawn (e.g., salmon and steelhead trout).

Analysis Area – A delineated area of land subject to analysis of (1) responses to proposed management practices in the production, enhancement, or maintenance of forest and rangeland outputs and environmental quality objectives; and (2) economic and social impacts.

Aquatic (and riparian) health — Aquatic and riparian habitats that support animal and plant communities that can adapt to environmental changes and follow natural evolutionary and biogeographic processes. Healthy aquatic and riparian systems are resilient and recover rapidly from natural and human disturbance. They are stable and sustainable, in that they maintain their organization and autonomy over time and are resilient to stress. In a healthy aquatic/riparian system there is a high degree of connectivity from headwaters to downstream reaches, from streams to floodplains, and from subsurface to surface. Floods can spread into floodplains, and fish and wildlife populations can move freely throughout the watershed. Healthy aquatic and riparian ecosystems also maintain long-term soil productivity. Mineral and energy cycles continue without loss of efficiency.

Available water — The amount of water in the soil that can be readily absorbed by plant roots.

B

Biological Diversity – (1) The distribution and abundance of plant and animal communities. (2) The variety of life forms and processes, including a complexity of species, communities, gene pools, and ecological functions.

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 – A unit of measurement represented by a board one foot square and one inch thick.

C

Canopy — In a forest, the branches from the one or more uppermost layers of trees; on rangeland, the vertical projection downward of the aerial portion of vegetation.

Categorical Exclusion (CE) – Routine, administrative, maintenance, and other actions, established by the Chief of the Forest Service, which normally do not individually or cumulatively have a significant effect on the quality of the human environment and, therefore, may be categorically excluded from documentation in an EIS or EA unless scoping indicates extraordinary circumstances.

Canopy closure — The amount of ground surface shaded by tree canopies as seen from above. Used to describe how open or dense a stand of trees is, often expressed in 10 percent increments.

Channel (stream) — The deepest part of a stream or riverbed through which the main current of water flows.

Closure – A road management term indicating the road cannot be used by motorized traffic. This limitation can be accomplished by regulation, barricade, or blockage devices. The road can be available for emergency use or permitted use such as firewood cutting during dry periods.

Competition — An interaction that occurs when two or more individuals make demands of the same resources that are in short supply.

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. The opposite of a fragmented condition.

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. The four levels of cover as defined for elk are: satisfactory cover; marginal cover; hiding cover; and thermal cover.

Cover type — A vegetation classification depicting a genus, species, group of species, or life form of tree, shrub, grass, or sedge. In effect the present vegetation of an area.

Crown — The part of a tree containing live foliage; treetops.

Cultural Resource — The physical remains of human activity (artifacts, ruins, burial mounds, petroglyphs, etc.) and conceptual content or context (as a setting for legendary, historic, or prehistoric events, as a sacred area of native peoples, etc.) of an area of prehistoric or historic occupation.

D

Decommissioning — Activities to permanently remove a road from the transportation system. The management objective of the activities is to restore the hydrologic function. These activities include, as needed: the removal of drainage structures such as culverts, re-contouring cut and fill slopes, subsoiling, and revegetating the old road beds.

Density (stand) — The number of trees growing in a given area, usually expressed in terms of trees per acre.

Desired Condition — (1) A portrayal of the land or resource conditions that are expected to result if goals and objectives are fully achieved. (2) A description of the landscape as it could reasonably be expected to appear at the end of the planning period if the plan goals, objectives, standards, and guidelines for that landscape are fully achieved.

Detrimental soil impacts — Soil erosion, displacement, compaction, puddling, or burning that exceeds certain thresholds. For instance, displacement is a detrimental soil impact only if more than 50% of the topsoil or humus-enriched A-horizon is removed from an area of 100 square feet or more, which is at least 5 feet in width. A Forest Plan standard limits the amount of detrimental soil impacts to 20% of an activity area.

Diameter at Breast Height (dbh) — The diameter of a tree measured 4-1/2 feet above the ground.

Disturbance — Refers to 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.

Downed wood — A tree or part of a tree that is dead and lying 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.

E

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.

Effects — Environmental changes resulting from a proposed action. Included are direct effects, which are caused by the action and occur at the same time and place, and indirect effects, which are caused by the action and are later in time or further removed in distance, but which are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on air and water and other natural systems, including ecosystems.

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.

Erosion — The wearing away of the land surface or stream channel by running water, wind, ice, gravity, or other geological activities; can be accelerated or intensified by human activities that reduce the ground cover of soils or that concentrate running water.

F

Fire-dependent systems — Forests, grasslands, and other ecosystems historically composed of species of plants that evolved with and are maintained by fire regimes.

Fire intensity — a term used to describe the rate at which a fire produces thermal energy in one square foot along a flaming front of fire; influenced by the amount of fuel available, local weather conditions, and the topography of the burn site.

Fire-intolerant — Species of plants that do not grow well with or that die from the effects of too much fire. Generally these are shade-tolerant species.

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 Severity – The degree to which a site has been altered or the successional processes disrupted by fire. Fire severity, loosely, is a product of fire intensity and residence time. Depending on the amount and condition of organic material in them, burned areas are described as belonging to one of three fire severity categories: light-severity, moderate-severity, or high-severity.

Fire-tolerant — Species of plants that can withstand certain frequency and intensity of fire. Generally these are shade-intolerant species.

Flame Length — The visible measurable indicator of fireline intensity. It is the length of a flame at the flaming front of a fire.

Floodplain — The portion of river valley or level lowland next to streams, which is covered with water when the river or stream overflows its banks at flood stage.

FOFEM — First Order Fire Effects Model. The model that helps determine mortality or survivability of plant and tree species based on effects of fire from scorch height to the crown or cambium kill under the bark. There is no model for residual burn time to ground root systems from burn out of large woody material, but the program does give an estimate for soil heating for time-temperature profile at specific depths.

Forage — Vegetation (both woody and non-woody) eaten by animals, especially grazing and browsing animals.

Forbs — Any herbaceous plant other than true grasses, sedges, and rushes.

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 (Forest Land and Resource Management Plan) — A document that guides natural resource management and establishes standards and guidelines for a national forest; required by the National Forest Management Act.

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) — Dry, dead parts of trees, shrubs, and other vegetation that can burn readily.

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.

Fuel Model — The combination of live and dead fuel loadings and arrangement that is used in conjunction with weather and topography inputs to model the fire behavior of a surface fire.

G

Graminoid — Grass like plants such as grasses and sedges.

Ground fire — A fire that burns the organic material in the soil layer and the decayed material or peat below the ground surface.

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 type — A group of plant communities having similar habitat relationships.

Hard Snag – A snag composed primarily of sound wood, particularly sound sapwood that is generally unmerchantable.

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.

Headwaters — Beginning of a watershed; un-branched tributaries of a stream.

Historic Range of Variability (HRV) — The natural fluctuation of ecological and physical processes and functions that would have occurred during a specified period of time. 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.

Hydrophobic Soil – Soil that does not readily absorb water. Hydrophobic soil is highly erodible. It is sometimes formed during severe fire on coarse textured soils. Hydrophobic soil usually returns to a non-hydrophobic condition after one or two winters.

I

Indicator species — A species that is presumed to be sensitive to habitat changes; population changes of indicator species are believed to best indicate the effects of land management activities.

Interdisciplinary Team (IDT) – A group of individuals with different training assembled to solve a problem or perform a task. The team is assembled out of recognition that no one scientific discipline is sufficiently broad to adequately solve the problem. Through interaction, participants bring different points of view to bear on the problem.

Intermittent stream — A stream that flows only at certain times of the year when it receives water from other streams or from surface sources such as melting snow.

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 — Logs on the forest floor with a large end diameter of at least 21 inches.

Large woody debris — Pieces of wood that are of a large enough size to affect stream channel morphology.

Late and Old Structural (LOS) Forest — (a) Single stratum with large tree (SSWL) forest refers to mature forest characterized by a single canopy layer consisting of large or old trees. Understory trees are often absent, or present in randomly spaced patches. It generally consists of widely spaced, shade-intolerant species, such as ponderosa pine and western larch, adapted to a low severity, high frequency fire regime. (b) Multi-stratum with large tree (MSWL) forest refers to mature forest characterized by two or more canopy layers with generally large or old trees in the upper canopy. Understory trees are also usually present, as a result of a lack of frequent disturbance to the understory. It can include both shade-tolerant and shade-intolerant species, and is generally adapted to a mixed fire regime of both high severity and low severity fires. Other characteristics of old forests include: variability in tree size; increasing numbers of snags and coarse woody debris; increasing appearance of decadence, such as broken tops, sparse crowns, and decay in roots and stems; canopy gaps and understory patchiness; and old trees relative to the site and species.

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.

M

Management Area – An area with similar management objectives and a common management prescription.

Management direction — A statement of goals and objectives, management prescriptions, and associated standards and guidelines for attaining them.

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.

N

National Environmental Policy Act (NEPA) – An act which encourages productive and enjoyable harmony between humans and their environment; promotes efforts to prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of humanity; enriches the understanding of the ecological systems and natural resources to the nation, and establishes a Council on Environmental Quality (CEQ).

Non-Wildland Urban Interface (non-WUI) – The area outside a line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.

O

Old Growth – For all National Forests in the Pacific Northwest Region, an old growth stand is defined as any stand of trees 10 acres or greater generally containing the following characteristics:

- a. Stands contain mature and over-mature trees in the overstory and are well into the mature growth stage (see Handbook of Terminology, Society of American Foresters)
- b. Stands will usually contain a multi-layered canopy and trees of several age classes.

- c. Standing dead trees and down material are present.
- d. Evidence of human activities may be present but may not significantly alter the other characteristics and would be a subordinate factor in a description of such a stand.

Ongoing actions — Those actions that have been implemented, or have contracts awarded or permits issued.

P

Prescribed fire — Intentional use of fire under specified conditions to achieve specific management objectives.

Prescription — A management pathway to achieve a desired objective(s).

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.

Proper Functioning Condition – Riparian wetland areas are functioning properly when adequate vegetation, landform, or large woody debris is present to dissipate stream energy associated with high water flows, thereby reducing erosion and improving water quality; filter sediment, capture bedload, and aid floodplain development; improve flood-water retention and ground-water recharge; develop root masses and stabilize stream banks against cutting action; develop diverse ponding and channel characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses, and support greater biodiversity.

Proposed action — A proposal by a federal agency to authorize, recommend, or implement an action.

R

Recreation Opportunity Spectrum (ROS) – The Forest Service developed the Recreation Opportunity Spectrum (ROS) system to help identify, quantify, and describe the variety of recreational settings available in National Forests. The ROS system provides a framework for planning and managing recreation resources. The ROS settings are classified on a scale ranging from primitive to urban. Seven elements are used to determine where the setting belongs on the scale:

- Visual Quality – the degree of apparent modification of the natural landscape.
- Access – the mode by which activities are pursued and how well users can travel to or within the setting.
- Remoteness – the extent to which individuals perceive themselves removed from the sight and sounds of human activity.
- Visitor Management - the degree and appropriateness of how visitor actions are managed and serviced.
- On-Site Recreation Development - the degree and appropriateness of recreation facilities provided within the setting.
- Social Encounters - the degree of solitude or social opportunities provided.
- Visitor Impacts - the degree of impact on both the attributes of the setting and other visitors within the setting.
- Based on the seven elements, the Forest Service assigns one of six ROS settings zones to all Forest Service land; four of these apply to the project area.
- Roaded Modified: 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: 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: 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: 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.

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.

Regeneration — The process of establishing new plant seedlings, whether by natural means or artificial measures (planting).

Rehabilitate — To repair and protect certain aspects of a system so that essential structures and functions are recovered, even though the overall system may not be exactly as it was before.

Resilient, resilience, resiliency — (1) 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. (2) In human communities, refers to the ability of a community to respond to externally induced changes such as larger economic or social forces.

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).

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. Riparian Habitat Conservation Areas

include traditional riparian corridors, wetlands, intermittent streams, and other areas that help maintain the integrity of aquatic ecosystems by (1) influencing the delivery of coarse sediment, organic matter, and woody debris to streams, (2) providing root strength for channel stability, (3) shading for stream, and (4) protecting water quality.

Road Density – The measure of the degree to which the length of road miles occupies a given land area.

S

Sawtimber – Trees suitable in size and quantity for producing logs that can be processed into lumber.

Scenery Management System – Management guidelines based on the premise that land management activities (including construction of facilities) should not contrast with the existing natural appearing landscape. Within a framework of regional landscape, character types, form, line, color, and texture should be used to make activities and structures “fit” within landscapes.

Scenic Integrity Objectives (SIOs) – The degree of direct human-caused deviations in the landscape, such as road construction, timber harvesting, or activity debris. Indirect deviations, such as landscape created by human suppression of the natural role of fire, are not included. The level to which an area meets its SIOs is indicated by the ratings Very High, High, Moderate, Low, Very Low, or Unacceptably Low.

Scoping — The early stages of preparation of an environmental impact statement/environmental assessment, 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.

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.

Sensitive Species – Those species which (1) have appeared in the Federal Register as proposals for classification and are under consideration for official listing as Endangered or Threatened; (2) are on an official State list; or (3) are recognized by the Regional Forester to need special management in order to prevent the need for their placement on Federal or State lists.

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 are present soon after a disturbance or at the beginning of a new successional process (such as seedling or sapling growth stages in a forest); mid seral in a forest would refer to pole or medium sawtimber growth stages; late or old seral refers to plants present during a later stage of plant community succession (such as mature and old forest stages).

Seral stage — The developmental phase of a forest stand or rangeland with characteristic structure and plant species composition.

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.

Shallow soils – : "scab" soils - highly and very highly erodible, unforested, shallow, rocky soils supporting low amounts of ground cover

Silviculture — The practice of manipulating the establishment, composition, structure, growth, and rate of succession of forests to accomplish specific objectives.

Site — A specific location of an activity or project, such as a campground, a lake, or a stand of trees to be harvested.

Snag — A standing dead tree, usually larger than five feet tall and six inches in diameter at breast height. Snags are important as habitat for a variety of wildlife species and their prey.

Soil — The earth material that has been so modified and acted upon by physical, chemical, and biological agents that it will support rooted plants.

Soil disturbance — Displacement or compaction (or other disturbance) of soil, that may or may not be severe enough to count as detrimental soil impact.

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 Structure — The size and arrangement, both vertically and horizontally, of vegetation. Forested vegetation is classified into 7 different structural stages:

- Stand Initiation (SI) - When land is occupied by trees following a stand-replacing disturbance.
- Stem Exclusion Open Canopy (SEOC) – Forested areas where the occurrence of new trees is predominantly limited by moisture.
- Stem Exclusion Closed Canopy (SECC) – Forested areas where the occurrence of new trees is predominately limited by light.

- Understory Reinitiation (UR) – When a second generation of trees is established under an older, typically seral, overstory.
- Young Forest Multi-Strata (YFMS) – Stand development resulting from frequent harvest or lethal disturbance to the overstory.
- Old Forest Multi-Strata (OFMS) – Forested areas lacking frequent disturbance to understory vegetation.
- Old Forest Single-Stratum (OFSS) – Forested areas resulting from frequent non-lethal prescribed or natural underburning, or other management.

The abundance and distribution of these forest structures provides the basis for evaluation of the historic range of variability (HRV) of structural conditions providing insight to the interaction of disturbance processes and associated structural and compositional conditions of forested landscapes.

Structure — The size and arrangement, both vertically and horizontally, of vegetation.

Structural stage — A stage of development of a vegetation community that is classified on the dominant processes of growth, development, competition, and mortality. See Stand Structure.

Subwatershed — A drainage area, equivalent to a 6th-field Hydrologic Unit Code (HUC). Hierarchically, subwatersheds (6th-field HUC) are contained within watershed (5th-field HUC), which in turn contained within a subbasin (4th-field HUC). The size of subwatersheds has recently been redefined as 10,000 to 40,000 acres; formerly size of watersheds was 5,000 to 20,000 acres. The former size was used in this document. Subwatersheds are shown graphically in Figure 3, Map Section.

Surface Fire – Fire that burns surface litter, other loose debris of the forest floor, and small vegetation.

T

Terrestrial — Pertaining to the land.

Terrestrial communities — Groups of cover types with similar moisture and temperature regimes, elevational gradients, structures, and use by vertebrate wildlife species.

Thermal cover — Cover used by animals for protection 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 — Species listed under the Endangered Species Act that are likely to become endangered within the foreseeable future through-out all or a significant portion of their range.

U

Underburn — To burn by a surface fire that can consume ground vegetation and ladder fuels.

Understory — Plants that grow beneath the canopy of other plants. Usually refers to grasses, forbs, and low shrubs under a tree or shrub canopy.

Uneven-aged stand — Stand of trees in which there are considerable differences in the ages of individual trees.

Upland — The portion of the landscape above the valley floor or stream.

V

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 Quality Objectives (VQOs) — A desired level of management based on physical and sociological characteristics of an area. Refers to the degree of acceptable alteration of the characteristic landscape.

- Preservation—Allows only ecological changes. Management activities, except for very low visual impact recreation facilities, are prohibited. This objective applies to specially classified areas, including wilderness.
- Retention—Provides for management activities that are not visually evident. Management activities are permitted, but the results of those activities on the natural landscape must not be evident to the average viewer.
- Partial Retention—Management activities may be evident to the viewer but must remain visually subordinate to the surrounding landscape.
- Modification—Management activities may visually dominate the natural surrounding landscape but must borrow from naturally established form, line, color, and texture.
- Maximum Modification—Land management activities can dominate the natural landscape to greater extent than in the modification objective, except as viewed from background when visual characteristics must be those of natural occurrences within the surrounding area.

W

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).

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, (2) hydric soils, and (3) wetland hydrology. The three technical characteristics specified are mandatory and must all be met for an area to be identified as a wetland. 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. 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. Wetland hydrology is defined as permanent or periodic inundation, or soil saturation to the surface, at least seasonally.

Whole Tree Yarding – No cutting of limbs and tops before yarding of the tree out of the unit during salvage operations. This does not mean that there will not be limbs and tops left out in the unit due to breakage since the trees are dead.

Wildfire — A human or naturally caused fire that does not meet land management objectives.

Wildland Urban Interface (WUI) – The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.

Y

Yarding -- the hauling of felled timber to the landing or temporary storage site from where trucks (usually) transport it to the mill site. Yarding methods include cable yarding, ground skidding, and aerial methods such as helicopter yarding.

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APPENDIX A – ALTERNATIVE SUMMARY

<p style="text-align: center;">ALT 2 HARVEST ACTIVITIES AND CONNECTED ACTIONS</p>							
UNIT #	ACRES	TREATMENT		YTA	FHB	GRAPPLE	PCT
		PRESCRIPTION	Planting			PILE	
12	36	HTH				36	36
14	11	HTH				11	
22	6	HTH			6		6
24	9	HTH			9		9
32	50	HTH				50	50
38	31	HTH				31	31
39	7	HTH				7	7
40	99	HSH	99			99	99
41	20	HSH	20	20		20	20
49	13	HTH			13		13
52	13	HTH		13			
53	15	HTH		15			
54	15	HTH		15			
56	35	HTH		35		35	35
58	66	HTH		66			
60	58	HTH		58			
62	22	HTH		23			
64	44	HTH		44			
66	33	HTH		33			
68	50	HTH				50	
69	7	HTH					
70	33	HTH					
72	139	HTH					
74	88	HTH					
76	30	HTH		30			
77	10	HTH		10			
78	72	HTH				72	72
79	21	HTH				21	21
80	20	HTH				20	20
82	51	HTH		51			
83	62	HTH		62			
84	12	HTH					
88	3	HTH		3			

<p style="text-align: center;">ALT 2 HARVEST ACTIVITIES AND CONNECTED ACTIONS</p>							
UNIT #	ACRES	TREATMENT		YTA	FHB	GRAPPLE	PCT
		PRESCRIPTION	Planting			PILE	
90	22	HTH					
91	39	HTH			39		39
94	33	HTH					
95	11	HTH					
96	4	HTH					
100	18	HTH		18			
102	22	HTH					
103	7	HTH					
105	14	HTH					
106	27	HTH					
108	23	HTH			23		23
110	3	HTH				3	3
112	13	HTH				13	13
116	41	HTH			3		
118	12	HTH			3		
120	12	HTH			12		
122	63	HTH			5		
124	10	HTH				10	10
126	75	HTH				75	75
128	34	HTH				34	34
130	61	HTH			5		
131	13	HTH			13		13
132	51	HTH				51	51
133	50	HTH				50	50
134	42	HTH					
135	11	HTH		11	11		11
136	46	HTH					
138	71	HTH				71	71
142	33	HTH				33	33
144	33	HTH					
146	58	HTH				58	58
148	13	HTH			13		13
149	19	HTH			19		19
150	27	HTH				27	
TOTAL	2192		119	507	174	877	935

HSH= Shelterwood Harvest
HTH= Commercial Thinning
PCT= Precommercial Thinning
FHB= Hand piling
YTA= Yard tops attached

ALT 3						
HARVEST ACTIVITIES AND CONNECTED ACTIONS						
UNIT #	ACRES	TREATMENT	YTA	FHB	GRAPPLE	PCT
		PRESCRIPTION			PILE	
12	36	HTH			36	36
14	11	HTH			11	
22	6	HTH		6		6
24	9	HTH		9		9
32	50	HTH			50	50
49	13	HTH		13		13
52	13	HTH	13			
53	15	HTH	15			
54	15	HTH	15			
60	58	HTH	58			
62	22	HTH	23			
66	33	HTH	33			
68	50	HTH			50	
69	7	HTH				
70	33	HTH				
72	139	HTH				
74	83	HTH				
76	30	HTH	30			
78	52	HTH			52	52
79	21	HTH			21	21
80	20	HTH			20	20
82	24	HTH	24			
83	62	HTH	62			
84	12	HTH				
88	3	HTH	3			
90	22	HTH				
91	39	HTH		39		39
94	25	HTH				
95	7	HTH				
96	4	HTH				
103	7	HTH				
105	14	HTH				
106	27	HTH				
108	23	HTH		23		23
110	3	HTH			3	3
112	13	HTH			13	13
116	41	HTH		3		
118	12	HTH		3		
120	12	HTH		12		

ALT 3						
HARVEST ACTIVITIES AND CONNECTED ACTIONS						
UNIT #	ACRES	TREATMENT	YTA	FHB	GRAPPLE	PCT
		PRESCRIPTION			PILE	
124	10	HTH			10	10
126	75	HTH			75	75
128	34	HTH			34	34
132	51	HTH			51	51
133	50	HTH			50	50
138	71	HTH			71	71
144	33	HTH				
146	58	HTH			58	58
148	13	HTH		13		13
149	19	HTH		19		19
150	26	HTH			26	
TOTAL	1506		276	140	631	666

HTH= Commercial Thinning

PCT= Precommercial Thinning

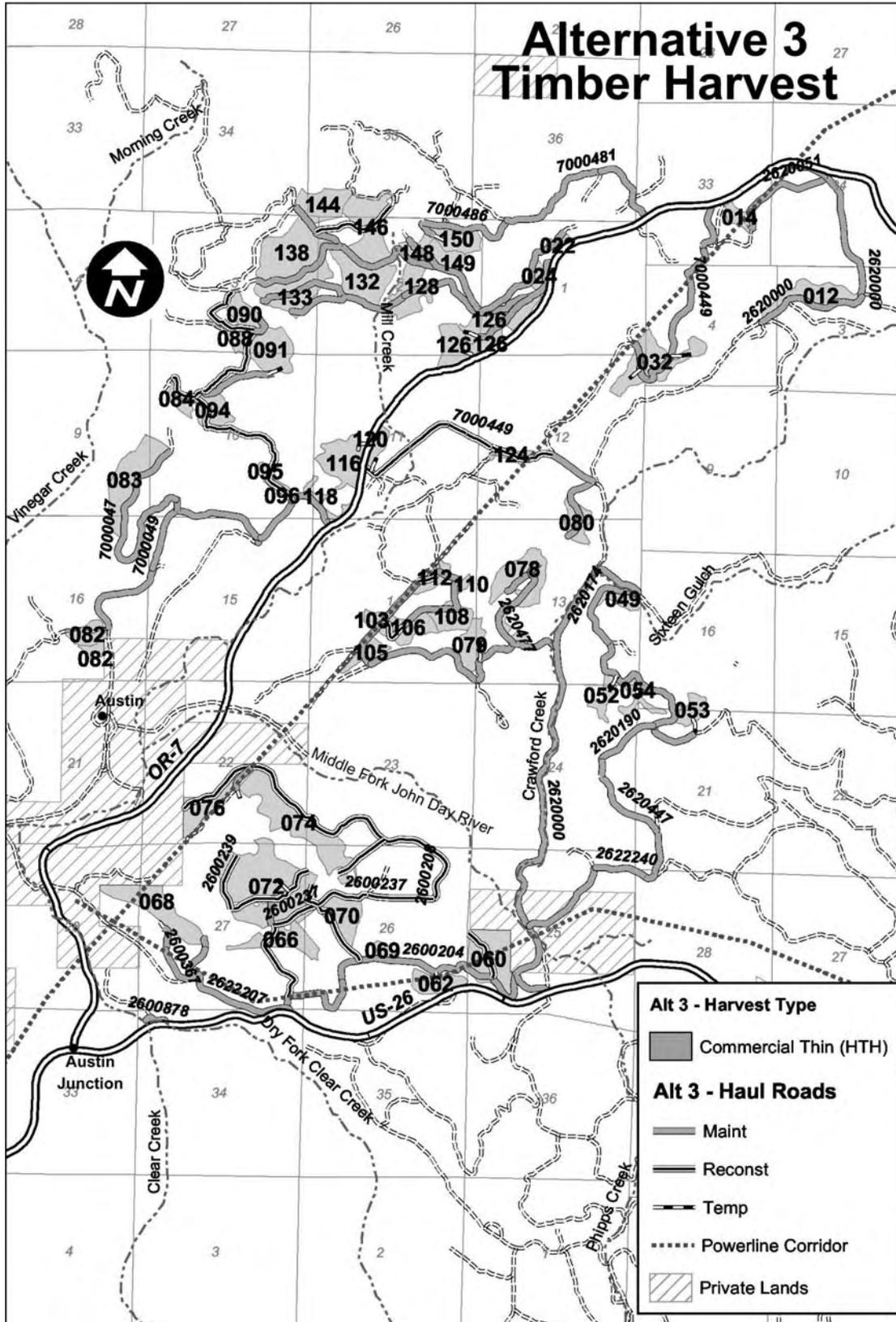
FHB= Hand piling

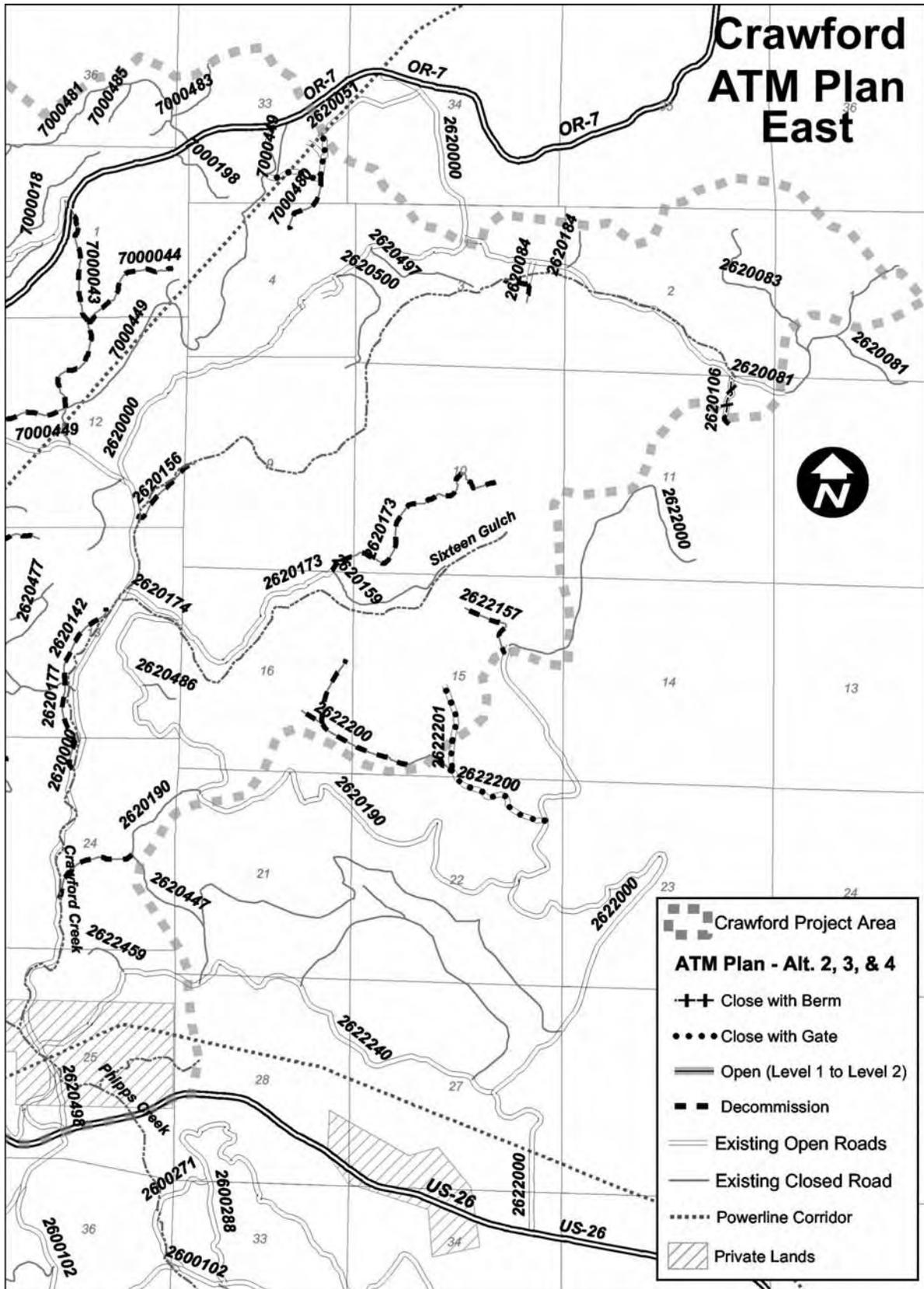
YTA= Yard tops attached

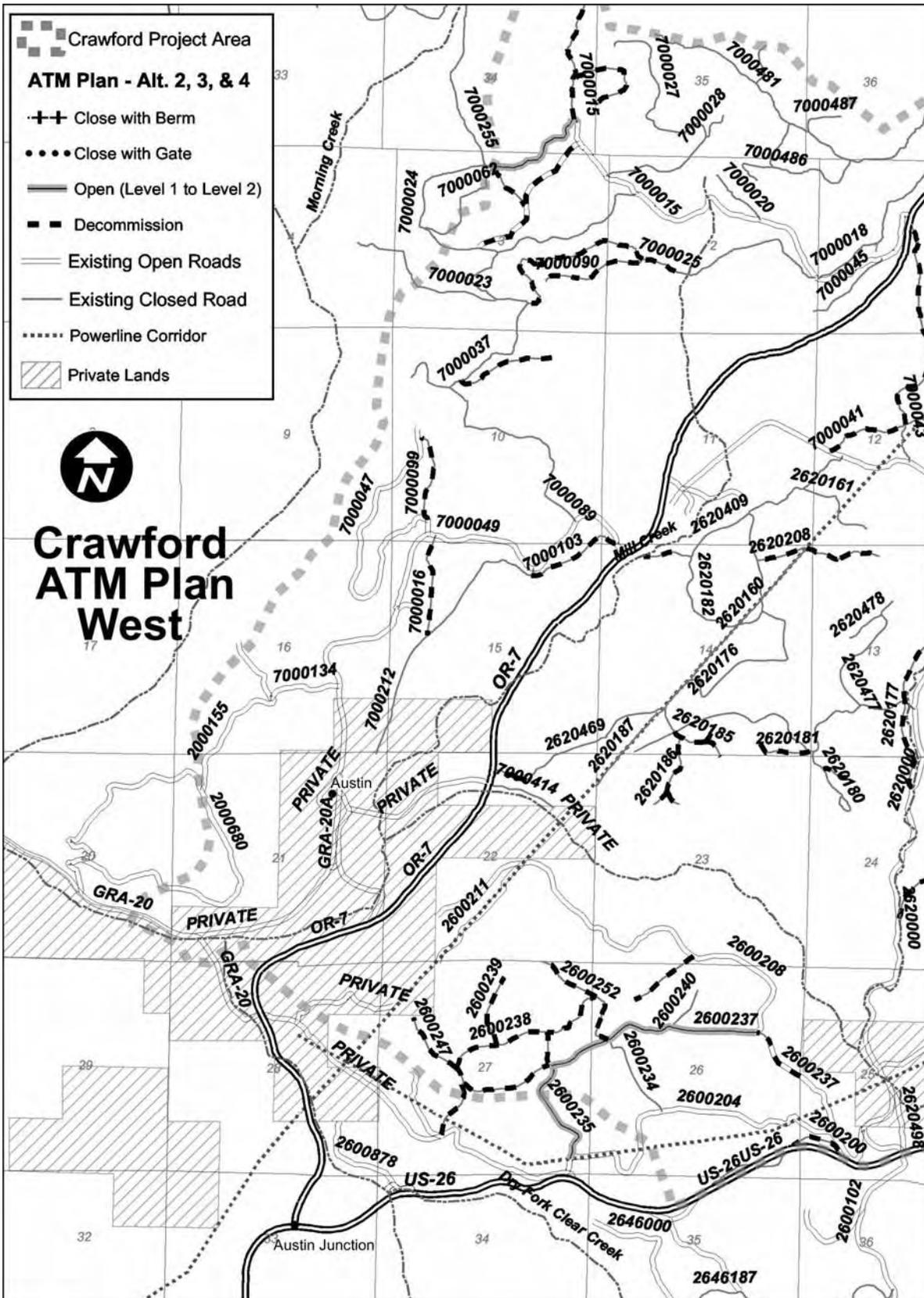
ALT 4					
Precommercial Thinning AND CONNECTED ACTIONS					
UNIT #	ACRES	TREATMENT PRESCRIPTION	FHB	GRAPPLE PILE	PCT
12	36	SPCT		36	36
22	6	SPCT	6		6
24	9	SPCT	9		9
32	50	SPCT		50	50
38	31	SPCT		31	31
39	7	SPCT		7	7
49	13	SPCT	13		13
56	35	SPCT		35	35
78	51	SPCT		51	51
79	21	SPCT		21	21
80	20	SPCT		20	20
91	39	SPCT	39		39
108	23	SPCT	23		23
110	3	SPCT		3	3
112	13	SPCT		13	13
124	10	SPCT		10	10
126	75	SPCT		75	75
128	34	SPCT		34	34
131	13	SPCT	13		13
132	51	SPCT		51	51
133	50	SPCT		50	50
135	11	SPCT	11		11
138	71	SPCT		71	71
142	33	SPCT		33	33
146	58	SPCT		58	58
148	13	SPCT	13		13
149	19	SPCT	19		19
TOTAL	795		146	649	795

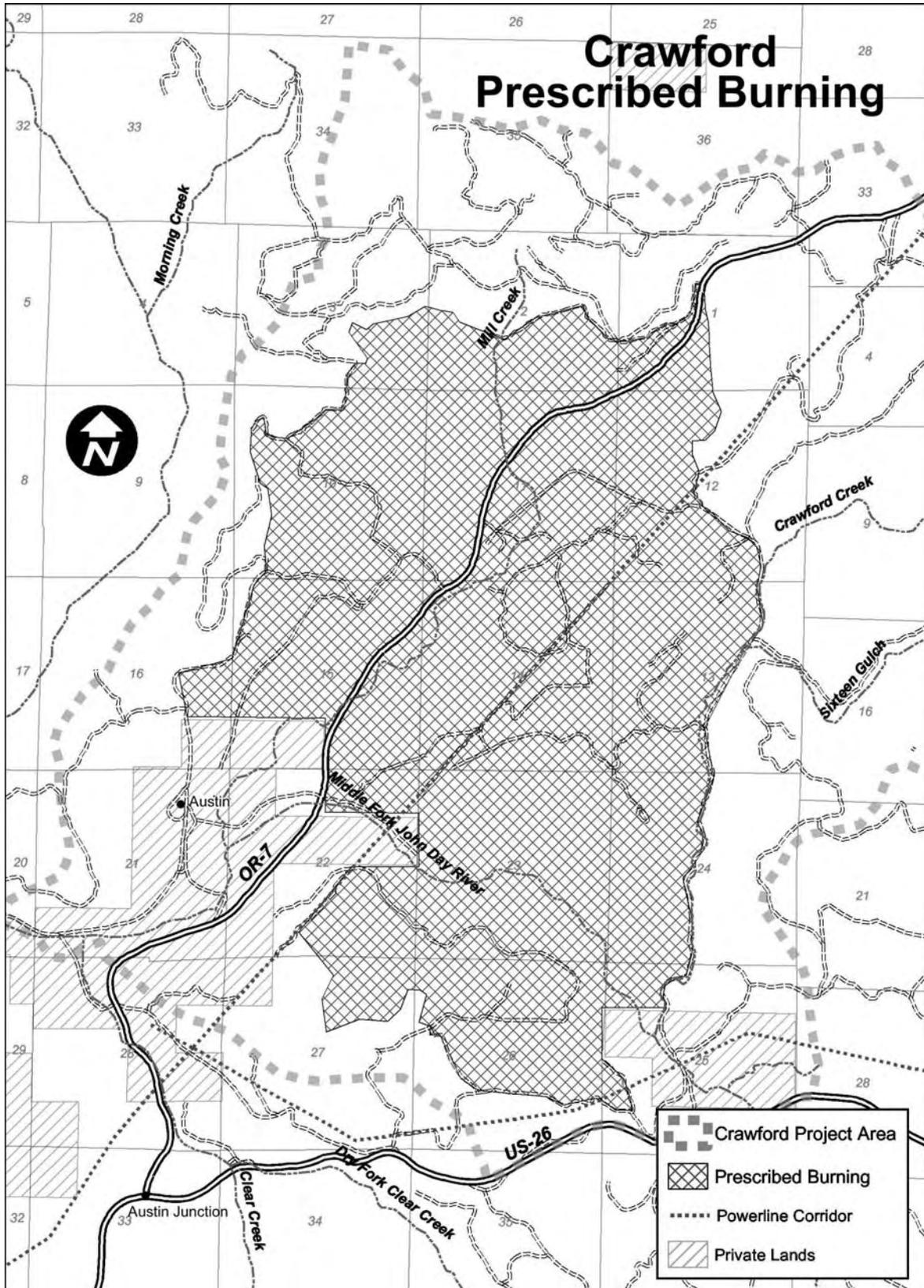
SPCT= Precommercial Thinning

FHB= Hand piling









Need updated map; identifies areas that are to be protected

APPENDIX C – ROAD SUMMARY

Log Haul by Alternative - Road Listing

ID	OPERATOR _MAINT	SURFACE TYPE	SUBWATERSHED	MILES	ALT 2	ALT 3
2600204	2	IMP	MILL CREEK	0.3	Maint	Maint
2600204	2	IMP	MILL CREEK	0.2	Maint	Maint
2600204	2	IMP	MILL CREEK	0.8	Maint	Maint
2600204	2	IMP	DRY FORK	0.1	Maint	Maint
2600204	2	IMP	DRY FORK	0.5	Maint	Maint
2600207	2	NAT	DRY FORK	0.8	Maint	Maint
2600208	2	NAT	MILL CREEK	0.5	Reconst	Reconst
2600208	2	NAT	MILL CREEK	1.8	Reconst	Reconst
2600211	2	NAT	MILL CREEK	0.2	Maint	Maint
2600234	1	NAT	MILL CREEK	0.5	Reconst	Reconst
2600235	1	NAT	MILL CREEK	0.2	Reconst	Reconst
2600235	1	NAT	DRY FORK	0.3	Reconst	Reconst
2600235	1	NAT	DRY FORK	0.1	Reconst	Reconst
2600237	1	NAT	MILL CREEK	0.1	Maint	Maint
2600237	1	NAT	MILL CREEK	0.3	Reconst	Reconst
2600237	1	NAT	MILL CREEK	0.4	Reconst	Reconst
2600237	1	NAT	MILL CREEK	0.3	Reconst	Reconst
2600237	1	NAT	DRY FORK	0.2	Maint	Maint
2600237	2	NAT	MILL CREEK	0.3	Reconst	Reconst
2600238	1	NAT	MILL CREEK	0.3	Reconst	Reconst
2600238	1	NAT	MILL CREEK	0.3	Reconst	Reconst
2600239	1	NAT	MILL CREEK	0.4	Reconst	Reconst
2600251	1	NAT	MILL CREEK	0.2	Maint	Maint
2600252	1	NAT	MILL CREEK	0.2	Reconst	Reconst
2600262	1	NAT	MILL CREEK	0.4	Reconst	Reconst
2600367	2	NAT	MILL CREEK	0.3	Maint	Maint
2600445	2	NAT	DRY FORK	0.1	Maint	Maint
2620000	2	IMP	UPPER NORTH FORK BURNT RIVER	0.8	Maint	Maint
2620000	2	IMP	UPPER NORTH FORK BURNT RIVER	0.2	Maint	Maint
2620000	3	IMP	MILL CREEK	0.2	Maint	Maint
2620000	3	IMP	MILL CREEK	0.3	Maint	Maint
2620000	3	IMP	MILL CREEK	0.1	Maint	Maint
2620000	3	IMP	MILL CREEK	0.1	Maint	Maint
2620000	3	IMP	MILL CREEK	0.7	Maint	Maint
2620000	3	IMP	MILL CREEK	0.4	Maint	Maint
2620000	3	IMP	MILL CREEK	0.1	Maint	Maint
2620000	3	IMP	MILL CREEK	0.2	Maint	Maint

ID	OPERATOR _MAINT	SURFACE TYPE	SUBWATERSHED	MILES	ALT 2	ALT 3
2620000	3	IMP	MILL CREEK	0.4	Maint	Maint
2620000	3	IMP	MILL CREEK	0.5	Maint	Maint
2620000	3	IMP	MILL CREEK	0.2	Maint	Maint
2620000	3	IMP	MILL CREEK	0.5	Maint	Maint
2620051	2	NAT	UPPER NORTH FORK BURNT RIVER	0.5	Maint	Maint
2620055	1	NAT	MILL CREEK	0.2	Maint	Maint
2620055	1	NAT	MILL CREEK	0.3	Maint	Maint
2620173	2	NAT	MILL CREEK	0.8	Maint	
2620174	2	NAT	MILL CREEK	0.7	Maint	Maint
2620174	2	NAT	MILL CREEK	0.3	Maint	Maint
2620174	2	NAT	MILL CREEK	0.1	Maint	Maint
2620174	2	NAT	MILL CREEK	0.3	Maint	Maint
2620174	2	NAT	MILL CREEK	0.2	Maint	Maint
2620174	2	NAT	MILL CREEK	0.3	Maint	Maint
2620176	1	NAT	MILL CREEK	0.1	Maint	Maint
2620176	1	NAT	MILL CREEK	0.1	Maint	Maint
2620176	1	NAT	MILL CREEK	0.4	Maint	Maint
2620176	1	NAT	MILL CREEK	0.4	Maint	Maint
2620176	1	NAT	MILL CREEK	0.1	Maint	Maint
2620176	1	NAT	MILL CREEK	0.2	Maint	Maint
2620176	1	NAT	MILL CREEK	0.1	Maint	Maint
2620176	1	NAT	MILL CREEK	0.2	Maint	Maint
2620176	1	NAT	MILL CREEK	0.2	Maint	Maint
2620176	1	NAT	MILL CREEK	0.1	Maint	Maint
2620176	1	NAT	MILL CREEK	0.5	Maint	Maint
2620176	1	NAT	MILL CREEK	0.2	Reconst	Reconst
2620180	1	NAT	MILL CREEK	0.1	Maint	
2620180	1	NAT	MILL CREEK	0.2	Maint	
2620180	1	NAT	MILL CREEK	0.1	Maint	
2620182	1	NAT	MILL CREEK	0.1	Reconst	Reconst
2620190	2	NAT	MILL CREEK	0.1	Maint	Maint
2620190	2	NAT	IDAHO CREEK/SUMMIT CREEK	0.2	Maint	Maint
2620190	1	NAT	MILL CREEK	0.4	Maint	Maint
2620190	1	NAT	MILL CREEK	0.1	Maint	Maint
2620209	1	NAT	MILL CREEK	0.3	Maint	Maint
2620249	2	NAT	MILL CREEK	0.3	Maint	Maint
2620447	1	NAT	MILL CREEK	0.1	Maint	Maint
2620447	1	NAT	IDAHO CREEK/SUMMIT CREEK	0.5	Maint	Maint
2620469	1	NAT	MILL CREEK	0.5	Maint	
2620477	1	NAT	MILL CREEK	0.6	Maint	Maint
2620477	1	NAT	MILL CREEK	0.1	Maint	Maint
2620478	1	NAT	MILL CREEK	0.2	Maint	Maint
2620500	1	NAT	MILL CREEK	0.1	Maint	

ID	OPERATOR _MAINT	SURFACE TYPE	SUBWATERSHED	MILES	ALT 2	ALT 3
2620500	1	NAT	MILL CREEK	0.5	Maint	
2622210	1	NAT	IDAHO CREEK/SUMMIT CREEK	0.3	Maint	Maint
2622240	2	IMP	MILL CREEK	0.6	Maint	Maint
2622240	2	IMP	MILL CREEK	0.3	Maint	Maint
2622240	2	IMP	IDAHO CREEK/SUMMIT CREEK	0.1	Maint	Maint
7000015	2	IMP	MILL CREEK	0.3	Maint	Maint
7000015	2	IMP	MILL CREEK	0.4	Maint	Maint
7000015	2	IMP	MILL CREEK	0.3	Maint	Maint
7000015	2	IMP	MILL CREEK	0.7	Maint	Maint
7000015	2	IMP	MILL CREEK	0.2	Maint	Maint
7000015	2	IMP	MILL CREEK	0.2	Maint	Maint
7000018	1	NAT	MILL CREEK	0.8	Maint	Maint
7000020	1	NAT	MILL CREEK	0.2	Maint	Maint
7000025	1	NAT	MILL CREEK	0.1	Maint	Maint
7000025	1	NAT	MILL CREEK	0.1	Maint	Maint
7000025	1	NAT	MILL CREEK	0.2	Maint	Maint
7000025	1	NAT	MILL CREEK	0.4	Maint	Maint
7000025	1	NAT	MILL CREEK	0.2	Maint	Maint
7000025	1	NAT	MILL CREEK	0.2	Maint	Maint
7000025	1	NAT	MILL CREEK	0.1	Maint	Maint
7000025	1	NAT	MILL CREEK	0.2	Maint	Maint
7000025	1	NAT	MILL CREEK	0.3	Maint	Maint
7000027	1	NAT	MILL CREEK	0.5	Reconst	Reconst
7000037	1	NAT	MILL CREEK	0.1	Reconst	Reconst
7000037	1	NAT	MILL CREEK	0.6	Reconst	Reconst
7000037	1	NAT	MILL CREEK	0.1	Reconst	Reconst
7000037	1	NAT	MILL CREEK	0.3	Reconst	Reconst
7000037	1	NAT	MILL CREEK	0.1	Reconst	Reconst
7000037	1	NAT	MILL CREEK	0.6	Maint	Maint
7000040	1	NAT	MILL CREEK	0.5	Maint	Maint
7000045	1	NAT	MILL CREEK	0.4	Maint	Maint
7000047	2	NAT	MILL CREEK	1.4	Maint	Maint
7000049	2	NAT	MILL CREEK	0.6	Maint	Maint
7000049	2	NAT	MILL CREEK	0.1	Maint	Maint
7000049	2	NAT	MILL CREEK	0.5	Maint	Maint
7000049	2	NAT	MILL CREEK	0.4	Maint	Maint
7000049	2	NAT	MILL CREEK	0.3	Maint	Maint
7000049	2	NAT	MILL CREEK	0.3	Maint	Maint
7000089	1	NAT	MILL CREEK	0.6	Reconst	Reconst
7000089	1	NAT	MILL CREEK	0.5	Reconst	Reconst
7000089	1	NAT	MILL CREEK	0.2	Reconst	Reconst
7000090	1	NAT	MILL CREEK	0.4	Maint	Maint
7000099	2	NAT	MILL CREEK	0.1	Maint	Maint
7000449	2	NAT	MILL CREEK	0.1	Reconst	Reconst

ID	OPERATOR _MAINT	SURFACE TYPE	SUBWATERSHED	MILES	ALT 2	ALT 3
7000449	2	NAT	MILL CREEK	0.3	Reconst	Reconst
7000449	2	NAT	MILL CREEK	0.1	Reconst	Reconst
7000449	2	NAT	MILL CREEK	0.2	Reconst	Reconst
7000449	2	NAT	MILL CREEK	0.4	Reconst	Reconst
7000449	2	NAT	MILL CREEK	0.1	Reconst	Reconst
7000449	2	NAT	MILL CREEK	0.1	Reconst	Reconst
7000449	1	NAT	MILL CREEK	0.3	Maint	Maint
7000449	1	NAT	MILL CREEK	0.2	Maint	Maint
7000449	1	NAT	MILL CREEK	0.8	Maint	Maint
7000449	1	NAT	MILL CREEK	0.1	Maint	Maint
7000449	2	NAT	MILL CREEK	0.1	Maint	Maint
7000479	2	NAT	MILL CREEK	0.1	Maint	Maint
7000481	1	NAT	MILL CREEK	0.1	Maint	Maint
7000481	1	NAT	MILL CREEK	0.2	Maint	
7000481	1	NAT	MILL CREEK	0.1	Maint	
7000481	1	NAT	MILL CREEK	0.7	Maint	Maint
7000481	1	NAT	MILL CREEK	0.3	Maint	Maint
7000481	1	NAT	MILL CREEK	0.3	Maint	
7000481	1	NAT	MILL CREEK	0.2	Maint	
7000481	1	NAT	MILL CREEK	0.1	Maint	
7000481	1	NAT	MILL CREEK	0.1	Maint	
7000486	1	NAT	MILL CREEK	0.1	Maint	Maint
7000486	1	NAT	MILL CREEK	0.1	Maint	Maint
7000486	1	NAT	MILL CREEK	0.5	Maint	Maint

Road Decommissioning and Road Closures – Road Listing

ID	OPERATOR MAINT	SURFACE TYPE	SUBWATERSHED	MILES	ACCESS ACTIVITY
2600200	1	NAT	MILL CREEK	0.3	decom
2600235	1	NAT	MILL CREEK	0.2	reopen
2600235	1	NAT	DRY FORK	0.3	reopen
2600235	1	NAT	DRY FORK	0.1	reopen
2600237	1	NAT	MILL CREEK	0.1	decom
2600237	1	NAT	MILL CREEK	0.5	decom
2600237	1	NAT	MILL CREEK	0.3	reopen
2600237	1	NAT	MILL CREEK	0.1	decom
2600237	1	NAT	MILL CREEK	0.4	reopen
2600237	1	NAT	MILL CREEK	0.3	reopen
2600237	1	NAT	DRY FORK	0.2	decom
2600237	2	NAT	MILL CREEK	0.2	decom
2600238	1	NAT	MILL CREEK	0.2	decom
2600238	1	NAT	MILL CREEK	0.3	decom
2600238	1	NAT	MILL CREEK	0.3	decom
2600239	1	NAT	MILL CREEK	0.4	decom
2600247	1	NAT	MILL CREEK	0.1	decom
2600247	1	NAT	MILL CREEK	0.3	decom

ID	OPERATOR MAINT	SURFACE TYPE	SUBWATERSHED	MILES	ACCESS ACTIVITY
2600251	1	NAT	MILL CREEK	0.2	decom
2600252	1	NAT	MILL CREEK	0.3	decom
2600252	1	NAT	MILL CREEK	0.1	decom
2600252	1	NAT	MILL CREEK	0.2	decom
2600262	1		MILL CREEK	0.4	decom
2620084	1	NAT	MILL CREEK	0.1	decom
2620106	2	NAT	MILL CREEK	0.2	close_berm
2620106	2	NAT	IDAHO CREEK/SUMMIT CREEK	0.1	decom
2620120	1	NAT	MILL CREEK	0.1	decom
2620142	1	NAT	MILL CREEK	0.4	decom
2620156	1	NAT	MILL CREEK	0.4	decom
2620173	2	NAT	MILL CREEK	0.1	decom
2620173	1	NAT	MILL CREEK	1.1	decom
2620177	1	NAT	MILL CREEK	0.4	decom
2620181	1	NAT	MILL CREEK	0.3	decom
2620185	1	NAT	MILL CREEK	0.1	decom
2620185	1	NAT	MILL CREEK	0.1	decom
2620186	1	NAT	MILL CREEK	0.1	decom
2620186	1	NAT	MILL CREEK	0.3	decom
2620188	1	NAT	MILL CREEK	0.1	decom
2620190	1	NAT	MILL CREEK	0.5	decom
2620208	1	NAT	MILL CREEK	0.2	decom
2620208	1	NAT	MILL CREEK	0.2	decom
2620208	1	NAT	MILL CREEK	0.2	decom
2620212	1	NAT	MILL CREEK	0.1	decom
2620350	1	NAT	MILL CREEK	0.1	decom
2620409	1	NAT	MILL CREEK	0.1	decom
2620469	1	NAT	MILL CREEK	0.1	decom
2620469	1	NAT	MILL CREEK	0.1	decom
2622157	1	NAT	MILL CREEK	0.4	decom
2622200	1	NAT	MILL CREEK	0.1	decom
2622200	2	NAT	IDAHO CREEK/SUMMIT CREEK	0.6	close_gate
2622200	1	NAT	IDAHO CREEK/SUMMIT CREEK	0.1	close_gate
2622200	1	NAT	MILL CREEK	0.5	decom
2622201	2	NAT	MILL CREEK	0.3	close_gate
2622201	2	NAT	IDAHO CREEK/SUMMIT CREEK	0.1	close_gate
2622203	1	NAT	MILL CREEK	0.3	decom
7000015	1	NAT	MILL CREEK	0.2	decom
7000015	1	NAT	MILL CREEK	0.4	decom
7000015	1	NAT	MILL CREEK	0.1	decom
7000016	1	NAT	MILL CREEK	0.5	decom

ID	OPERATOR MAINT	SURFACE TYPE	SUBWATERSHED	MILES	ACCESS ACTIVITY
7000025	1	NAT	MILL CREEK	0.1	decom
7000025	1	NAT	MILL CREEK	0.2	decom
7000025	1	NAT	MILL CREEK	0.1	decom
7000025	1	NAT	MILL CREEK	0.2	decom
7000025	1	NAT	MILL CREEK	0.2	decom
7000025	1	NAT	MILL CREEK	0.3	decom
7000029	1	NAT	MILL CREEK	0.5	decom
7000040	1	NAT	MILL CREEK	0.5	decom
7000041	1	NAT	MILL CREEK	0.4	decom
7000043	1	NAT	MILL CREEK	0.5	decom
7000043	1	NAT	MILL CREEK	0.5	decom
7000043	1	NAT	MILL CREEK	0.1	decom
7000044	1	NAT	MILL CREEK	0.6	decom
7000064	1	NAT	MILL CREEK	0.2	decom
7000090	1	NAT	MILL CREEK	0.1	decom
7000090	1	NAT	MILL CREEK	0.4	decom
7000099	1	NAT	MILL CREEK	0.4	decom
7000103	1	NAT	MILL CREEK	0.5	decom
7000255	1	IMP	MILL CREEK	0.5	reopen
7000479	2	NAT	MILL CREEK	0.2	close_gate
7000479	2	NAT	MILL CREEK	0.1	close_gate
7000479	2	NAT	MILL CREEK	0.1	close_gate
7000480	1	NAT	MILL CREEK	0.3	decom
Unnumbered Open Road		NAT	MILL CREEK	0.8	decom

APPENDIX D – CUMULATIVE ACTIVITIES CONSIDERED

Introduction

The following listed activities will be reviewed for cumulative effects within each of the resource sections. These activities are located within the Mill Creek subwatershed unless otherwise noted. The year listed on the table is the year the activity was implemented or proposed for implementation.

Past Activities

Past Timber Sales (Crawford Project Area)

Year	Sale Name	Harvest Acres	Harvest Type	Crawford Unit	Description
			Tractor/Skyline (Acres)		Soils **Harvest Prescription (Acres)
1910 - 1940	Railroad Logging * Area ID	Area			
1978	Meadow LP	202	T/8	12	133 HSH 69 HCC
1978	16 Gulch	334	T/2	39	154 HSH 180 HPR
1980	Gulch Fiber	77	0	0	43 HSH 34 HCC
1980-1983	Mill Thinning	1475	T/437 acres	60,64,69,66,70,68,72,120,122,74,124	1475 HTH
1881	Twin Fiber	33	0	0	33 HSH
1981	COGO	28	0	0	28 HCR
1981	Bog	34	0	0	34 HCC
1983-1985	For Thin	421	T/44	53,79,105	421 HTH
1985	WPM	48	0	0	48 HCR
1985	Left Overs	99	0	0	99 HTH
1985	Porky Pole	99	0	0	99 HCC
1985-1987	Tipton	343	T/22	80,142,144	247 HFR 31 HSH 19 HPR 46 HTH
1986	Crawpole	14	T/2	41	14 HCR
1987	Nippon	53	T/16	40	53 HRS
1989	Vincent	66	0	0	66 HPR
1989	Bull II	10	0	0	10 HCC
1989	Post Pole	4	0	0	4 HCC
1989	Tip Thin	319	T/97	96,118,83,95,94,88,	319 HTH

Year	Sale Name	Harvest Acres	Harvest Type	Crawford Unit	Description
1991	Austin Seed Orchard	35	0	0	35 HCC
1991	ITLP	7	0	0	7 HCC
1992	WYE	78	T/2	150	48 HCR 26 HPR 4 HSV
1992	Spike	142	T/5	32	82 HSH 36 HCR 24 HTH
1993	DanThin	41	0	0	41 HTH
1997 - 1998	Private Lands near Austin	100	Tractor		100 HTH (within Hwy 7 foreground)
1998	POGPOGO	268	T/2	53	151 HRS 117 HTH

* Area ID – These areas are broadly mapped; minimal historical records.

** Harvest Prescription Definition

- Commercial Thinning (HTH) -
- Regeneration Harvest: even aged management; the stands naturally or artificially regenerated.
(HCC)- clearcut
(HSH) Shelterwood
(HCR) - seedtree
- Overstory Removal (HOR)- Harvest overstory removal
- Final Removal (HFR)- final removal of mature overstory to release established immature crop tree that were not a result of a prescribed regeneration cut.
- Partial Removal (HPR) -

Past Wildfires

Year	*Fire Name	Acres	Description
1999	Phipps	43 acres burned in the Upper Middle Fork John Day Watershed. None of these acres are within the Mill Creek subwatershed.	Fire suppression and rehabilitation
1998	Grouse Knob	23 acres burned in the Upper Middle Fork John Day Watershed. None of these acres are within the Mill Creek subwatershed.	Fire suppression and rehabilitation
2002	Easy	3,673 acres burned in the Upper Middle Fork John Day Watershed. None of these acres are within the Mill Creek subwatershed.	Fire suppression and rehabilitation. Salvage logging has been completed.

*Records for larger wildfires (over 20 acres) within the Upper Middle Fork John Day Watershed. Additional small fires have occurred and been suppressed throughout the Watershed and Crawford Project area.

Other Past Activities

Year	Other Past Activities	Description
Early 1800's until 1860	Wagon Trails	One of the wagon trails came from the Baker City area in the general location of Highway 26.
1862 until 1930's	Mining	The major deposits of gold were found downstream of the Upper Middle Fork watershed. Some mining took place on Bridge Creek which is located in the Upper Middle Fork John Day River watershed, but outside the project area.
Late 1800's until present	Water withdrawal for irrigation/domestic water	Numerous irrigation ditches are located in the Upper Middle Fork John Day Watershed. Three ditches are located off the Middle Fork John Day River. One other diversion comes off Clear Creek. Diversions and ditches were constructed and maintained for either pasture irrigation or livestock watering. Rotary fish bypass screens have been installed and maintained by Oregon Department of Fish and Wildlife (ODFW).
Early 1900's	Firewood Cutting	Firewood cutting throughout Upper Middle Fork Watershed and project area. Firewood cutting access increased in the 1920's as the existing transportation system was established.
Early 1900's until present	Historic livestock grazing.	The entire Middle Fork John Day Watershed was grazed by both sheep and cattle predating the establishment of the Malheur National Forest. The first documented use was in 1909, by sheep. This use was continued until 1950, when grazing allotments were established on the Forest.
Early 1900's until 1948	Sumpter Valley Railroad line and spur lines	In 1905, the Sumpter Valley Railroad laid tracts into Austin. The last Sumpter Valley Railroad train ran in 1948. Historic railroad spur lines are located in the Crawford project area.
1900's until present	Summer Recreation	Within the Upper Middle Fork Watershed the probability of recreation use was low prior to 1929. Historic recreation use in the Upper Middle Fork Watershed and Project Area includes hunting, camping, mushroom picking, Christmas tree cutting, and sight-seeing. In recent years recreational use of ATVs has become prevalent.
1917 until 1975	Bates mill constructed and operated	In 1917 the Oregon Lumber Company built the sawmill at Bates and started logging activities on the Middle Fork of the John Day River. The mill remained in full operation until 1975. A few houses remain in the general location of the old mill.
Early 1900's to present	Private Residence Special Use Permits	Three private homes located on Forest Service Land. Homes are located between the Hwy 7 and Hwy 26 junction just outside the Crawford project area.
1919 to present	Austin House	The original Austin House was constructed around 1919. A 15 year special use permit granting use of approximately 5 acres of NFS lands to operate a restaurant, a café, grocery store, lounge, gas station, and residence for the owners. Permit was issued in July, 2005. Located in the Upper Middle Fork Watershed just outside the project area.
1920's until present	Forest Service road building	First road building was for access for fire fighting. Developing transportation system provided access to miners, loggers, and cattle and sheep ranchers. Old routes were low grade and followed many of the old railroad grades.
1920's until present	Use and maintenance of National Forest Roads	Use and maintenance of approximately open roads on National Forest System lands in the Mill Creek subwatershed. Road maintenance includes cleaning of culverts, blading of existing roads, brushing of right-of-ways.

Year	Other Past Activities	Description
1930's until present	Construction of State Highway 26	Highway was constructed in the 1930s. Highway 26 is the southern boundary of the Crawford project area.
1950's until present	Construction of State Highway 7 from Austin Junction to Sumpter	Highway was constructed in 1950s. Highway 7 runs through the Crawford project area.
1960's to present	Powerline Special Use Permit (OTEC)	Electrical overhead power transmission lines run through the Mill Creek subwatershed. The section of the power line that runs from Bates to the Forest Boundary is approximately 7.3 miles.
1965 to present	Powerline Special Use Permit (Idaho Power)	Electrical overhead power transmission line run through the Mill Creek Subwatershed. The power line was constructed around 1966. Approximately 9 miles of road within the project area are used for power line access and maintenance. Some of these are closed roads.
1965 to present	Buried Phone Cable Special Use Permit (Oregon Telephone)	Approximately 8 miles of buried phone cable from Bates to Blue Mt. Summit. The buried cable is located just north of Highway 26.
1970's until present	Winter Recreation Snowmobiling	Grooming and use of snowmobile trails within the Upper Middle Fork Watershed and Crawford Project Area.
1926 to present	State Hwy. Maintenance Site Special Use Permit	The first buildings for the maintenance site were constructed in 1926. The special use permit site is currently 16.8 acres and contains a sand shed, maintenance building, 5 homes, and several out buildings.
1950's until present	Fire Suppression	Fire suppression activities and rehabilitation.
Early to mid 1990's	Road Closures	Approximately 16.2 miles previously decommissioned.
1994-1998	Riparian enhancement – Crawford Creek Area	Course wood placement in streams, Crawford Creek, Crawford Cr. Tributaries, and 16 Gulch.
1995 to present	Fiber Optics Cable Special Use Permit (Oregon Telephone)	Approximately 8 miles of cable from Bates to Blue Mt. Summit. Buried cable is located just north of Highway 26 in the Crawford Project area.
2000-2003	Riparian enhancement at stream crossings along Hwy 26	Several culverts/bridges were replaced along Highway 26, and the inlet to these culverts was planted with shrubs/trees and fenced to exclude livestock and big game.

Present Activities (2006)

Present Activity	Description
Water Withdrawals/Irrigation	Same as in past
Private residence special Use permits	Same as in the past
Firewood cutting	Same as in past
Livestock grazing	Currently, portions of four grazing allotments fall within the Mill Creek subwatershed: Upper Middle Fork C&H, Austin On & Off, Blue Mtn C&H, and Sullens C & H.
Summer and winter recreation	Same as in past
Use and maintenance of National Forest Roads	Same as in past
Powerline/Buried Phone Cable Special Use Permits	Same as in past
Austin House Special Use Permit	Same as in past
State Hwy. Maintenance Site Special Use Permit	Same as in past
Fire Suppression	Same as in past

Present Activity	Description
Bridge/Lunch Creek Culvert Replacement	Replacement of culverts on Bridge, Lunch, and South Fork Bridge Creek (2005-2007)
State of Oregon Department of Transportation (ODOT) culvert replacement	Eight culverts on Upper Middle Fork Watershed on Highway 26 (2005-2007)

Foreseeable Activities

Year	Approved	Foreseeable Activity	Description
Annual	Yes	Water Withdrawals/Irrigation	Same as in the past
Annual	Yes	Private Residence Special Use Permits	Same as in the past
Annual	Yes	Firewood cutting	Same as in the past
Record of decision anticipated 2006	Pending- Draft EIS issued	Middle Fork John Day Range EIS	Analysis for grazing allotments in the Middle Fork John Day, Camp Creek, and Galena Watersheds
Annual	Yes	Summer and winter recreation	Same as in past
Annual	Yes	Use and maintenance of National Forest Roads	Same as in past
Annual	Yes	Powerline Special Use permits (Idaho Power and OTEC).	Same as in past
Annual	Yes	Fire Suppression	Same as in the past
Annual	Yes	Grazing	Same as in the past
Annual	Yes	Road Maintenance	Same as in the past
Annual	Yes	Austin House Special Use Permit	Same as in the past
Annual	Yes	Fire Suppression	Same as in the past
Special Use Renewal anticipated 2006	Pending	State Hwy. Maintenance Site Special Use Permit	Same as in the past with some proposed upgrades to water system and heat sources for houses.
Special Use Renewal anticipate 2006	Pending	Oregon Telephone Fiber Optics and Telephone Cable Special Use Permits	Same as in the past
Summer 2007	Yes	Oregon State Department of Transportation (ODOT) fish passage improvement projects	Same as ongoing
2005-2007	Yes	Bridge/Lunch Creek Culvert Replacement	Same as ongoing
2005-2007	Yes	State of Oregon Department of Transportation (ODOT) culvert replacement	Same as ongoing