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Environmental Assessment

Long Prairie Mistletoe Reduction

Bend-Ft. Rock Ranger District, Deschutes National Forest
Deschutes, Klamath, and Lake Counties, Oregon

T. 22 S., R.11-13 E. and T. 23 S., R. 11-13 E

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INTRODUCTION

Document Structure

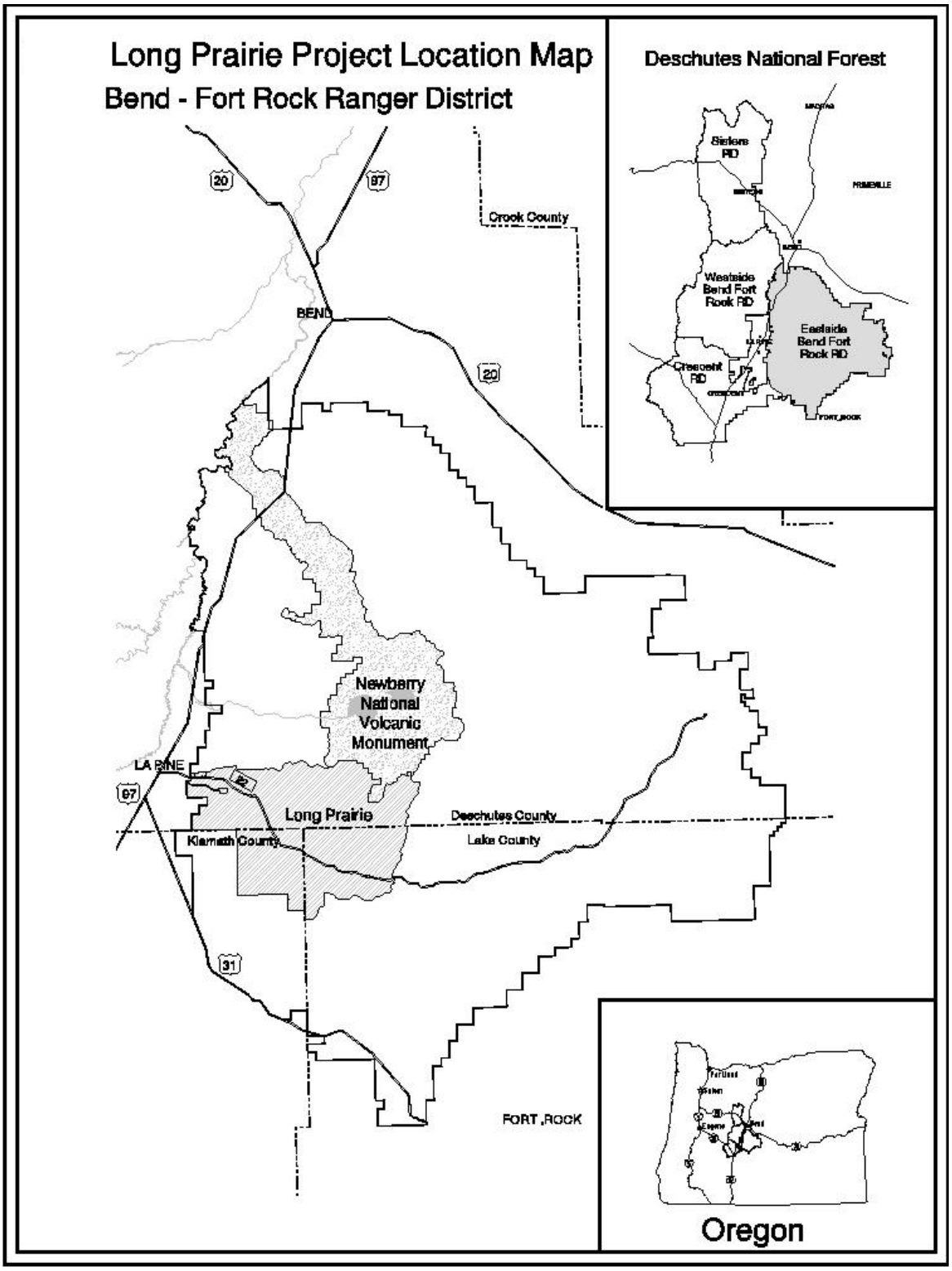
The Forest Service has prepared this Environmental Assessment in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This Environmental Assessment discloses the direct, indirect, and cumulative environmental impacts that would result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

- *Introduction:* The section 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.
- *Comparison of Alternatives, including the Proposed Action:* This section 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 possible mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.
- *Environmental Consequences:* This section describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource area. Within each section, the existing condition is described first, followed by the effects of the No Action Alternative that provides a baseline for evaluation and comparison of the other alternatives that follow.
- *Agencies and Persons Consulted:* This section provides a list of preparers and agencies consulted during the development of the environmental assessment.
- *Appendices:* The appendices provide more detailed information to support the analyses presented in the environmental assessment.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Bend-Ft. Rock Ranger District Office in Bend, Oregon.

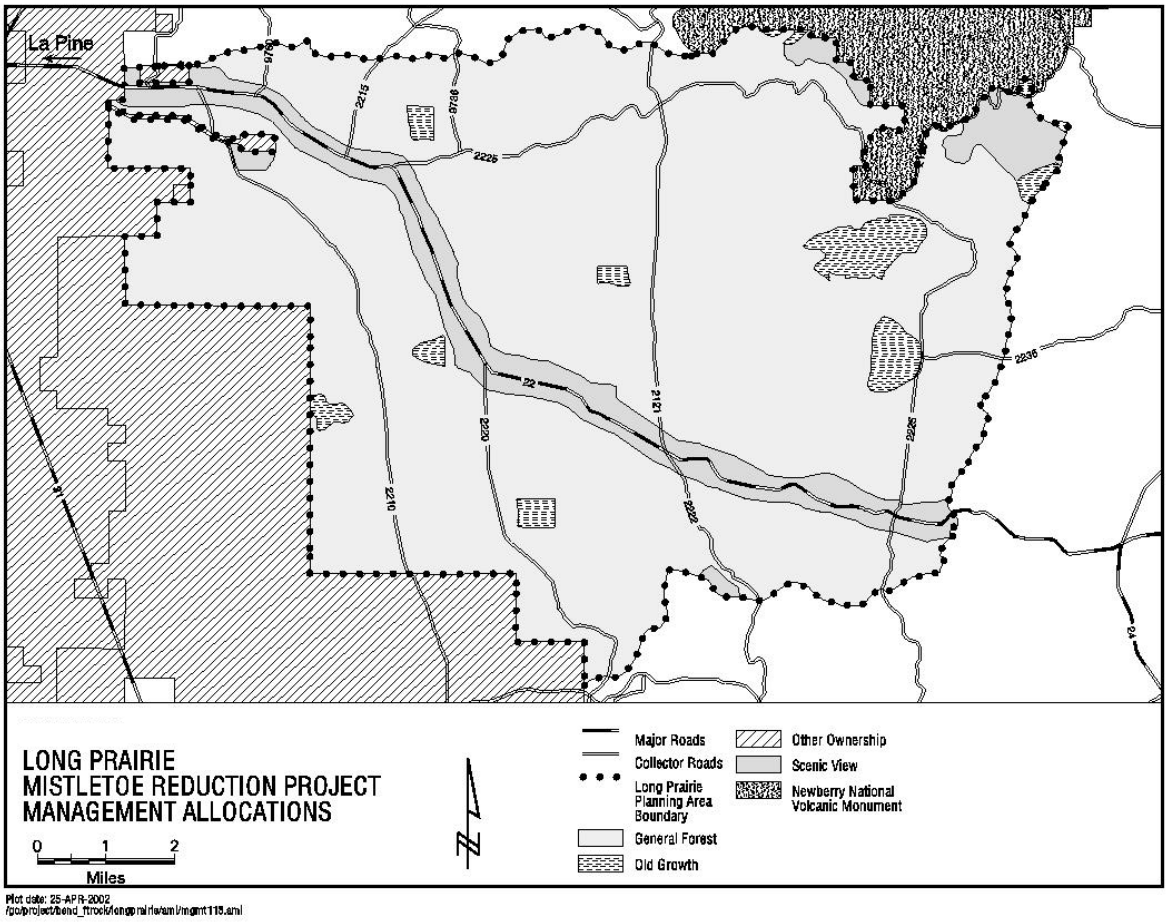
Background

The project area (Map 1) is located approximately 2 miles east of La Pine, Oregon in T. 22 S., R.11-13 E. and T. 23 S., R. 11-13 E. It is approximately 55,867 acres in size. It is bordered to the northeast by Newberry National Volcanic Monument (NNVM). The project area is in the Long Prairie Watershed (5^{th} Field). There is no surface water within the project area. The closest surface water is: 1) Paulina Lake, approximately 2.5 miles northeast of the project area, 2) the Little Deschutes River, approximately 2.5 miles west of the project area, and 3) Paulina Creek, approximately 2.7 miles north of the project area. Elevations range from approximately 4,250 feet just east of La Pine to over 6,600 feet along the boundary of NNVM. The project area is outside the range of the northern spotted owl (Northwest Forest Plan Area).



Map 1. Long Prairie Mistletoe Reduction Project area.

The Deschutes National Forest **Land and Resource Management Plan** (LRMP or Forest Plan), as amended in June 1995 by the Decision Notice for the Continuation of Interim Management Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales (Eastside Screens), identifies three management allocations within the project area (Map 2). Approximately 86 percent of the project area is within general forest, approximately 10 percent within scenic views (foreground retention along Road 22) and approximately 3 percent within the old growth allocation.



Map 2. Long Prairie Mistletoe Reduction Project Management Areas.

Desired Condition

The Deschutes Forest Plan identifies management goals for each allocation. The goal within General Forest is to emphasize timber production while providing forage production, visual quality, wildlife habitat and recreational opportunities for public use and enjoyment. In this allocation the forest health goal is to maintain and enhance the vigor of the forest ecosystem through the control of forest pests (including dwarf mistletoe). Within Scenic Views, the management goal is to provide Forest visitors with high quality scenery that represents the natural character of Central Oregon. The forest health goal is to maintain and enhance the vigor of the forest ecosystem through control

or prevention of major insect and disease problems that put the visual resource at an unacceptable degree of risk.

The Forest Plan describes a future condition where young, vigorous stands of trees have replaced many of the older, dying lodgepole pine stands that were "decimated" by the mountain pine beetle epidemic of the 1970's and 1980's. The Forest is in an overall state of health, vigor and diversity. As a result, the Forest can fulfill resource management goals both in the short and long term. Undesirable impacts from forest pests on resource objectives are greatly reduced. Where these impacts occur, they are a result of scoping, analysis and a decision framework that considers the desirable and undesirable roles of pests in the context of integrated resource management objectives.

Historic Disturbance Regimes

Historically, fire served to control the occurrence, distribution and severity of dwarf mistletoe in lodgepole and ponderosa pine stands.

In premanagement-era lodgepole pine landscapes, Hessburg et al. (1994) indicate the amount of mistletoe was highly correlated with boom-and-bust fire cycles characteristic of the series. After fire, mistletoe reinvasion was rapid when islands of live, mistletoe-infected lodgepole pine were scattered throughout the burned area. Reinvasion was slow when fires were large and intense, resulting in near total stand destruction. New infections came from diseased trees on distant perimeters or from chance introductions by birds and small mammals. The Deschutes National Forest Watershed Evaluation & Analysis for Viable Ecosystems (WEAVE) document (USDA 1994a) describes historic fire activity and disease levels in arid (dry) lodgepole pine sites typical of the Long Prairie Project area. Most stand replacing events ranged in size from 50 to 1000 acres. Few trees survived these stand replacing events. Regenerated lodgepole pine in these burn areas would be relatively free of dwarf mistletoe. Mistletoe would slowly spread back into the burn areas from adjacent unburned areas. Birds and other wildlife would also reintroduce mistletoe into the burn areas. This vegetation type makes up 55 percent of the project area (Table 4).

Historic fire activity and disease levels in ponderosa pine are described by Hessburg, et al. (1994). In ponderosa pine stands, fires historically were low intensity underburns. They reduced, but seldom eliminated, mistletoe from a ponderosa pine stand. These fires eliminated mistletoe infected understories. Mistletoe in overstory trees was reduced when witches brooms (profusely branched, dense masses of distorted branches caused by dwarf mistletoe infection) ignited, leading to the destruction of most or all the crown. These frequent, low-intensity fires also slowed mistletoe spread by creating more single story stand conditions and decreasing stand density. This vegetation type makes up 36 percent of the project area (Table 4).

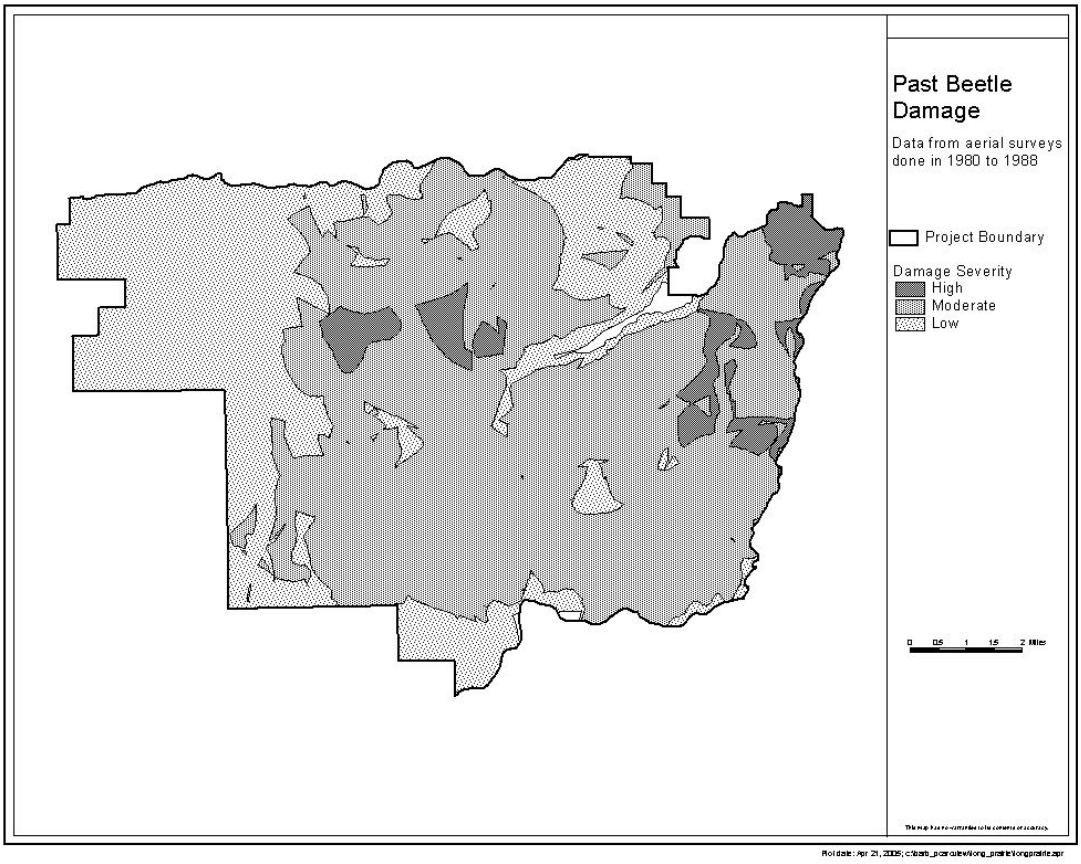
Existing Condition

Past disturbances and management actions have contributed to the existing condition present within the Long Prairie project area. The Final Environmental Impact Statement (FEIS) for the Deschutes Forest Plan (USDA Forest Service 1990, page 3-38) states

"insects and diseases have had, and are presently having, a significant effect on the structure, species composition and condition of the forest ecosystem of the Deschutes National Forest". The FEIS identified bark beetles as being within the group of insects most impacting the Forest. The FEIS (page 3-43) identified the mountain pine beetle as most seriously impacting the Forest and described these impacts as follows:

> "..the mountain pine beetle has devastated large areas of lodgepole pine in recent years, killing an estimated 65 million trees.. In terms of impact on the environment .. most lodgepole pine stands have experienced 50 to 65 percent mortality with some stands going higher. The largest trees were preferred by the beetle and in most stands nearly every tree larger than 9 inches in diameter was killed."

To estimate past effects of mountain pine beetle within the project area, digital coverages of insect and disease aerial surveys (USDA Forest Service 2004) were reviewed. Within this portion of the Forest, mortality from mountain pine beetle peaked between the years 1980 and 1989. Aerial survey estimates of damage severity during this time period were summarized to show relative levels of mortality (Map 3). The only area showing no effect from beetles (no shading) is Surveyor Lava Flow in the east central part of the project area.

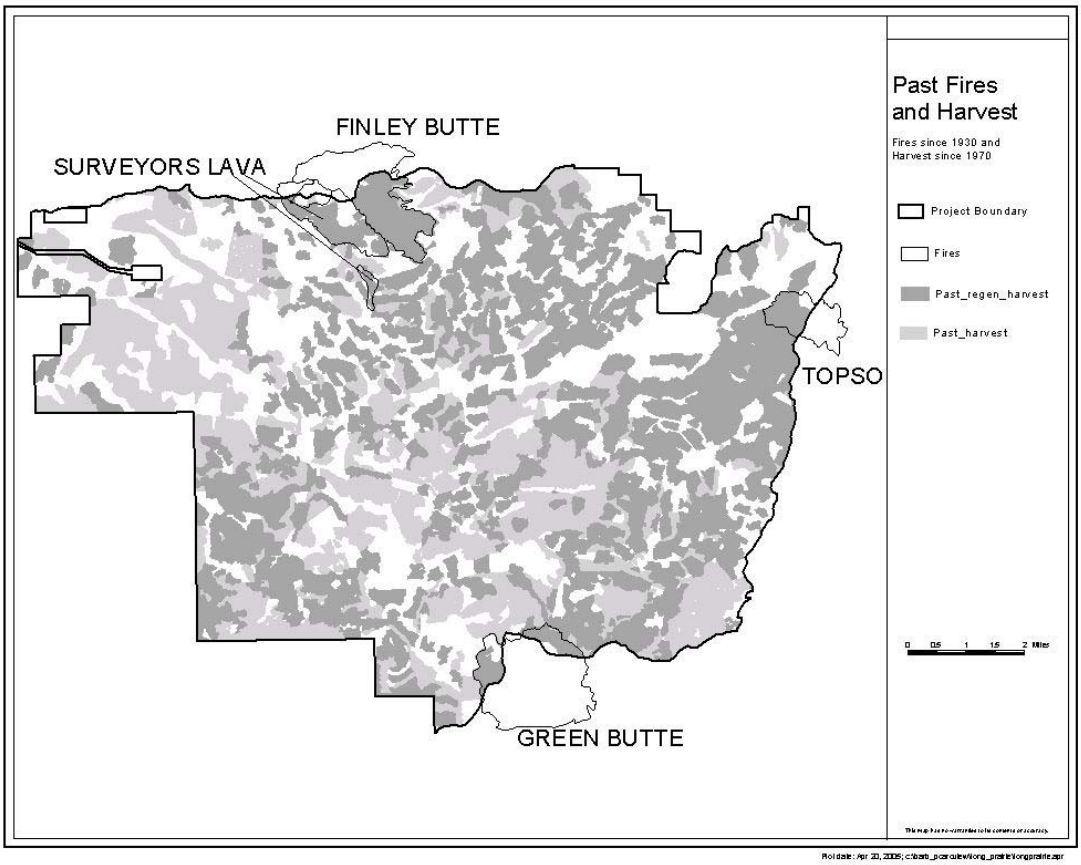


Map 3. Past beetle damage within and adjacent to Long Prairie Mistletoe Reduction Project.

Since 1970, harvest treatments have occurred on approximately 65 percent (35,660 acres) of the project area (Table 1 and Map 4). Prior to the beetle outbreak (1980's), harvest levels were relatively low. Approximately 8 percent of the project area had some type of harvest. During the peak of the beetle outbreak, harvest levels increased. Approximately 31 percent of the project area was harvested during this time period. Harvest levels remained relatively high following the beetle outbreak (since 1990), with harvest occurring on approximately 25 percent of the project area.

Table 1. Past harvest within the Long Prairie project area (55,867 acres).

Time Period	All Harvests		Regeneration Harvest		Regeneration Harvest due to Fire	
	Acres	% of Project Area	Acres	% of Project Area	Acres	% of Project Area
Since 1970 and prior to 1980	4,410	8%	2,690	5%	250	<1%
1980 to 1990	17,560	31%	11,420	20%	150	<1%
Since 1990	13,690	25%	6,150	11%	1,210	2%
Total	35,660	64%	20,260	36%	1,610	3%



Map 4. Past fires and past harvest activity within Long Prairie Mistletoe Reduction Project.

Approximately 60 percent of past harvest treatments were done with the objective of regenerating the treated stands (Regeneration Harvest, Table 1 and Map 4). Most of these regeneration harvests occurred in lodgepole pine dominated stands. Correspondingly, most regeneration harvest occurred in areas where mountain pine beetle had caused moderate to high levels of mortality (Map 3). Regeneration harvests have also been associated with areas where fires have occurred (Table 1 and Map 3). Since 1930, fires larger than 10 acres in size that have occurred in the project area include: Green Butte (1977), Finley Butte (1990), Topso (1990), and Surveyors Lava (1993).

Within many of the regeneration harvest areas, overstory trees were retained to assure areas would naturally regenerate. Overstory trees were generally retained at 40 to 60-foot spacing (an average of 12 to 27 trees per acre) to assure distribution of seed across the stand and to provide site amelioration. The original intent was to remove seed trees once adequate seedlings were present in the understory. In the years since harvest, these stands have regenerated and an understory of vigorous trees is now present. Understory trees are approaching or exceed a height of 3 feet or an age of 10 years.

The following pictures illustrate typical areas proposed for treatment within the Long Prairie project. Figure 1 shows a lodgepole pine understory with a mistletoe-infected lodgepole pine overstory. Figure 2 shows a lodgepole pine and ponderosa pine understory with a mistletoe-infected ponderosa pine and lodgepole pine overstory.

Unit 92 of Long Prairie Mistletoe project (photo by B. Schroeder, 8/25/2004).

Figure 1. Picture of typical lodgepole pine stand proposed for treatment.

Unit 54 of Long Prairie Mistletoe Reduction project (photo by B. Schroeder, 8/25/2004)

Figure 2. Picture of typical stand of ponderosa and lodgepole pine proposed for treatment.

The FEIS for the Deschutes Forest Plan (USDA Forest Service 1990, page 3-38) identified dwarf mistletoes as being within the group of pathogens most impacting the Forest. Dwarf mistletoe is found throughout the project area. It is also present in varying amounts in overstory trees retained in regeneration harvest units.

Dwarf mistletoe is a parasitic plant that affects the health, vigor and growth of both lodgepole and ponderosa pine. It spreads fastest from infected overstory trees to understory trees. Understory trees greater than three feet in height (or more than 10 years old) and generally within 30 feet of an infected overstory tree are at the greatest risk of infection. Dwarf mistletoe reduces diameter and height growth and can kill or predispose the tree to attack by insects or other diseases. The extent to which mistletoe affects the host tree depends largely upon the age when the tree is initially infected. Older, larger trees experience little or no obvious effects whereas younger and smaller trees often experience significant reductions in height and diameter growth. Heavy mistletoe infection in a stand can adversely impact some wildlife species through a decrease in cover, tree regeneration and growth, and cone/seed output (Bull et al. 1997). Dwarf mistletoe infection can induce the formation of witches' brooms. These brooms can provide forage, nesting, and cover for birds and mammals. They can also increase the

likelihood of ground fires becoming crown fires. Canopy gaps caused by mistletoe-induced mortality increase within-stand diversity, but also reduce the interior-forest area (Hawksworth and Wiens 1996).

Comparison of Desired and Historic Conditions to Existing Condition

Understory trees in natural regeneration units are now at risk of becoming infected with mistletoe given 1) the size and age of understory and 2) the presence of mistletoe in overstory trees and adjacent stands. The distribution of infected overstory trees in these units assures most understory trees have the potential to become infected with mistletoe. Mistletoe infection can reduce the future growth potential of understory trees. Consequently, the likelihood of developing larger diameter trees desired for timber production and favored by or depended upon by many wildlife species can be reduced. Also, the potential to develop healthy, full crowned trees that are desirable for scenic views can be reduced. Retention of overstory trees in natural regeneration units would maintain multi-storied stand structures that were likely uncommon with historic fire disturbances. Spread and intensification rates of mistletoe into the understory are likely to occur faster and more extensively than what occurred historically.

Management Direction

The Forest Plan provides guidance for meeting forest health goals. Where diseases are such that unacceptable damage or reduction in tree growth can be predicted, protection measures may be warranted prior to the actual damage occurring (Forest Plan Standard and Guideline (S&G) TM-10). The Forest Plan does not specify what growth losses are acceptable as a result of dwarf mistletoe infection in even-aged stands. The Forest Plan does address what's an acceptable loss in uneven-aged stands. S&G TM-32 states in part that uneven-aged management should be restricted to stands where dwarf mistletoe can be stabilized indefinitely at a low infection level to insure no more than a 10 percent loss in productivity occurs.

Depending on stand conditions, the Forest Plan outlines the following as possible management strategies for dwarf mistletoe infected stands (Forest Plan Table 4-29):

1. Eliminate inoculum by regeneration harvest.
2. Convert to single story structure, leaving only lightly infected trees. Regenerate at the end of the rotation.
3. Favor non-host species in silviculture operations.
4. Remove overstory before regeneration is 3 feet tall or 10 years old.
5. Remove overstory and thin understory to maintain infections at low levels.

Interim Management Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales (Regional Forester's Forest Plan Amendment #2) provides direction for maintaining snags and green trees replacements. It amends Forest Plan Standard and Guideline WL-37. According to Interim Management Direction, all sale activities will maintain snags and green replacement trees of greater than or equal to 21 inches dbh, (or whatever is the representative dbh of the overstory layer if it is less than 21 inches dbh),

at 100 percent potential population levels of primary cavity excavators. This should be determined using the best available science on species requirements as applied through current snag models or other documented procedures.

The Wildlife Tree and Log Implementation Strategy (USDA Forest Service 1994b) provides guidance and options for meeting snag, green tree replacement (GTR) and down log objectives (Forest Plan S&G WL-38) across the Forest. According to the strategy, desired pattern for wildlife trees and logs is a combination of patches or clumps and randomly scattered individual trees and logs. Patches should generally be larger than 2.5 acres. Wildlife trees and logs should be provided within treatment units. The strategy recognizes there are circumstances that may preclude meeting wildlife tree and log objectives within the unit. In these situations, it is acceptable to provide the wildlife trees and logs in patches or clumps adjacent to or on the perimeter of the treatment units. Patches or clumps outside the units should be properly designated and tracked.

The Wildlife Tree and Log Implementation Strategy describes the effects dwarf mistletoe has on host trees and the overall landscape. It also discusses the role mistletoe plays in providing habitat for wildlife. Keeping in mind these processes, the strategy suggests avoiding conditions conducive to the spread and intensification of mistletoe unlikely to occur with historic disturbance regimes. The strategy indicates the most desirable treatment is to remove all mistletoe infected trees which are of the same species as the regenerated stand. If the overall analysis area is snag deficient, then complete treatment may not be possible and other techniques could be used to retain snags and limit the spread of mistletoe.

Purpose and Need for Action

The purpose and need of this project is to reduce the likelihood of dwarf mistletoe spreading from infected overstories to understories, and to provide timber products to benefit local and regional communities. Specifically, there is a purpose and need to:

1) Reduce the spread of dwarf mistletoe from overstory trees to understory trees within areas previously harvested and regenerated to increase the likelihood of: a) developing larger diameter trees desired for timber production and favored by or depended upon by many wildlife species, and b) having healthy, full crowned trees desirable for scenic views, and
2) Provide commercial forest products to the economy in support of the Forest Service's legally mandated mission.

An action responding to this purpose and need would be consistent with the goals and objectives of the Deschutes National Forest Land and Resource Management Plan (1990, as amended).

Proposed Action

To meet the purpose and need for action, the Forest Service proposes to fall and remove live overstory trees excess to cavity nester habitat needs that are greater than or equal to 4 inches dbh and less than 21 inches dbh. To minimize treatment costs, trees to be

removed would include those with and without dwarf mistletoe. Within proposed treatment units, approximately 3 trees per acre would be retained to provide future snags (green tree replacements) for cavity nester habitat. Additional green tree replacements would be provided outside and adjacent to proposed treatment units. For additional details on the proposed action, refer to the "Alternatives" section of this document.

Decision Framework

The Responsible Official for this proposal is the Forest Supervisor of the Deschutes National Forest. Based upon the information and analysis in this Environmental Assessment and public input, the Responsible Official will decide: 1) where and under which circumstances dwarf mistletoe reduction will occur, 2) how much commercial wood fiber will be offered for sale, and 3) which mitigation measures and monitoring items are needed for resource protection.

The Forest Supervisor can decide to:

- Select the proposed action, or
- Select the other action alternative that has been considered in detail, or
- Select a modified action alternative, or
- Select the no-action alternative, and
- Identify what mitigation measures and monitoring items will apply.

The decision regarding which combination of actions to implement will be determined by comparing how each factor of the project purpose and need is met by each of the alternatives and the manner in which each alternative responds to the significant issues. The alternative which provides the best mix of prospective results in regard to the purpose and need and the significant issues, and does so in an economically efficient manner, will be selected for implementation.

In addition, the Responsible Official will determine whether the selected alternative may have a significant effect on the quality of the human environment and whether an environmental impact statement needs to be prepared.

Public Involvement

The initial proposal was provided to the public and other agencies for comment during scoping in a letter dated April 30, 2002, with comments requested by May 31, 2002. Two letters were received in response to scoping. The proposal has been listed in the Schedule of Projects beginning in the summer of 2002. Information on the proposed action and on an alternative to the proposed action went out for public comment between May 19 and June 30, 2004; four groups responded with comments. Representatives from the Oregon Department of Fish and Wildlife and the U.S. Fish and Wildlife Service reviewed the project in the field with Forest Service personnel on August 8, 2004.

Government-to-government consultation occurred with the Tribes (Klamath Tribe, Confederated Tribes of Warm Springs, and Burns Paiute Tribe) in the format of the scoping letter, which described the project area and proposed action, and the letter

requesting public comment on the proposed action and the alternative to the proposed action. Through each letter, the Tribes were invited to comment on the project. No special concerns about Tribal resources were identified. It is acknowledged that the Tribes may have lost the verbal history and they may not know where desired plant species and resources may be found. This affects their ability to tell federal agencies where Tribal trust resources can be located on federal lands.

Comments received from the public included support for the Purpose and Need for action. Conversely, concern was expressed that mistletoe is a part of forest function and is important to many species of birds and wildlife. There was also concern for the amount of temporary road construction. The strategies for providing green tree replacements were questioned. Concern was expressed that green tree replacements retained outside of units may be lost in future sales. There was also concern that insufficient numbers of green tree replacements were to be retained within treatment units. One respondent identified an unroaded area within the project area and described its ecological value. Concern was expressed for how the actions would affect the unroaded characteristics. The project file contains documentation of the comments received and how the Forest Service considered them.

On October 6, 2004, a legal notice appeared in the Bend Bulletin notifying the public that a decision had been made on the project and that the decision and associated Environmental Assessment (dated September 2004) were available for review at the District or Forest Supervisor's Offices or at the Forest Website. Additionally, the Environmental Assessment was provided to six members of the public who had previously commented on the project or had specifically requested a copy of the assessment. As a result of the administrative appeals process, additional analysis was done to assess the impacts of the project. This Environmental Assessment updates the assessment dated September 2004.

Issues

To assist in identifying issues, the Interdisciplinary Team reviewed comments received during scoping and the 30-day comment period. An issue was defined as a discussion, debate, or dispute regarding the environmental effects directly or indirectly related to the implementation of the proposed action.

Issues were separated into two groups: significant and non-significant. Issues were considered to be significant due to the extent of their geographic distribution, the duration of their effects, or the intensity of interest or resource conflict. Significant issues were further separated into two groups: 1) those used to formulate alternatives and 2) those used to prescribe mitigation measures or analyze environmental effects. Issues were considered non-significant if they were: 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)…" Issues identified as significant are described below. Issues identified as non-significant and the associated rational are described in Appendix 4.

Significant Issue That Framed Alternatives

Cavity nester habitat reduction.

Proposed timber harvest would remove live overstory trees, with and without dwarf mistletoe, from a landscape in which past bark beetle outbreaks and timber harvest have reduced the number of live, larger diameter trees. Timber harvest as proposed may affect cavity nester habitat indirectly by reducing future snag recruitment, and consequently could affect cavity nester populations.

Measures used to display effects and compare alternatives

- Acres of black-backed and three-toed woodpecker habitat.
- Number of green tree replacements.
- Proportion of treatment areas with relatively low or high levels of green tree replacements.
- Acres of treatment that would remove trees with and without dwarf mistletoe.
- Acres of treatment that would retain trees without dwarf mistletoe.
- Timber sale preparation costs.

Significant Issues Used to Prescribe Mitigation or Analyze Effects

Issues used to prescribe mitigation measures or guide the analysis of environmental effects are presented below in outline form. Mitigation measures are described in the "Alternatives" section of this document. The question of how proposed overstory treatments and associated use of temporary roads would affect the listed resources is addressed in the "Environmental Consequences" section of this document.

Vegetation/Trees

- Structural stage as compared to the Historic Range of Variability.
- Understory tree vigor

Disease

- Dwarf mistletoe

Wildlife

- Proposed, Threatened, Endangered, and Sensitive Animals
- Management Indicators and Species of Concern
- Wildlife Habitats, including
    - Late/Old Structural Habitat, Forest Plan Allocated Old-Growth Areas and the connectivity between these areas
    - Coarse Woody Material

Other Issues

- Proposed, Threatened, Endangered, and Sensitive Plants
- Noxious Weeds/Exotic Species
- Soil Resource
- Fisheries and Hydrology
- Scenic Resources
- Recreation
- Cultural Resources
- Road Access
- Inventoried Roadless Areas
- Unroaded Areas
- Grazing
- Fire/Fuels and Air Quality
- Economic and Social

There is no surface water in or immediately adjacent to the project area. Consequently there are no issues related to water quality.

ALTERNATIVES, INCLUDING THE PROPOSED ACTION

This section describes and compares the alternatives considered for the Long Prairie Mistletoe Reduction project. Alternative descriptions include associated mitigation measures, connected actions, and monitoring elements. This section also includes maps for each action alternative. Maps 5 through 12 show the locations of treatment units, temporary roads, and areas to be designated as green tree replacement clumps. This section also presents the alternatives in comparative form (Tables 2 and 3), sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public. Some of the information used to compare the alternatives is based upon the design of the alternative (i.e., remove overstory trees with and without mistletoe versus remove only overstory infected with mistletoe) and some of the information is based upon the environmental, social and economic effects of implementing each alternative (i.e., detrimental soil disturbance or the cost of harvesting overstory versus the cost of girdling/pruning).

Alternatives

Alternative 1 – No Action

Under this alternative, current management plans would continue to guide management of the project area. No treatments would be done to reduce the spread of mistletoe from overstory trees to understory trees in stands regenerated following timber harvest. The No Action Alternative responds to the cavity nester issue by retaining all existing overstory trees present within units previously harvested and regenerated.

Alternative 2 – The Proposed Action

In a request for comments dated April 30, 2002, the Forest Service described a proposed action to reduce dwarf mistletoe in stands naturally regenerated since past timber harvest. Approximately 12,080 acres were proposed for treatment. Subsequent field review found areas where treatment was not necessary to meet the purpose and need for action. In some cases, there was insufficient volume to implement the proposed commercial harvest. The proposed action was revised to incorporate this new information. Approximately 3,900 acres were dropped from the original proposed action.

With Alternative 2, the Forest Service proposes to treat approximately 8,180 acres of stands naturally regenerated following timber harvest (see Maps 5-8 and Appendix 1). The majority of proposed treatment is within the General Forest allocation (Table 3). Treatment would consist of felling and removing live overstory trees excess to cavity nester habitat needs greater than or equal to 4 inches diameter at 4.5 feet above ground level (dbh) and less than 21 inches dbh. Trees proposed for removal include those with and without dwarf mistletoe. Within proposed treatment units, approximately 3 trees per acre would be retained to provide future snags (green tree replacements) for cavity nester habitat. Green tree replacements would be greater than 8 inches dbh or the largest trees available. Existing snags and coarse woody material would be retained.

Proposed treatment is projected to provide approximately 11,400 hundred cubic feet (CCF) or 5.9 million board feet (MMBF) of wood fiber volume (±20%). Much of this volume would come from lodgepole pine averaging 8 to 10 inches dbh. A minor amount of the volume would come from ponderosa pine.

Alternative 3

To respond to the cavity nester issue (page 19), Alternative 3 would retain more overstory trees within some treatment units to serve as green tree replacements. This would be accomplished by using harvest and non-harvest treatments designed to retain overstory trees not infected with dwarf mistletoe. In other areas, the treatment would be the same as described for Alternative 2 which would harvest overstory trees with and without dwarf mistletoe. The non-harvest treatment proposed with Alternative 3 consists of pruning, girdling, or felling mistletoe infected overstory trees. Construction of temporary roads would not be necessary to access units proposed for this type of treatment. Alternative 3 implementation costs would be higher than those associated with Alternative 2 due to: 1) costs associated with identifying overstory trees without dwarf mistletoe, and 2) costs associated with girdling, pruning, and felling.

Alternative 3 proposes the most treatment to reduce dwarf mistletoe in stands naturally regenerated following timber harvest. Approximately 11,455 acres are proposed for treatment (see Maps 9-12 and Appendix 1). The majority of proposed treatment is within the General Forest Allocation (Table 3). All treatments would retain existing snags and coarse woody material.

On approximately 5,304 acres, Alternative 3 proposes to reduce dwarf mistletoe using the same method described for Alternative 2. Treatment would consist of felling and removing live overstory trees excess to cavity nester habitat greater than or equal to 4 inches dbh and less than 21 inches dbh. Trees proposed for removal include those with and without dwarf mistletoe. Within proposed treatment units, approximately 3 trees per acre would be retained to provide future snags (green tree replacements) for cavity nester habitat. Green tree replacements would be greater than 8 inches dbh or the largest trees available.

On approximately 5,374 acres, Alternative 3 proposes a variety of treatments to reduce mistletoe infected overstory trees while retaining overstory trees without dwarf mistletoe to serve as green tree replacements. Overstory trees not infected with dwarf mistletoe would be retained as individual trees or as clumps within the treatment area. These treatments are unique to Alternative 3 and include the following:

1) Fall and remove mistletoe-infected overstory trees greater than or equal to 4 inches dbh and less than 21 inches dbh on approximately 581 acres.
2) Within approximately 1,203 acres, designate for retention clumps of overstory trees free of dwarf mistletoe. It's estimated 50 percent of these acres would be in retention clumps. Outside of retention clumps, fall and remove live trees greater than or equal to 4 inches dbh and less than 21 inches dbh with and without dwarf mistletoe.
3) On approximately 3,590 acres, treat mistletoe infected lodgepole or ponderosa pine overstory trees by pruning, girdling, or falling and retaining on site. With the **pruning treatment**, branches would be severed from the bole of the tree. All branches below the source of mistletoe infection, all mistletoe infected branches, and four branch whorls above the last visible source of mistletoe infection would be pruned. The intent of the treatment would generally be to remove mistletoe infected branches without killing the tree. Pruning would generally retain a live crown of approximately 50 percent the height of the tree (live crown ratio). There would be no upper diameter limit on the size of tree that would be pruned. The **girdling treatment** would remove a band of bark and cambium approximately 6 inches wide from around the entire circumference of the tree. The intent of the treatment would be to kill the tree, thereby killing the mistletoe. Trees would be girdled at approximately 4 feet above the ground. There would be no upper diameter limit on the size of tree that would be girdled. The **felling treatment** would consist of cutting mistletoe infected trees at approximately ground level. Felled trees would be retained on site. To minimize reduction of future cavity nesting habitat, felling would be limited to trees less than 8 inches dbh. Where trees are felled within 200 feet of a two or four digit Forest Service Road, branches from felled trees would be severed from the bole, piled, and burned.

   Whether a tree would be pruned, girdled or felled would depend on species, diameter and amount of mistletoe present within the tree. Trees to be treated would generally be greater than 4 inches dbh.

   - Lodgepole and ponderosa pine less than 8 inches dbh would generally be felled. If mistletoe infection is confined to the lower portion of the crown, trees could instead be pruned. Pruning would be possible if it could be done safely from the

ground using a chain saw. Maximum safe pruning height using chainsaws is approximately 6 feet from the ground.

- Lodgepole pine greater than or equal to 8 inches dbh would generally be girdled. If mistletoe infection is confined to the lower portion of the crown, trees could instead be pruned. Pruning would generally be possible if it could be done safely from the ground using a pruning saw. The maximum pruning height using these saws is approximately 16 feet from the ground.
- Ponderosa pine greater than or equal to 8 inches dbh would generally be climbed and pruned. If pruning would result in the tree having less than 25 percent live crown ratio, trees would instead be girdled.

As funding allows, proposed girdling, pruning and felling of mistletoe infected overstory trees would occur within 5 to 7 years of the decision.

The following treatments are also unique to Alternative 3. On approximately 648 acres, Alternative 3 proposes to retain no lodgepole pine overstory greater than or equal to 4 inches and less than 21 inches dbh. Ponderosa pine and white fir within the units would provide green tree replacements. Similarly, on approximately 24 acres, no ponderosa pine greater than or equal to 4 inches and less than 21 inches dbh would be retained. Lodgepole pine within proposed treatments would provide green tree replacements. On approximately 105 acres, all lodgepole pine overstory greater than or equal to 4 inches and less than 21 inches dbh would be removed. With this treatment, all green tree replacements would be provided outside of treatment area. These treatments would remove overstory trees with and without dwarf mistletoe.

Proposed treatment is projected to provide approximately (±20%) 11,000 hundred cubic feet (CCF) or 5.7 million board feet (MMBF) of wood fiber volume. Much of this volume would come from lodgepole pine trees averaging 8 to 10 inches in diameter at 4.5 feet above the ground. A minor amount of the volume would come from ponderosa pine.

Actions Common to Alternatives 2 and 3

In addition to the green tree replacements retained within the treatment units, green tree replacements would be provided in patches or clumps outside and adjacent to proposed treatment units. Green tree replacement clumps outside of the treatment units would be designated and tracked within one of the district's GIS data layers. With **Alternative 2**, approximately 5,140 acres of green tree replacement clumps would be designated and tracked (Maps 5-8). With **Alternative 3**, approximately 6,580 acres would be designated and tracked (Maps 9-12). Clumps range in size from 2 to 230 acres in size and average approximately 30 acres. Areas designated as green tree replacement clumps would not necessarily be precluded from future harvest. Future treatments would need to retain at least 53 trees per acre greater than or equal to 8 inches dbh (or the largest available). Green tree replacement designation would remain in these areas until understory trees within regeneration units are large enough (10" dbh for lodgepole pine and 15" dbh for ponderosa pine) to provide suitable snag habitat. This could take up to 60 to 80 years.

To access some units proposed for harvest, currently closed roads would need to be opened (see Maps 5-12). For both action alternatives, approximately 1.5 to 2 miles of currently closed roads would need to be re-established.

Temporary roads would be needed to access some units proposed for harvest (see Maps 5-12 for approximate locations). All temporary roads would be located on pre-existing, unclassified road prisms. These locations, which were used during prior harvest activities, are currently not passable due to soil berms, vegetation and/or past subsoiling activities. Dozers would be used to remove berms and vegetation and smooth the road prism. For **Alternative 2**, approximately 39 miles of temporary roads would be needed. For **Alternative 3**, approximately 33 miles would be needed. Following completion of harvest operations, the timber purchaser would be required to close temporary roads. Closures would be accomplished by using a dozer to push soil into berms. Post-harvest subsoiling could occur as much as 3 to 4 years following harvest operations. At the time of subsoiling, berms blocking temporary roads would be removed. Following subsoiling, temporary roads would be closed for the final time by pushing soil into berms or by camouflaging with logs and woody debris. Camouflaging, particularly in scenic views, would generally be the preferred method. No new road construction is proposed.

Felling and removal of trees would be done using ground-based equipment. Trees would generally be felled using a ground-based machine equipped with a felling head. The machine would be track-mounted or rubber-tired. The felling head would be boom-mounted or fixed. Felled trees would be whole-tree yarded to landings using track-mounted or rubber tire skidders. To minimize increasing detrimental soil disturbance, skid trails and landings used for the prior harvest would be used where possible. In some cases, this would mean using skid trails and landings that have been subsoiled. Slash generated at the landings would be machine piled and burned. Burning will be conducted in compliance with National Ambient Air Quality Standards and Oregon Department of Forestry Smoke Management regulations and restrictions. Burning would occur during favorable existing and forecasted weather conditions to assure smoke dispersion away from the city of La Pine.

The following actions would occur within 5 years of the decision: 1) removal of overstory trees, 2) the piling and burning of activity created slash, and 3) the opening and reclosing of roads. Within 7 to 9 years of the decision, landings and skid trails would be subsoiled as needed to mitigate soil compaction in excess of LRMP Standards and Guidelines. Within 8 to 10 years of the decision, subsoiled landings, skid trails, and temporary roads would be monitored for noxious weeds.

Mitigations Common to Alternatives 2 and 3

Mitigation measures are specific actions that could be taken to minimize, avoid or eliminate potentially significant impacts on the resources that would be affected by the alternatives, or rectifying the impact by restoring the affected environment (40 CFR 1508.02). The following design features and mitigation measures were developed to ease some of the potential impacts the various alternatives may cause. They would be applied

to both action alternatives. These mitigation measures and design elements are considered in the effects analysis.

The effectiveness of each measure is rated as high, moderate, or low to provide a qualitative assessment of expected effectiveness that the implemented practice will have on preventing or reducing impacts on resources. Effectiveness ratings are based on the following criteria:

a) Literature and Research,
b) Administrative Studies (local or within similar ecosystem),
c) Experience (judgment of qualified personnel by education and/or experience), and
d) Fact (obvious by reasoned, logical response).

HIGH: Practice is highly effective (greater than 90%), meets one or more of the rating criteria, and documentation is available.

MODERATE: Documentation shows that practice is 75 to 90 percent effective; or Logic indicates that practice is highly effective, but there is no documentation. Implementation and effectiveness of this practice needs to be monitored and the practice will be modified if necessary to achieve the mitigation objective.

LOW: Effectiveness is unknown or unverified, and there is little or no documentation; or applied logic is uncertain and practice is estimated to be less than 60 percent effective. This practice is speculative and needs both effectiveness and validation monitoring.

Soils

1. Minimize the extent of new soil disturbance from mechanical treatments by implementing some or all of the following design features:

a) Use existing log landings and skid trail networks (whenever possible). Subsoiling treatments have rehabilitated disturbed soil on roads and logging facilities in portions of some activity areas and vegetative cover currently exists to minimize surface erosion. Avoid re-use of previously subsoiled areas, as much as possible, to protect established vegetative cover and minimize surface erosion.
b) Designated locations for new trails and landings need to best fit the terrain and minimize the extent of soil disturbance.
c) Maintain spacings of 100 to 150 feet for all primary (main) skid trail routes, except where converging at landings. Closer spacings due to complex terrain must be approved in advance by the Timber Sale Administrator. Main skid trails have typically been spaced 100 feet apart (11% of the unit area) from 1994 to present. For the larger activity areas (greater than 40 acres) that can accommodate wider spacing distances, it is recommended that distance between main skid trials be increased to 150 feet to reduce the amount of detrimentally disturbed soil to 7 percent of the unit area (Froehlich, 1981, Garland, 1983). This would reduce the amount of surface area where restoration treatments, such as subsoiling, would be required to mitigate impacts to achieve soil management objectives.

d) Restrict skidders and tractors to designated areas (i.e., roads, landings, designated skid trails), and limiting the amount of traffic from other specialized equipment off designated areas. The use of specialized machinery will be authorized to make no more than two equipment passes on any site-specific area to accumulate materials.
e) Use of directional felling techniques from pre-approved skid trails, and suspending the leading end of logs during skidding operations.
f) Avoid equipment operations during times of the year when soils are extremely dry and subject to excessive soil displacement.
g) Avoid equipment operations during periods of high soil moisture, as evidenced by equipment tracks that sink deeper than during dry or frozen conditions.
h) Operate equipment over frozen ground or a sufficient amount of compacted snow to protect mineral soil. Equipment operations should be discontinued when frozen ground begins to thaw or when there is too little compacted snow and equipment begins to cause soil puddling damage (rutting).

(**Effectiveness: High**)

2. Restrict mechanical disturbance on slopes greater than 30 percent to designated areas (i.e., roads, landings, designated skid trails) at all times and require operators to winch logs to skidders. Hand felled trees shall be directionally felled toward pre-approved skid trails. Exceptions for areas that make up less than 10 percent of an activity area would be subject to Forest Service approval. Assure that water control structures are installed and maintained on skid trails that have gradients of 10 percent or more.

Portions of the following five units proposed for mechanical treatment contain slopes greater than 30 percent:

Alternative 2: Unit 296

Alternatives 2 and 3: Units 25, 83, 84, and 97

(**Effectiveness: High**)

3. Assure that water control structures are installed and maintained on skid trails that have gradients of 10 percent or more. Ensure erosion control structures are stabilized and working effectively. (**Effectiveness: High**)

4. In all proposed activity areas, locations for new yarding and transportation systems would be designated prior to the logging operations. This includes temporary roads, spur roads, log landings, and primary (main) skid trail networks. (**Effectiveness: Moderate**)

5. Minimize the erosive effects of concentrated water through the proper design and construction of temporary roads. (**Effectiveness: Moderate**)

6. Reclaim temporary roads, log landings and primary (main) skid trails within some of the proposed activity areas to reduce the cumulative amount of detrimentally compacted soil and meet Regional guidance provided in FSM 2520, R-6 Supplement No. 2500-98-1. Appropriate rehabilitation treatments include the use of subsoiling equipment to loosen compacted soil layers, redistributing humus-enriched topsoil in

areas of soil displacement damage, and pulling available slash and woody materials over the treated surface to establish effective ground cover protection. Reclaim portions of the following 190 activity areas, ranging in size from 3 to 242 acres, which are expected to exceed allowable limits of detrimental soil conditions following the mechanical treatments proposed with this project. Decommission (obliterate) logging facilities that will not be needed for future management. Estimated subsoil acres needed to comply with management direction are included in a unit-specific table in Appendix 2. (**Effectiveness: High**)

Units: 5, 6, 7, 10, 11, 12, 13, 14, 16, 17, 18, 19, 21, 24, 25, 26, 37, 38, 39, 41, 43, 45, 46, 47, 48, 49, 51, 52, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 65, 66, 67, 71, 72, 75, 78, 79, 80, 81, 82, 83, 84, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 101, 102, 103, 105, 107, 108, 109, 111, 113, 114, 116, 118, 119, 120, 121, 122, 123, 126, 128, 130, 131, 133 135, 136, 137, 138, 139, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 154, 155, 156, 160, 161, 162, 163, 164, 165, 166, 168, 170, 173, 174, 175, 176, 177, 178, 179, 180, 182, 185, 188, 189, 190, 191, 194, 195, 196, 200, 201, 203, 204, 205, 206, 209, 210, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 226, 227, 228, 229, 230, 232, 234, 237, 242, 243, 245, 247, 248, 249, 254, 255, 256, 257, 258, 259, 260, 262, 264, 265, 266, 270, 274, 275, 276, 277, 278, 279, 280, 282, 283, 284, 286, 288, 294, 296, and 298.
(Note: Listed units are for both action alternatives. Some units may not apply to each alternative.)

Noxious Weeds

7. Water for dust abatement will be obtained where access to water is weed-free. (**Effectiveness: High**)

8. To reduce or eliminate the introduction of noxious weeds, machinery involved in harvest activities and associated road work must be washed prior to entry into the project area. Use appropriate timber sale contract equipment washing provision. **(Effectiveness: Moderate to High)**

Wildlife

9. Retain all existing snags as supplemental wildlife trees for roosting and foraging except when they pose a hazard, other resource protection, or project logistics (Wildlife and Log Implementation Strategy, Forest Plan S&G WL-38). (**Effectiveness: Moderate)**

10. Active raptor nest stands found before or during management activities will be protected from disturbing activities within ¼ mile (1 mile for the use of explosives) of the nest by restricting site disturbing operations during the following periods:

Cooper's hawk	April 15-August 31 (WL-19) **(Units 163, 184, 188)**
Sharp-shinned	April 15-August 31 (WL-19) **(Unit 283)**

Northern goshawk	March 1-August 31 (WL-3) **(Unit 25)**
Red-tailed hawk	March 1-August 31 (WL-3)
Golden Eagle	January 1-August 31 (M3-15)
Great Gray Owl	March 1 – June 20 (WL-33)

(**Effectiveness: High**)

11. Trees will not be harvested in a 150-200 foot radius around cave entrances and infeeder drainages with slopes less than 30 degrees. There will be no ground disturbing activities on slopes steeper than 30 percent adjacent to cave entrances. Similar buffers will be maintained around direct drainages into caves. This includes sinkholes, cave collapse areas known to open into a cave's drainage system, and perennial, intermittent or ephemeral streams flowing into caves (Forest Plan S&G CV-3). (**Effectiveness: Moderate**) **(Applicable to Unit 21)**

12. Maintain a minimum 300-foot no treatment buffer around guzzlers located within or adjacent to treatment units. **(Effectiveness: High)**
Guzzlers near units: 130, 224, 231, and 282
Guzzlers within unit: 228

13. Where possible, minimize logging operations during spring and early summer (April 15 to July 15) to limit disturbance to nesting birds. (**Effectiveness: Moderate)**

Scenic Views

14. Within the Foreground landscape as seen from the Road 22 scenic corridor, protect all residual vegetation where possible. Fell understory trees damaged during overstory removal as needed to meet visual quality objectives. Felled trees would be lopped and scattered or handpiled and burned. (**Effectiveness: High**)

15. Flush cut stumps in treatment units within immediate foreground (within 300 feet) of the Road 22 scenic corridor to reduce treatment visibility. (**Effectiveness: High**)

16. Where possible, design and locate parallel skid trails and landing areas at least 300 feet from the Road 22 scenic corridor to reduce visibility to casual forest visitors. (**Effectiveness: High**)

17. Minimize ground disturbance within the Foreground sensitive viewing areas to reduce soil contrast that may adversely affect scenic quality. (**Effectiveness: High**)

18. Along the Road 22 scenic corridor, slash treatment, including the burning of landing piles and the treatment of damaged trees (Mitigation Measure 14), shall be completed within two years of mistletoe treatment. (**Effectiveness: High**)

Heritage Resources

19. All cultural or heritage resources that are or have potential for eligibility on the historic register would be avoided. Any discoveries of cultural or heritage resources made during project operations would be protected by avoidance and evaluated by heritage resource personnel. **(Effectiveness: High)**

Public Health and Safety

20. Within harvest units, retain green tree replacements no closer than 100 feet from open roads to reduce future safety hazard when trees die. **(Effectiveness: High)**

Sensitive Plants

21. To avoid known populations of *Botrychium pumicola* (BOPU) located outside and adjacent to treatment unit 232, flag known BOPU site location prior to sale preparation and logging activities. **(Effectiveness: High)**

Recreation

22. To retain the existing character of dispersed campsites, minimize ground disturbance and damage to vegetation in and near dispersed campsites. For larger, or heavy use sites, avoid the immediate area within 100 feet of campsite center. **(Effectiveness: High)**

23. To maintain snow cover on designated snowmobile trails, do not allow snowplowing or winter haul on the following dual-use snowmobile trails/roads from December 1 to March 31:

Newberry Snowmobile Trail #2

- Road 2121, north from the junction with Road 2225
- Road 2125
- Road 2225, north from the junction with Road 2125

Newberry Snowmobile Trail #65

- Road 2121-200
- Road 2225-400
- Road 2225-490

(Effectiveness: High)

24. To maintain "reassurance" trail markers (metal diamonds tags nailed to trees) located along designated snowmobile trails implement one or a combination of the following:

a) Retain all overstory trees with "reassurance" trail markers that are not infected with dwarf mistletoe,
b) Move "reassurance" trail markers from overstory trees infected with dwarf mistletoe to overstory trees that are either: 1) not infected with dwarf mistletoe or 2) are not proposed for treatment, or
c) Retain overstory trees with "reassurance" trail markers that are infected with dwarf mistletoe. Count these trees as contributing towards meeting green tree replacement requirements.

(Effectiveness: High)

25. To reduce the visible results of management activities along designated snowmobile trails, minimize the amount of leave tree marking paint that would be visible from snowmobile trails. **(Effectiveness: High)**

Roads

26. At any time during the implementation of harvest treatments, limit miles of open temporary road within the Long Prairie Project area to less than 4 miles. Include in the timber sale contract(s) provisions that provide for the timely closure of temporary roads. Objective is to reduce potential for vehicle travel to expand beyond established road system, thereby reducing potential for wildlife disturbance, noxious weed spread, and OHV use. **(Effectiveness: Moderate)**

Mitigation Specific to Alternative 3

Public Health and Safety

1. To reduce risk of girdled trees falling on travel routes or dispersed campsites, use treatments other than girdling within 100 feet of open roads, designated snowmobile trails, and dispersed campsites. **(Effectiveness: High)**

Connected Actions Common to Alternatives 2 and 3

1. **Stocking Surveys.** Following overstory treatments, survey stands to monitor understory stocking.

2. **Whipfelling**. Following overstory treatments, fell undesirable understory whips (low vigor, live crown ratios less than 40 percent, and/or mistletoe infected) in the following units: 16 (Alternative 3), 65, 89, 229, and 288 (Alternatives 2 and 3). With Alternative 2, treatment would total 320 acres. With Alternative 3, treatment would total 345 acres.

3. **Noxious Weed – Pulling.** If noxious weeds are found during the monitoring (Monitoring Item 2) of subsoiled skid trails and landings (Mitigation Measure 6), weeds would be pulled if the infestation is manageable. Weeds pulled during or after the flowering/fruiting period would be bagged and removed for off-site disposal.

4. **Soil Restoration/Enhancement.** Within units proposed for soil rehabilitation (Mitigation Measure 6) and as funding allows, conduct soil rehabilitation treatments in excess of amounts specified for mitigation. Additional rehabilitation would further reduce the cumulative amount of detrimentally compacted soil within activity areas. This would result in a net improvement in soil quality over a larger portion of the treatment areas.

Monitoring Common to Alternatives 2 and 3

Project monitoring includes "implementation monitoring" to assure the selected alternative and mitigation measures are implemented on the ground as designed and achieve the desired results. Monitoring also includes "effectiveness and validation monitoring" to confirm assumptions used for effects analysis.

Item 1. Scenic Views Monitoring

Objective: Maintenance of desired views along Road 22.
Monitoring Elements: Landing location and skid trail orientation. Understory tree condition.
Area of Consideration: Units adjoining Road 22.
Suggested Methodology: Ocularly survey at start of harvest activities to assure landings and skid trails are located in visually desirable locations. Ocularly survey following harvest activities to assess extent of damage to understory and initiate treatments to fall damaged trees detracting from visual quality objectives.

Item 2. Noxious Weed Monitoring

Objective: Prevent establishment or spread of noxious weeds.
Monitoring Elements: Presence of noxious weeds.
Area of Consideration: Subsoiled skid trails and landings.
Suggested Methodology: Ocularly survey for 2 years following subsoiling.

Item 3. OHV Monitoring

Objective: Monitor assumptions used to predict how harvest treatments will affect OHV use of adjacent steep slopes or allocated old growth areas. Does the closing of temporary roads and/or the subsoiling of temporary roads and skid trails limit their use by OHVs? Do residual understory trees limit OHV access through harvest units to the adjacent steep slopes or allocated old growth areas?
Monitoring Elements: Steep slopes or allocated old growth areas with potential to be accessed by OHVs through the following harvest units:

Alternative 2
Units adjacent to steep slopes: 5, 7, 25, 30, 48, 97, 130, 194, 217, 250, 283, 295, 296, 298
Units adjacent to allocated old growth areas: Units 105 and 151.
Alternative 3
Units adjacent to steep slopes: 7, 25, 18, 48, 97, 106, 130, 188, 250, 279, 283, 298.
Units adjacent to allocated old growth areas: 151

Type of Monitoring: Effectiveness and Validation monitoring
Methods/Parameters: Visual observations
Frequency/Duration: Annually for 1 to 2 years following completion of harvest and/or subsoiling.
Projected Costs: $750 (5 days @ $150/day) annually
Responsibility: District recreation personnel

Item 4. Temporary Road Monitoring

Objective: To assure that temporary roads are being closed in a timely manner.
Monitoring Elements: Miles of open temporary roads within the Long Prairie project area (Mitigation Measure 26).
Type of Monitoring: Implementation monitoring.
Methods/Parameters: Visual observations
Frequency/Duration: Weekly, or as needed, during the life of the timber sale(s).
Responsibility: Timber Sale Administrator

Opportunities Common to Alternatives 2 and 3

Opportunities exist to implement prior decisions to close roads within the Long Prairie project area (Appendix 3, Current and Foreseeable, Road Closures). One such opportunity would be to use the timber sale contract(s) to implement prior road closure decisions. A map identifying prior road closure decisions is on file in the project record.

Alternatives Considered but Eliminated from Further Analysis

1. Restoration treatment that does not utilize commercial logging.
   While this alternative would meet part 1 of the stated purpose and need, it would not meet part 2, "Provide commercial forest products to the economy in support of the Forest Service's legally mandated mission."

2. Controlled reintroduction of fire to return dwarf mistletoe to HRV levels.
   This alternative would not be a feasible method to reduce spread of mistletoe from overstory to understory trees (Part 1 of the stated purpose and need). Understory trees are too small to be resistant to wildfire. The historic role of fire in ponderosa pine stands was to eliminate mistletoe infected understories. Additionally, this alternative would not meet part 2 of the stated purpose and need, "Provide commercial forest products to the economy in support of the Forest Service's legally mandated mission."

3. Understory thinning.
   This alternative would not meet either part 1 or part 2 of the stated purpose and need. Part 1, "Reduce the spread of dwarf mistletoe from overstory trees to understory trees within areas previously harvested and regenerated to increase the likelihood of: a) developing larger diameter trees desired for timber production and favored by or depended upon by many wildlife species, and b) having healthy, full crowned trees desirable for scenic views," would not be met because the infected overstory would not be removed, so the risk of spreading mistletoe from the overstory to the understory would remain. Part 2, "Provide commercial forest products to the economy in support of the Forest Service's legally mandated mission," would not be met because a precommercial thin of the understory would not provide timber products to the economy.

4. Don't reuse existing skid trails and landings.
   This alternative was eliminated from further analysis because it would not be desirable to impact additional ground within the units. Restricting vehicle and machinery access to existing skid trails and landings would minimize additional soil and vegetation impacts within the units.

5. Remove overstory greater than 21" dbh.
   For the ponderosa pine plant association group, the amount of late or old structural stage is currently below the Historic Range of Variability. According to Interim Management Direction, all remnant late and old seral and/or structural live trees greater than or equal to 21" dbh that currently exist within the stands proposed for harvest activities are to be maintained. The Regional Forester recently (June 11, 2003) issued guidance for implementing Eastside Screens (Interim Management Direction). While the direction indicates some flexibility in implementing 21" diameter limitations is appropriate, it confirms the objective of increasing the number of large trees and LOS stands on the landscape. Within units proposed for treatment, there are relatively few trees greater than 21" dbh infected with dwarf mistletoe. It is not necessary to remove these trees to adequately meet the purpose and need for reducing mistletoe spread to understory trees.

Comparison of Alternatives

This section summarizes differences between alternatives. Table 2 highlights how overstory treatments and green tree replacement strategies differ by alternative. Table 3 highlights different levels of effects or outputs, with specific reference to the purpose and need for action and the issue used to frame alternatives.

Table 2. Comparison of proposed overstory treatment by alternative.

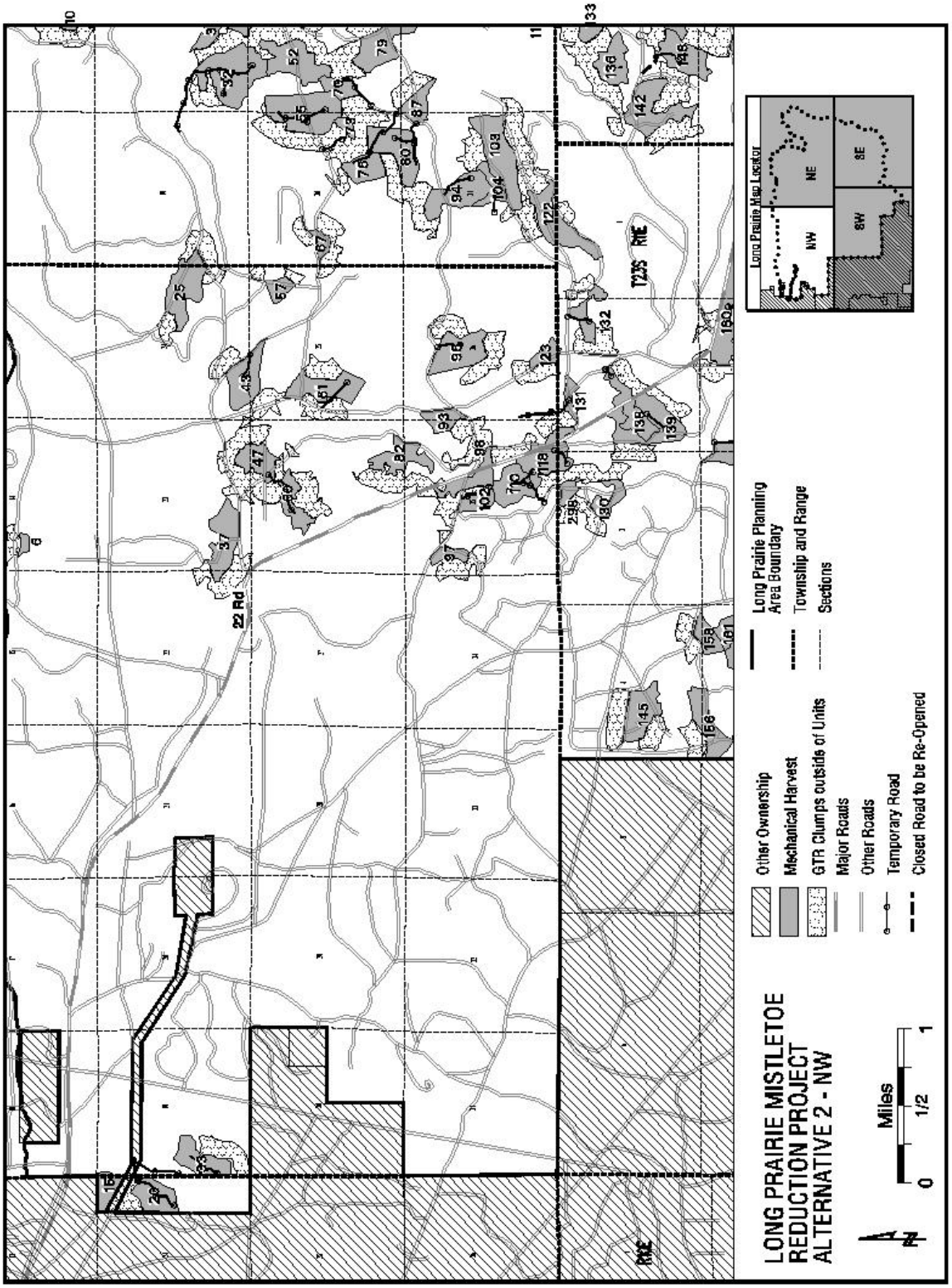
Overstory Treatment	Green Tree Replacement (GTR) Strategy	Alternative 2		Alternative 3	
		Acres	Percent of Total	Acres	Percent of Total
Lodgepole Pine Overstory					
Remove live lodgepole pine overstory trees ≥4 and <21 inches dbh excess to green tree replacement strategy.	Retain 3 lodgepole pine per acre ≥8 inches dbh. If present, ponderosa pine and white fir will provide additional GTRs.	7,070	86%	3,984	35%
	Retain lodgepole pine overstory without dwarf mistletoe in clumps within treatment unit.			1,203	10%
Remove live lodgepole pine overstory trees ≥4 and <21 inches dbh.	No retention of lodgepole pine is necessary. Ponderosa pine and white fir to provide GTRs.			648	6%
	No retention of lodgepole pine is necessary. Retain lodgepole pine overstory in clumps located outside treatment unit.			105	1%
Remove live lodgepole pine overstory trees ≥4 and <21 infected with dwarf mistletoe.	Retain lodgepole pine without dwarf mistletoe.			561	5%
Ponderosa Pine Overstory					
Remove live ponderosa pine overstory trees ≥4 and <21 inches dbh excess to green tree replacement strategy.	Retain 3 ponderosa pine per acre ≥8 inches dbh. If present, lodgepole pine and white fir will provide additional GTRs.	18	<1%		
Remove live ponderosa pine overstory trees ≥4 and <21 inches dbh infected with dwarf mistletoe.	No retention of ponderosa pine is necessary. Lodgepole pine to provide GTRs.			24	<1%
Lodgepole/Ponderosa Pine Overstory					
Remove live lodgepole and ponderosa pine overstory trees ≥4 and <21 inches dbh excess to green tree replacement strategy	Retain 3 lodgepole or ponderosa pine per acre ≥8 inches dbh. If present, white fir will provide additional GTRs	1,091	13%	1,320	12%
Remove live lodgepole and ponderosa pine overstory trees ≥4 and <21 inches dbh infected with dwarf mistletoe.	Retain lodgepole and ponderosa pine without dwarf mistletoe.			20	<1%
Girdle, prune, or fall and retain mistletoe infected lodgepole or ponderosa pine overstory trees ≥4 inches dbh.	Retain lodgepole and ponderosa pine without dwarf mistletoe.			3,590	31%
Total Treatment		8,179	99%	11,455	100%

Table 3. Comparison of alternative outputs or effects.

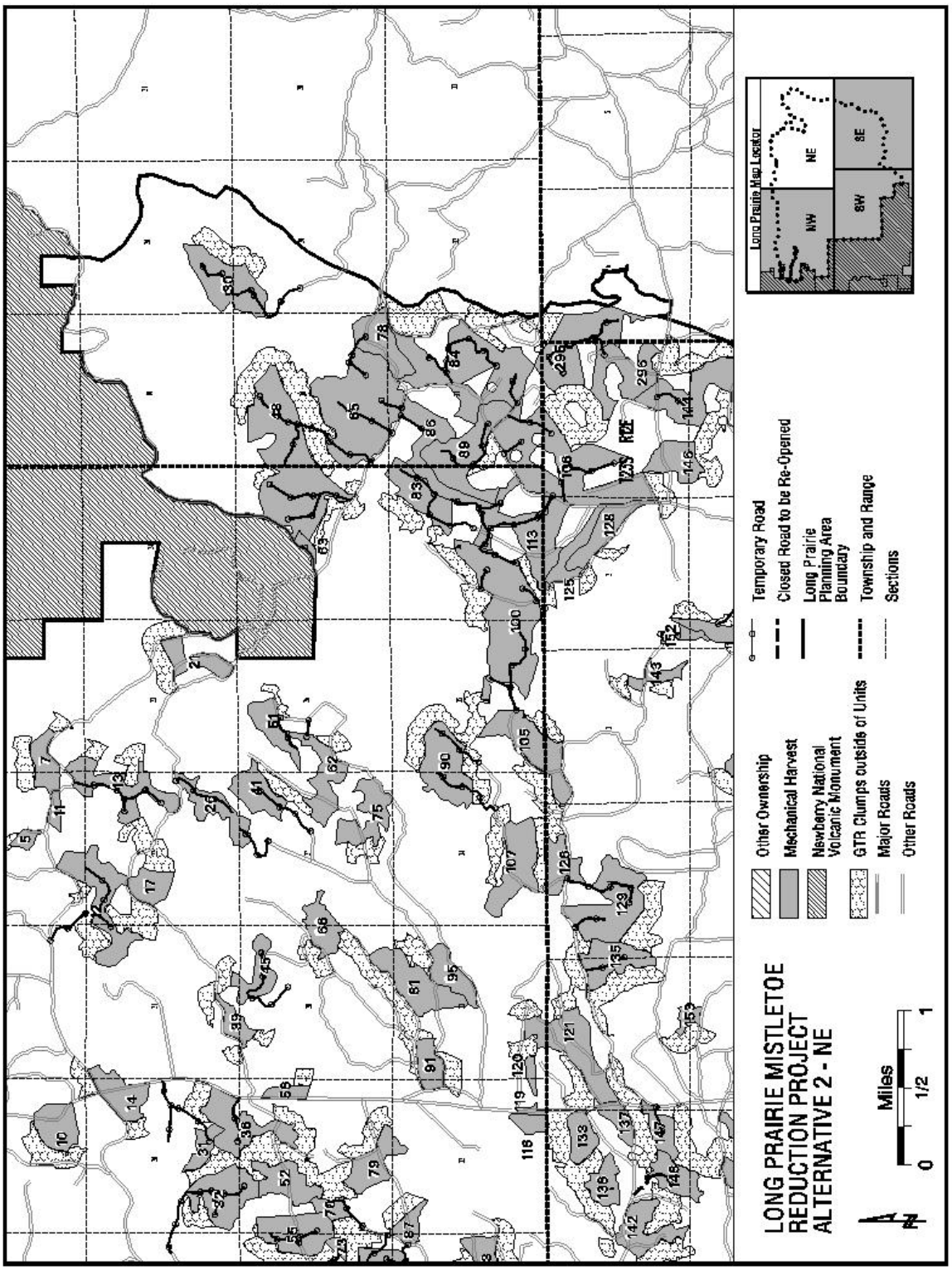
	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3
Alternative Summary			
Treatment Acres by Management Allocation			
General Forest (GFO)	0 acres	7,573 acres	10,572 acres
Scenic Views			
Foreground – Partial Retention (SV2)	0 acres	528 acres	804 acres
Middleground – Partial Retention (SV4)	0 acres	79 acres	79 acres
Scenic Views Subtotal	0 acres	607 acres	883 acres
Treatment Method			
Commercial harvest	0 acres	8,180 acres	7,865 acres
Girdle/Prune/Fell and retain on site	0 acres	0 acres	3,590 acres
Treatment of trees without dwarf mistletoe (DMT)			
Remove trees with and without DMT	0 acres	8,180 acres	6,081 acres
Retain trees without DMT	0 acres	0 acres	5,374 acres
Clumps retained outside treatment units to provide Green Tree Replacements (GTRs)	0 acres	5,140 acres	6,580 acres
Estimated miles of temporary road construction	0 miles	39 miles	33 miles
Subsoiling to reduce detrimental soil compaction	0 acres	386 acres	422 acres
Purpose and Need for Action			
Proposed Mistletoe Treatment Acres	0 acres	8,180 acres	11,455 acres
Estimated Wood Fiber Volume to be harvested	0 CCF 0 MMBF	11,400 CCF 5.9 MMBF	11,000 CCF 5.7 MMBF
Cavity Nester Issue			
GTRs within all areas considered for treatment			
Average Condition			
• Trees per acre (Weighted Average)	21 tpa	11 tpa	11 tpa
• Trees per acre % of desired level (31 tpa[2])	68%	35%	35%
Range of Conditions			
• Relatively high levels of GTRs (>17 GTR/acre)			
▪ Acres	11,630 acres	3,450 acres	5,513 acres
▪ % of total treatment acres	100%	30%	47%
• Relatively low levels of GTRs (2-6 GTR/acre)			
▪ Acres	0 acres	8,180 acres	6,117 acres
▪ % of total treatment acres	0%	70%	53%
GTRs within units and adjacent GTR clumps	Not applicable	32 trees/acre	31 trees/acre
GTRs within project area	35 trees/acre	31 trees/acre	30 trees/acre
Black-backed and Three-toed woodpecker habitat in cavity nester analysis area[1] (Acres)	13,971	13,971	13,955
Black-backed woodpecker marginal habitat in cavity nester analysis area[1] (Acres)	37,217	36,852	36,365
Economic Efficiency			
• Timber Sale Preparation Costs			
$ per hundred cubic foot volume (ccf)	---	$8.00/ccf	$8.75/ccf
$ total sale volume	$0.00	$91,200	$96,250
• Fell/Girdle/Prune Costs	---	---	$215,400
• Returns to Government (Total Timber Value)	$0.00	$326,937	$292,919
• Benefit/Cost Ratio	---	1.15	1.01
• Present Net Value	-$70,000	$37,158	$2,131
• Jobs maintained or created	0	57	51

[1]Description of cavity nester analysis area on pages 56 to 57.

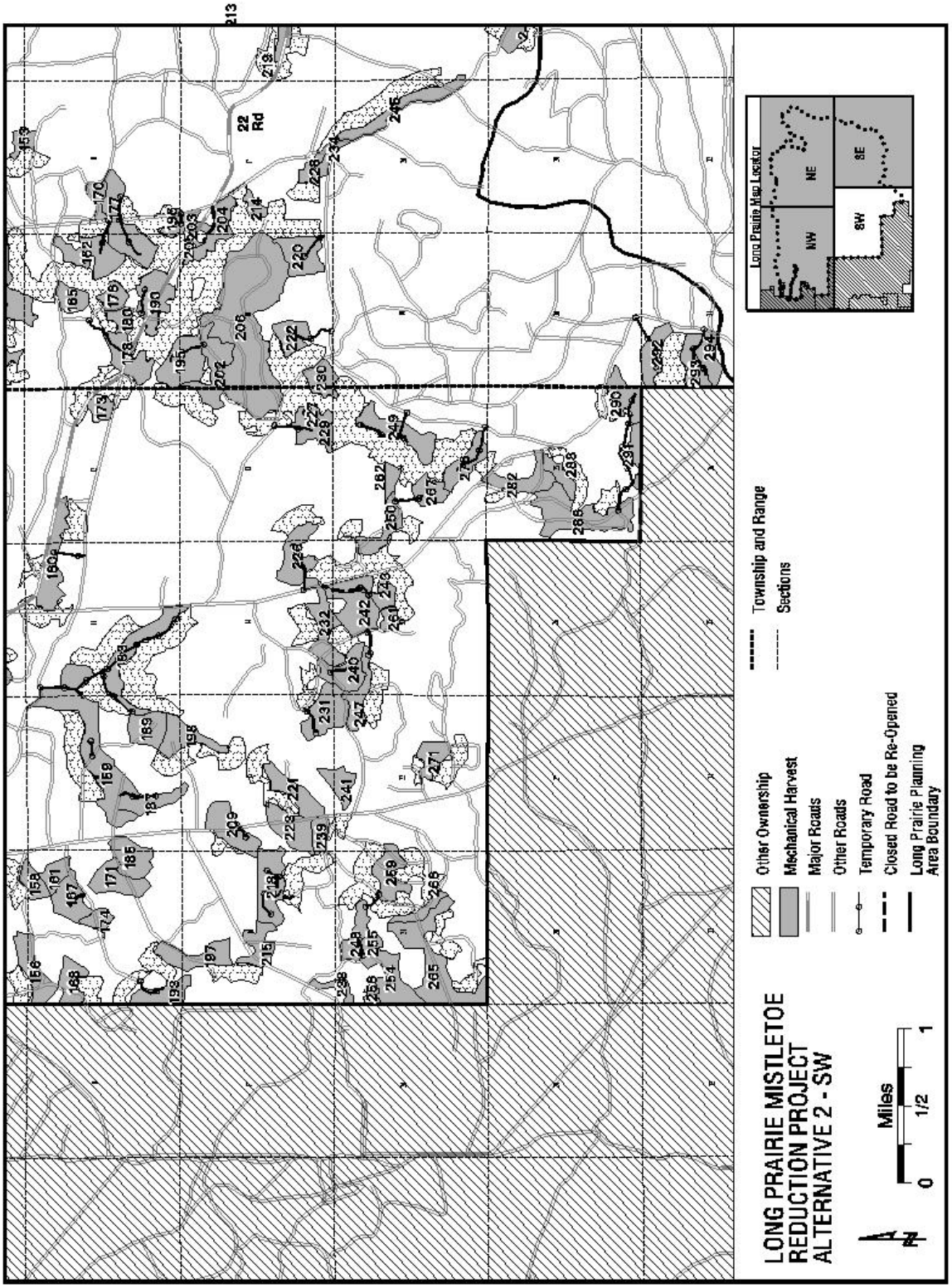
[2]Weighted average. GTR direction in lodgepole pine (LP, 33 tpa) and ponderosa pine/mixed conifer (PP/MC, 25 tpa) (Table 11) weighted by the percent of treatment in each vegetation type (Table 4. Alternative 2: 76% LP; 24% PP/MC. Alternative 3: 72% LP; PP/MC: 24-28%).



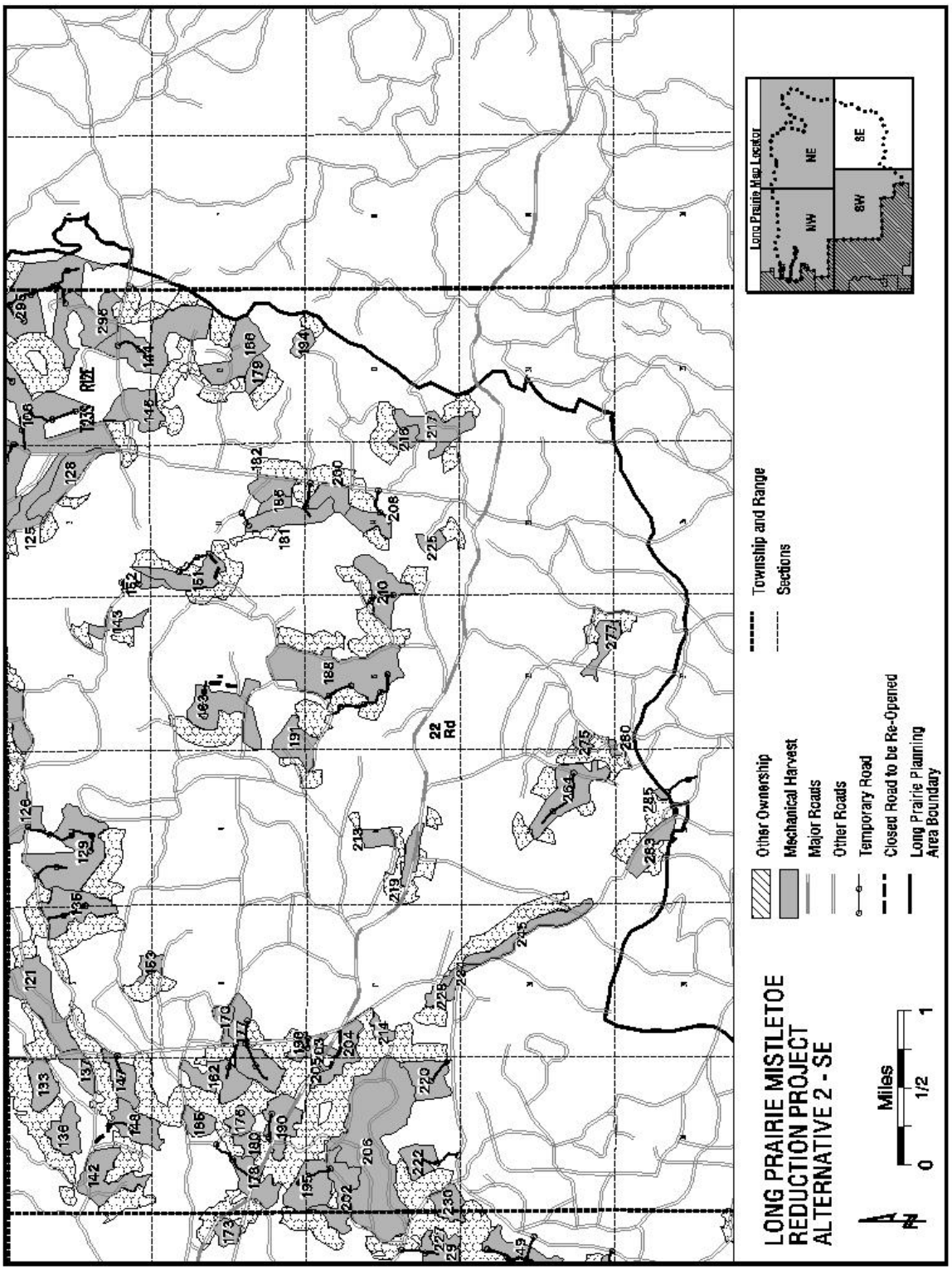
Map 5. Alternative 2, Northwest Quarter.



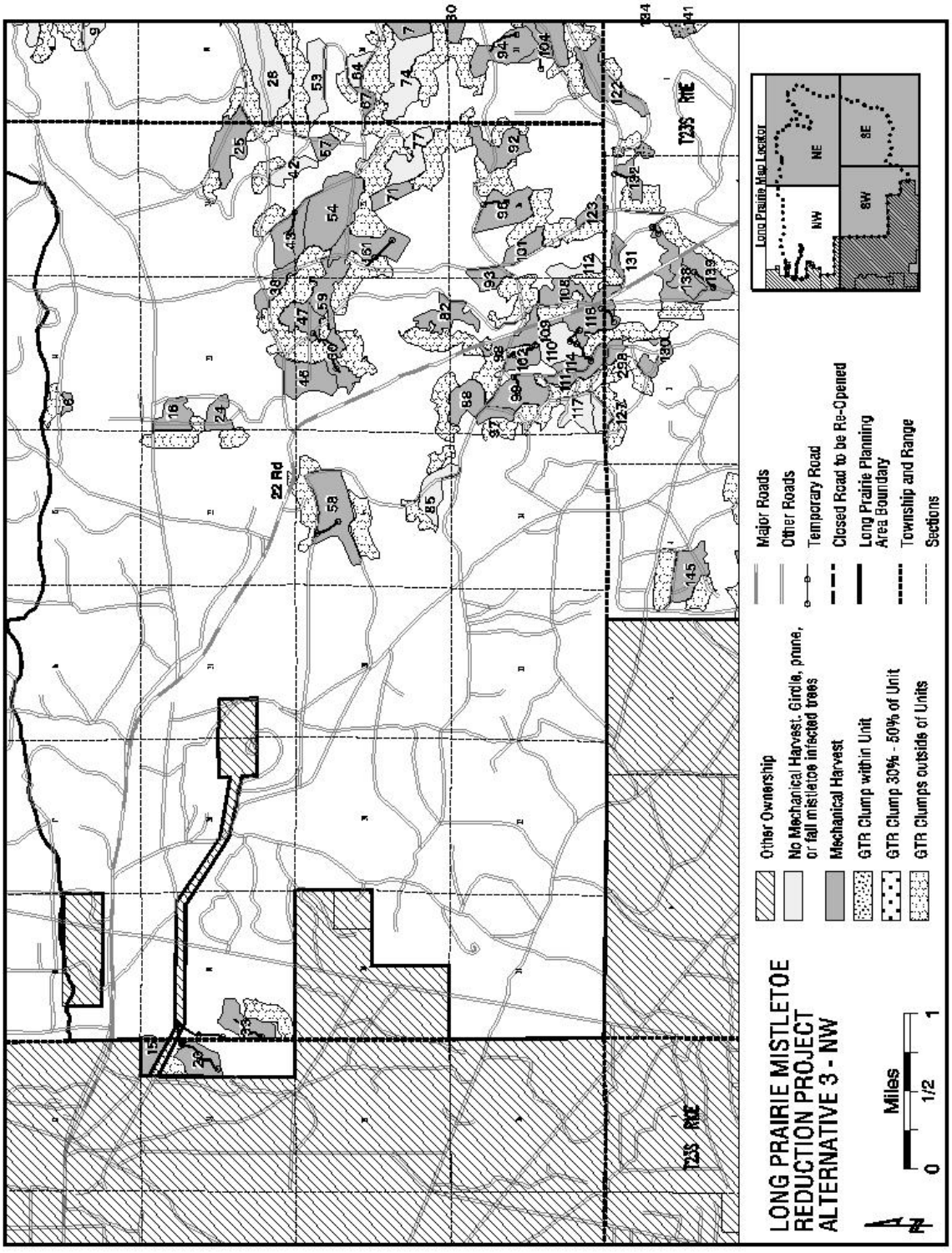
Map 6. Alternative 2, Northeast Quarter.



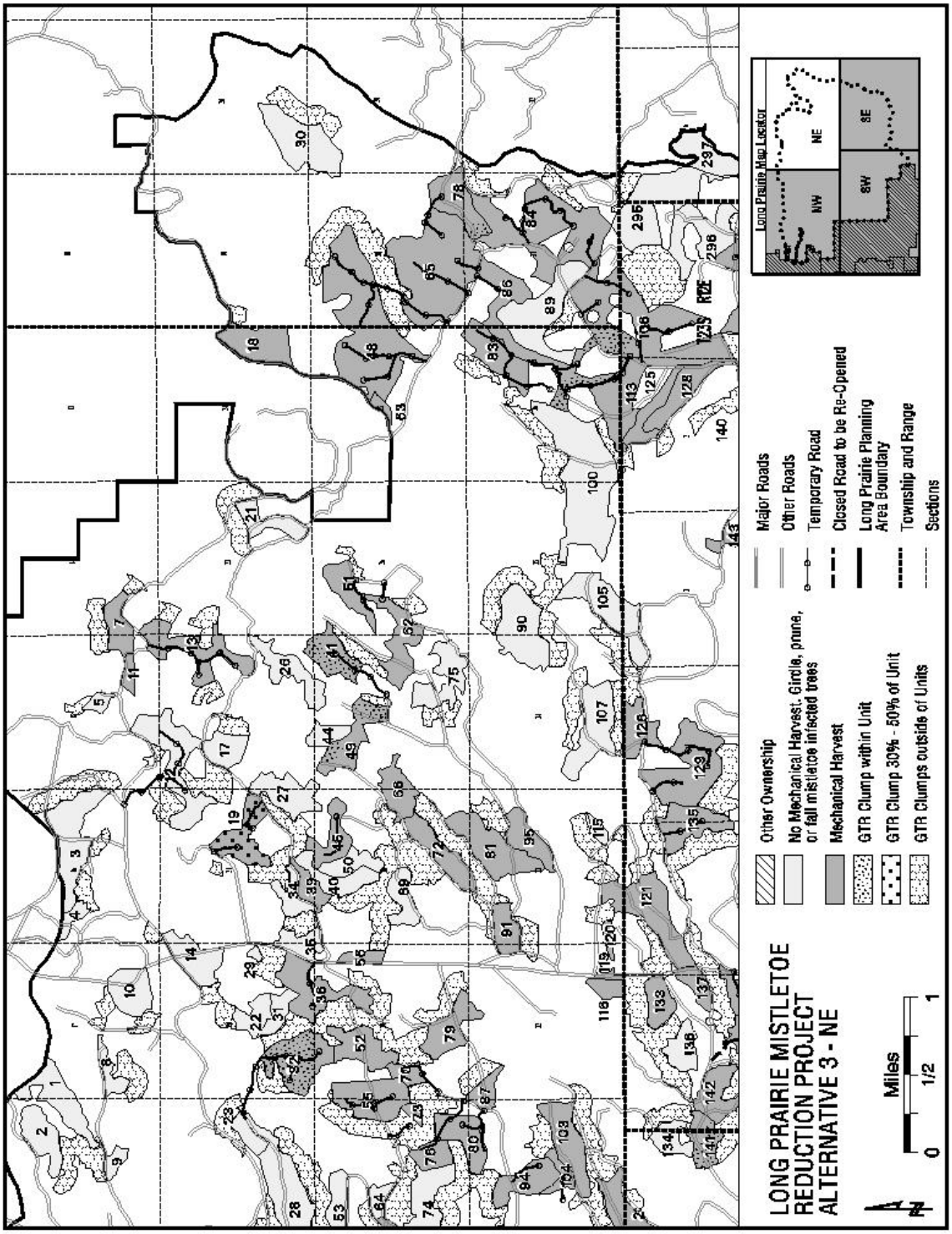
Map 7. Alternative 2, Southwest Quarter.



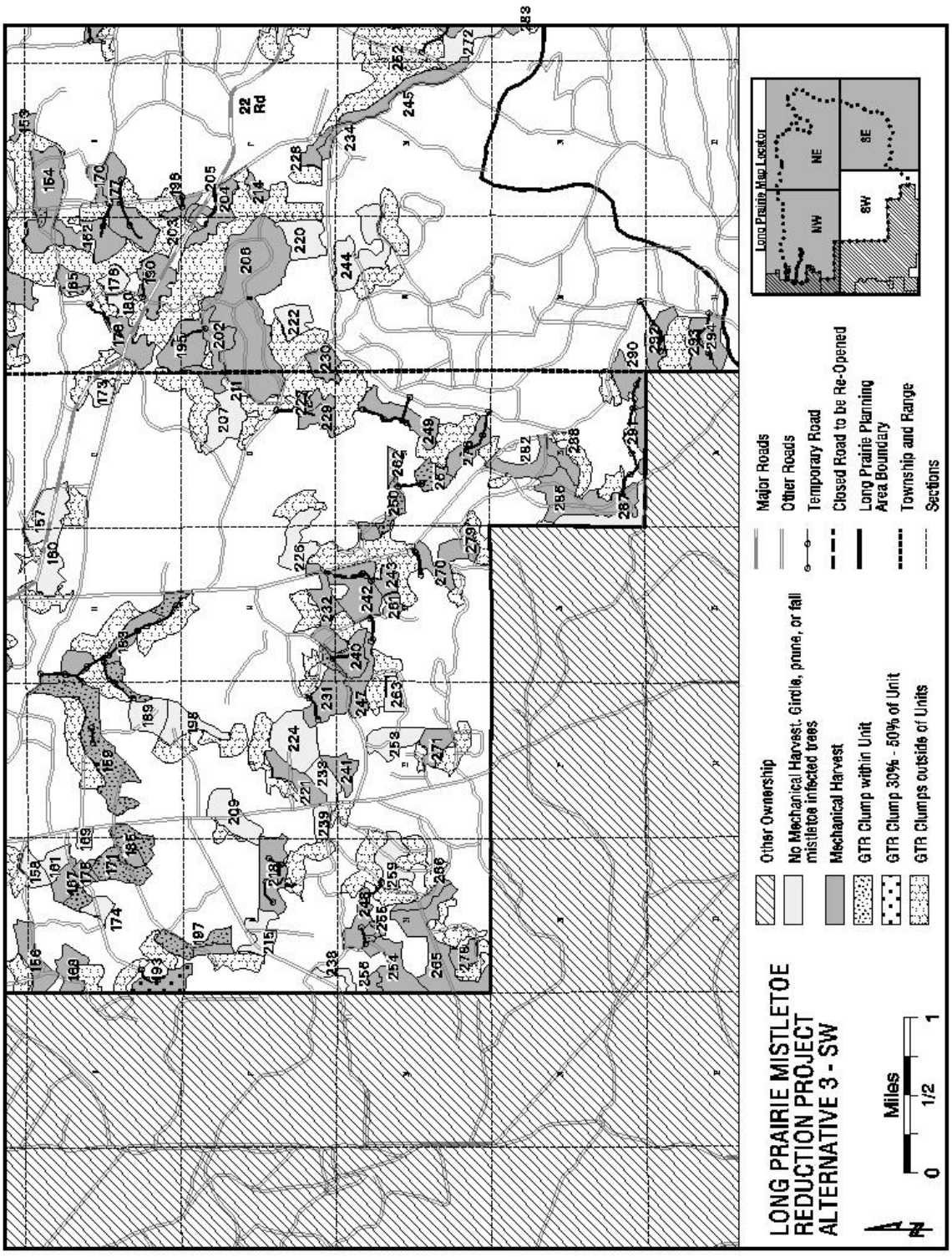
Map 8. Alternative 2, Southeast Quarter.



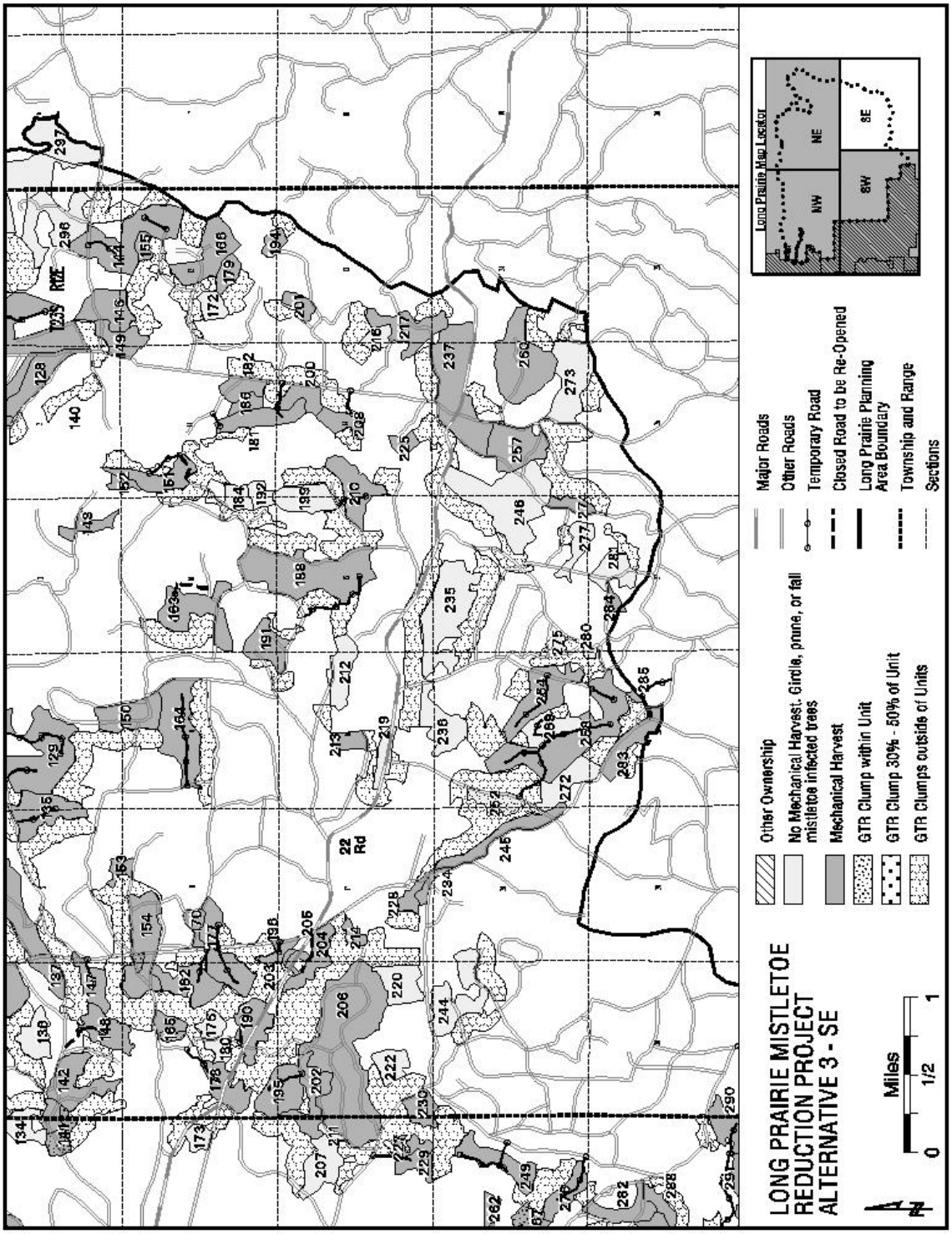
Map 9. Alternative 3, Northwest Quarter.



Map 10. Alternative 3, Northeast Quarter.



Map 11. Alternative 3, Southwest Quarter.



Map 12. Alternative 3, Southeast Quarter.

ENVIRONMENTAL CONSEQUENCES

This section summarizes the physical, biological, social and economic environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for comparison of alternatives presented in Table 2. For the cumulative effects analysis, consideration of past actions followed guidance provided by the Council of Environmental Quality (June 24, 2005 Memorandum from James L. Connaughton, Project Record). Ongoing and reasonably foreseeable future actions considered in the cumulative effects analysis are listed in Appendix 3. With the No Action Alternative, it is assumed the Precommercial Thinning project (Appendix 3), which would overlap areas proposed for treatment with the Long Prairie project, would not occur. Where pertinent, analysis is tiered to the FEIS of the Deschutes Forest Plan.

Vegetation/Trees

The Silviculturist Report for the Long Prairie Mistletoe Reduction Project (Project Record, written by Barbara P. Schroeder and dated September 20, 2004) is incorporated by reference and summarized below.

Existing Condition

Table 4 shows the distribution of plant association groups (PAGs) and non-forest groups within the Long Prairie Project area. PAGs combine plant associations (Volland 1988) by their climax species, site potential, and temperature and moisture similarities. A listing of how plant associations are grouped into PAGs can be found in Appendix C of the Deschutes National Forest Watershed Evaluation and Analysis for Viable Ecosystems (USDA Forest Service 1994a). Lodgepole pine (*Pinus contorta*) is the dominant conifer species within the project area. Other conifers present include ponderosa pine (*Pinus ponderosa*) and white fir (*Abies concolor*). The three species occur together within the mixed conifer PAG. Lodgepole pine and ponderosa pine can occur together in any of the other PAGs.

Table 4. Vegetation and non-vegetation types within Long Prairie Project area.

Vegetation/Non-Forest Classification	% of Project area	% of Proposed Treatment	
		Alternative 2	Alternative 3
Forest Plant Association Groups (PAGs)			
Lodgepole pine (Wet and dry)	55%	76%	72%
Ponderosa pine (Wet and dry)	36%	22%	25%
Mixed Conifer (Dry)	8%	2%	3%
Non-Forest Groups			
Cinder/Lava/Rocks	1%		
Long Prairie Project area Total	100%	100%	100%

Historic range of variability (HRV) has been defined (USDA Forest Service 1994a) in part as "…the typical proportions of ecosystem elements … over a period of time when the ecosystem was not significantly affected by European settlement and management. HRV is the amplitude or minimum to maximum ranges of "natural conditions"". The Silviculturist Report details the way HRV was estimated for the Long Prairie project area. Estimates are based on cadastral survey notes, dating to the mid to late 1880's, timber type maps, dating from 1913 to 1935, and historic disturbance regimes, including fire, disease, and insects.

Table 5 compares the existing proportion of structural stages to the historic range of variability (HRV). Within the lodgepole pine plant association group (PAG), the amount of understory reinitiation is currently above HRV. All other structural stages, including late or old, are within HRV. Within the ponderosa pine and mixed conifer PAGs, the amount of multi-story without large trees is above HRV. The amount of single-story and multi-story Late or Old Structural stage (LOS) is currently below HRV. All other structural stages are within HRV.

Alternative 1

Direct and Indirect Effects

No treatments would occur to change species composition or proportion of structural stages.

Cumulative Effects

Past disturbances and management actions (described in the existing condition section on pages 10 to13) have influenced the existing proportion of structural stages (Table 5).

The **Gem Timber Sale** (Appendix 3) will reduce the amount of lodgepole pine understory reinitiation structural stage by approximately 170 acres. The amount of ponderosa pine multi-story without large trees will be reduced by approximately 18 acres. There will be a corresponding increase in the amount of stand initiation structural stage. These changes are not great enough to change the proportion of structural stages displayed in Table 5. Other reasonably foreseeable future actions (Appendix 3) will have no cumulative effect on species diversity or existing proportion of structural stages.

Future natural disturbances could change the existing proportion of structural stages. High intensity wildfires have the greatest potential to create rapid, large-scale change. In the event of a high intensity wildfire, more of the stand initiation structural stage would be created. A wildfire or combination of wildfires would need to exceed 4,000 acres in size to put the amount of stand initiation above HRV in the lodgepole pine PAG (Table 6). Wildfires of greater than 100 to 600 acres would increase stand initiation above HRV in the ponderosa and mixed conifer PAGs (Table 6).

Table 5. Comparison of existing structural stage to historic range of variability (HRV).

Structural Stage	Historic Range of Variability (HRV)	Existing Condition Alternative 1 (No Action)		Alternative 2 (Proposed Action)		Alternative 3	
		Acres and % of PAG	Relation to HRV	Acres and % of PAG	Relation to HRV	Acres and % of PAG	Relation to HRV
Lodgepole pine PAG (31,227 acres)							
Stand Initiation	15 – 50%	11,677 ac 37%	Within	15,176 ac 49%	Within	15,041 ac 48%	Within
Stem Exclusion, Closed Canopy	5 – 30%	2,791 ac 9%	Within	2,753 ac 9%	Within	2,758 ac 9%	Within
Understory Reinitiation	5 - 20%	9,417 ac 30%	Above (+10%)	7,255 ac 23%	Above (+3%)	7,330 ac 23%	Above (+3%)
Multi-story without Large Trees	5 – 20%	3,921 ac 13%	Within	2,622 ac 8%	Within	2,677 ac 9%	Within
Multi-story with Large Trees[1]	0 – 15%	2,667 ac 9%	Within	2,667 ac 9%	Within	2,667 ac 9%	Within
Single-story with Large Trees[1]	0 – 5%	754 ac 2%	Within	754 ac 2%	Within	754 ac 2%	Within
Ponderosa pine PAG (19,953 acres)							
Stand Initiation	0 - 15%	2,354 ac 12%	Within	3,676 ac 18%	Above (+3%)	3,629 ac 18%	Above (+3%)
Stem Exclusion, Closed Canopy	0 – 20%	1,588 ac 8%	Within	1,573 ac 8%	Within	1,574 ac 8%	Within
Understory Reinitiation	5 – 35%	5,292 ac 26%	Within	4,855 ac 24%	Within	4,657 ac 23%	Within
Multi-story without Large Trees	0 -20%	9,899 ac 50%	Above (+30%)	9,029 ac 45%	Above (+25%)	9,273 ac 46%	Above (+26%)
Multi-story with Large Trees[1]	5 – 25%	798 ac 4%	Below (-1%)	798 ac 4%	Below (-1%)	798 ac 4%	Below (-1%)
Single-story with Large Trees[1]	20 – 55%	22 ac <1%	Below (-20%)	22 ac <1%	Below (-20%)	22 ac <1%	Below (-20%)
Mixed Conifer PAG (3,999 acres)							
Stand Initiation	0 - 25%	882 ac 22%	Within	956 ac 24%	Within	897 ac 22%	Within
Stem Exclusion, Closed Canopy	0 – 20%	558 ac 14%	Within	557 ac 14%	Within	557 ac 14%	Within
Understory Reinitiation	5 – 35%	759 ac 19%	Within	703 ac 18%	Within	755 ac 19%	Within
Multi-story without Large Trees	0 -25%	1,404 ac 35%	Above (+10%)	1,387 ac 35%	Above (+10%)	1,394 ac 35%	Above (+10%)
Multi-story with Large Trees[1]	10 – 30%	353 ac 9%	Below (-1%)	353 ac 9%	Below (-1%)	353 ac 9%	Below (-1%)
Single-story [1]with Large Trees	15 – 50%	43 ac 1%	Below (-14%)	43 ac 1%	Below (-14%)	43 ac 1%	Below (-14%)

[1] Late or Old Structure (LOS).

Table 6. Wildfire size that would put amount of stand initiation structural stage above historic range of variability.

Plant Association Group (PAG)	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3
Lodgepole pine	>4,060 acres	>300 acres	>625 acres
Ponderosa pine	>600 acres	Any size	Any size
Mixed conifer	>120 acres	>40 acres	>120 acres

Alternatives 2 and 3

Direct and Indirect Effects

Proposed treatments would not change existing diversity of tree species. While treatments would reduce overstory stocking, species currently present in the overstory would generally continue to be present in the overstory. Proposed treatments would not change the diversity of tree species in the understory.

Proposed pruning, girdling and felling treatment in Alternative 3 would generally not change the existing structural stage classification. The remaining treatments which would remove overstory trees would change the existing proportion of structural stages within the project area (Table 5). Removal of overstory trees would primarily decrease the amount of understory reinitiation and multi-story without large trees. With these decreases, there would be a corresponding increase in the amount of stand initiation structural stage. While the proportion of structural stages would change, there would generally be no change in the relation to historic range of variability. There would be one exception. Within the ponderosa pine PAG, the amount of stand initiation structural stage would change from being within the historic range of variability to being approximately 3 percent above.

Cumulative Effects

Similar to Alternative 1, past disturbances and management actions (described in the existing condition section on pages 10 to 13) have influenced the existing proportion of structural stages (Table 5).

As described for Alternative 1, the activities associated with the **Gem Timber sale** (Appendix 3) will change structural stages within areas of treatment. The extent of these changes will be small in relation to the Long Prairie project area. Consequently, the proportion of structural stages displayed in Table 4 will not change for Alternatives 2 and 3 when considered in combination with the structural changes resulting from Gem. Other reasonably foreseeable future actions (Appendix 3) will have no cumulative effect on species diversity or existing proportion of structural stages.

High intensity wildfires would have potential to further increase the amount of stand initiation within the project area. Fires of any size within the ponderosa pine PAG, and fires 400 acres (Alternative 2) to 625 acres (Alternative 3) in the lodgepole pine PAG would result in the amount of stand initiation structural stage being above the historic range of variability (Table 6).

Consistency with Management Direction

Consistent with Interim Management Direction (Regional Forester's Forest Plan Amendment #2), the landscape has been characterized by biophysical environment for patterns of stand structure and has been compared to the Historic Range of Variability (HRV) (Table 5 and Silviculturist's Report). No harvest treatments are proposed within stands classified as late or old structure.

The proposed use of even-aged management in lodgepole and ponderosa pine stands is consistent with Forest Plan direction. The Forest Plan identifies that lodgepole pine should be managed using even-aged management (S&G TM-22). It also identifies uneven-aged management is most applicable in stands free of dwarf mistletoe (TM-32) and where dwarf mistletoe can be stabilized indefinitely at low infection levels.

Advanced regeneration present within proposed treatment areas will be retained and managed into the future (S&G TM-42).

Stands proposed for treatment are presently minimally stocked and will meet at least the minimum stocking requirements within 5 years of final overstory removal (S&G TM-49).

According to S&G TM-59, harvest units will no longer be considered openings when trees reach four and one-half feet tall. Within areas proposed for treatment, average height of understory ranges from 2 feet to 16 feet tall. Understory height commonly averages 4 to 5 feet. Proposed treatments will generally not result in newly created forest openings. In units no longer considered openings due to understory height, overstory removal would not create a new opening. In units still considered openings, within 5 years of final removal harvest, height of understory would be approximately four and one half feet and the areas would no longer be considered openings.

Proposed overstory removal in unit 121 could result in an opening that exceeds Forest Plan Standards and Guidelines. This unit is proposed for treatment in both Alternatives 2 and 3. Existing overstory is dense enough that the treatment area is currently not considered an opening. Proposed removal of the overstory could result in a created opening approximately 87 acres in size. This is larger than S&G TM-58 which indicates the Forest will conform to the Regional Guidelines on created forest openings. Regional guidelines allow for openings up to 60 acres when openings need to be expanded larger than 40 acres to avoid mistletoe infection.

Disease

The Silviculturist Report for the Long Prairie Mistletoe Reduction Project (Project Record, written by Barbara P. Schroeder and dated September 20, 2004) is incorporated by reference and summarized below. Also incorporated by reference is the silviculturist input for a mistletoe project previously analyzed on the district (Project Record, written by Barbara P. Schroeder with a final revision date of August 21, 1998).

Introduction

Effects dwarf mistletoes have on their hosts include: 1) reduced height and diameter growth, 2) increased mortality, 3) reduced seed production and reduced seed viability, 4) reduced wood strength and increased knot size, 5) increased susceptibility to attack be insects, particularly bark beetles, and 6) increased flammability (Geils et al. 2002, Hawksworth and Wiens 1996, Hawksworth 1978). Koonce and Roth (1980) describe the following effects mistletoe has on the flammability of ponderosa pine stands:

> Mistletoe may influence the frequency of fire by making stands more flammable. Mistletoe infected branches are often laden with resinous spindles and brooms which form fuel ladders leading to crowning fires. Fallen brooms persist in slash, increasing the amount of large, resinous, partially rotten, highly flammable material. In decadent stands, dwarf mistletoe increases the amount of dry, dead aerial fuel.

Hawksworth and Wiens (1996) identify some ecological effects of mistletoe:

> By inducing formation of witches' brooms and causing topkill and mortality of host trees, dwarf mistletoes affect the species composition, vertical crown structure, and spacing of trees within infected stands. These direct effects, in turn, have numerous consequences on the physical structure and functioning of the ecosystem. For example, the brooms provide forage, nesting, and cover for birds and mammals, but also increase the likelihood of ground fires becoming crown fires. Canopy gaps caused by mistletoe–induced mortality increase within-stand diversity but also reduce the interior-forest area.

Depending on management objectives and priorities, the effects of dwarf mistletoe are interpreted as positive, negative, or usually of mixed consequence (Geils et al. 2002).

According to Geils et al. (2002), the primary means by which a regenerated stand becomes infected with dwarf mistletoe is through infected residual trees left on the site. Other means by which mistletoe can spread, in decreasing order of importance are: infected advanced regeneration, spread from adjacent stands, and long-distance animal vectoring (Geils et al. 2002).

Hawksworth (1978) identifies several characteristics of dwarf mistletoe that make it amenable to control: 1) Dwarf mistletoes are obligate parasites; they need a living host to survive. Once an infected tree or branch is cut, the mistletoe dies, and 2) Dwarf mistletoes are generally host specific.

Hawksworth and Wiens (1996) indicate removing infected overstory trees before regeneration is 1 meter tall or 10 years old is a strategy that reduces the likelihood of dwarf mistletoe spreading into the understory. Geils et al. (2002) also present this as a strategy for preventing spread of mistletoe into cut blocks. A prevention method they also list is to avoid leaving single trees or small clumps of residual infected trees throughout the harvest area. Scattered overstory trees are a significant inoculum source for young, understory regeneration.

Existing Condition

According to the FEIS for the Deschutes LRMP, dwarf mistletoe is widely distributed on the Deschutes National Forest. Based on the 1985 Vegetative Resource Survey, dwarf mistletoe was present on an estimated 34 percent of the inventoried acres of ponderosa pine type and 66 percent of the lodgepole pine type (FEIS, page 3-41). Ponderosa pine dwarf mistletoe (*Arceuthobium campylopodum*) and lodgepole pine dwarf mistletoe (*Arceuthobium americanum*) are widespread throughout the project area. Data from the Current Vegetation Survey (1993 to 1996) indicate lodgepole pine dwarf mistletoe is present on 61 percent of the survey plots that contain lodgepole pine. Ponderosa pine dwarf mistletoe is present on 27 percent of the survey plots in the project area that contain ponderosa pine. Lodgepole and ponderosa pine dwarf mistletoe are present on 19 percent of the plots that contain both lodgepole and ponderosa pine.

Dwarf mistletoe infected overstory is present in all areas proposed for treatment. Stand surveys indicate mistletoe occurrence is variable (Table 7). In approximately 35 percent of the stands surveyed, mistletoe distribution is patchy, with mistletoe infected overstory trees observed on less than 30 percent of the stand. In approximately 25 percent of the stands, infected overstory was observed over 30 to 60 percent of the stand. In the remaining 40 percent of stands, mistletoe is extensively distributed, with infected overstory trees observed in greater than 60 percent of the stand. The majority of treatment units have 4 to 10 infected overstory trees per acre. Approximately 15 to 25 percent of the units have more than ten infected overstory trees per acre. Mistletoe is also present in some understory trees.

Table 7. Dwarf mistletoe distribution in areas evaluated for treatment within the Long Prairie project area.

Alternative	Percent of stand with infected overstory trees			
	<30%	≥30 to 60%	≥60%	Total
Alternative 1 (Existing)				
Acres	3,740	3,075	4,815	11,630
Alternative 2				
Acres (% of Existing)	3,005 (80%)	1,945 (63%)	3,230 (67%)	8,180
Alternative 3				
Acres (% of Existing)	3,685 (98%)	3,030 (98%)	4,740 (98%)	11,455
Acres of Trtmnt retaining trees without mistletoe (% of Existing)	1,935 (52%)	2,214 (72%)	1,225 (25%)	5,374

Alternative 1

Direct and Indirect Effects

Existing lodgepole pine overstory trees in regeneration units could live another 30 to 40 years. Mistletoe infected ponderosa pine could live for 80 years or longer. As long as mistletoe infected overstory trees are present, understory trees would continue to be exposed to mistletoe seed. The number of understory trees infected with dwarf mistletoe would increase (mistletoe spread). Mistletoe spread to understory trees would also occur along the edge of stands where adjacent trees are infected with mistletoe. Birds and mammals would continue to spread minor amounts of mistletoe seed into the interior of the unit. In addition to mistletoe spread, there would be an increase in the number of mistletoe plants on infected understory trees (mistletoe intensification). As mistletoe

intensifies in the understory, the potential for understory tree growth would be reduced. Potential for the understory to utilize site growth potential, provide future large snag habitat, and develop into late or old structure would be decreased (USDA Forest Service 1998b).

Mistletoe spread to the understory would be influenced by the number of infected overstory trees present within the unit. In a previous analysis (USDA Forest Service 1998b), projections were made to compare potential for mistletoe spread assuming varying levels of infected overstory trees. The results of the projections are summarized in Figure 3. The fewer infected overstory trees per acre, the lower the potential for mistletoe spread. With one infected overstory tree per acre, understory throughout the unit could be exposed to mistletoe seed within a projected 90 to 100 years. With 20 or more infected overstory trees per acre, this time period would be reduced to 25 years. Understory farthest from the overstory source of mistletoe would generally be exposed to mistletoe seed at an older age than understory closest to the source of infection.

The relatively low rate of mistletoe spread associated with one infected overstory tree per acre would be higher than the spread rate that would follow a stand replacing disturbance. Historically, stand replacement wildfires in ponderosa and lodgepole pine stands were approximately 50 to 1,000 acres in size (USDA Forest Service, 1994a). Assuming this size range and no residual overstory with mistletoe, spread of mistletoe from the stand edges into the interior would be slow. With a stand size of 50 acres and an understory as old as 100 years, it is projected understory on only 35 percent of the stand would be exposed to mistletoe seed (USDA Forest Service, 1998b). With a similarly aged understory in a 1,000 acre stand, understory on approximately 7 percent of the stand would be exposed to mistletoe seed (USDA Forest Service, 1998b).

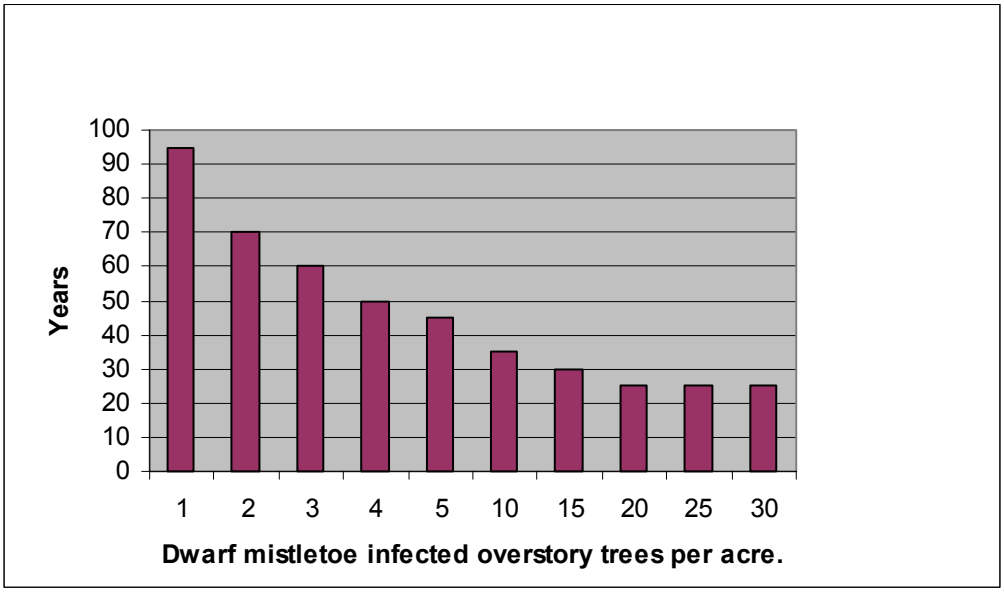


Figure 3. Years for dwarf mistletoe to spread across approximately 100 percent of an area.

Mistletoe intensification would likely be influenced by infected overstory trees present in the unit. Within single-story stand structures, mistletoe has been found to intensify at a rate of approximately one dwarf mistletoe rating class every 14 to 18 years (Parmeter 1978 and Hawksworth and Johnson 1989). At this rate it would take approximately 40 to 55 years for dwarf mistletoe infection levels to reach a mistletoe rating of three (DMR 3). As a rule, the threshold level for growth reduction seems to be class 3, or when about one-half of the crown becomes infected (Hawksworth and Johnson 1989). Rate of mistletoe intensification in an understory growing beneath an infected overstory has not been quantified. It would be expected, however, within 30 to 60 feet of infected overstory, intensification of mistletoe in understory trees would be faster than rates observed in single-story stands. The upper crowns of these understory trees would be continually exposed to mistletoe seed from overstory trees. It would be difficult for understory trees to outgrow or stay even with the vertical spread of mistletoe.

As mistletoe intensifies, understory growth potential would decrease. Table 8 summarizes growth projections made for understories infected with dwarf mistletoe (USDA Forest Service, 1998b). Projections compare growth of understories infected with mistletoe to growth of similar understories with no dwarf mistletoe infection. Projections can be used to compare growth potential assuming different levels of overstory mistletoe infection, not to give an absolute number for outputs. Least growth loss would occur where one or fewer overstory tree per acre is infected with dwarf mistletoe. More than a 10 percent loss in volume production is projected to occur where 3 overstory trees per acre are infected with dwarf mistletoe. The majority of regeneration units have 4 to 10 infected overstory trees per acre. Understory growth loss from dwarf

Table 8. Future volume (Merch. Cu. Ft.) of mistletoe infected stands as a proportion of uninfected stand volume.

Number of Infected Overstory (Trees/Ac)	Ponderosa pine				Lodgepole pine			
					Understory Age 120[3]			
	Understory Age 70[1]		Understory Age 100[2]		Without Future Precommercial Thin		With Future Precommercial Thin	
	DMR[4]	% of Uninfected Volume	DMR	% of Uninfected Volume	DMR	% of Uninfected Volume	DMR	% of Uninfected Volume
1	0.8	93%	0.8	92%	1.6	100%	1.0	100%
3	1.2	83%	0.8	86%	3.4	81%	2.6	99%
5	1.7	76%	1.6	82%	4.0	81%	3.2	81%
10	2.9	69%	3.0	63%	4.5	61%	4.5	61%
15	3.7	61%	4.6	51%	4.7	43%	4.7	43%

[1] Managed Yield Table for the Deschutes National Forest Ponderosa pine working group (General Forest) indicates 95% of culmination of mean annual increment occurs between ages 55 and 75.

[2] Managed Yield Table for the Deschutes National Forest Ponderosa pine working group (General Forest) indicates culmination of mean annual increment occurs between ages 65 and 105.

[3] Managed Yield Table for the Deschutes National Forest Lodgepole pine working group (General Forest) indicates 95% of culmination of mean annual increment occurs between ages 95 and 135. Minimum age for lodgepole pine old growth is 120 years (USDA Forest Service, 1993).

[4] Dwarf Mistletoe Rating (DMR). A 6-class numerical rating system used to assess dwarf mistletoe infection levels in individual trees and stands (Hawksworth and Wiens 1996). Trees with a DMR of 1 would be lightly infected. Trees with a DMR of 6 would be heavily infected.

mistletoe infection would be approximately 20 to 40 percent. Growth losses of 40 to 60 percent are projected where more than 10 overstory trees per acre are infected.

Reductions in stand volume reflect reduced diameter and height growth and increased mortality. Several studies show that severely infected stands produce only one-half to one-third the merchantable volume of timber expected from uninfected stands on comparable sites (Hawksworth and Wiens 1996). Hawksworth and Hinds (1964) found the following in lodgepole pine stands in Colorado:

> Acceptable volumes cannot be obtained in stands that are infected while they are young. Merchantable volumes in 100-year-old stands infected for 70 years average only about 300 cu.ft./ac., compared with 2,350 cu.ft. per healthy stands of the same age on the same sites.

Cumulative Effects

Future precommercial thinning (Appendix 3) could reduce the amount of mistletoe present in the understory. As long as mistletoe infected overstory trees are present, reductions in mistletoe gained through precommercial thinning would be short term. Long term reductions in stand growth resulting from mistletoe infection would still occur.

Alternatives 2 and 3

Direct and Indirect Effects

Overstory treatments proposed in Alternatives 2 and 3 would reduce the number of overstory trees infected with dwarf mistletoe. With fewer infected overstory trees, the rate at which mistletoe spreads and intensifies in understory trees would be reduced. Potential for the understory to utilize site growth potential, provide future large snag habitat, and develop into late or old structure would be increased (USDA Forest Service 1998b).

With Alternative 2, approximately 60 percent of acres proposed for treatment are in stands with mistletoe infected overstory distributed over 30 percent of the stand (Table 7). With Alternative 3, approximately 70 percent of the acres proposed for treatment are in stands with mistletoe infected overstory distributed over 30 percent of the stand (Table 7). Approximately 46 percent of the acres proposed for treatment in Alternative 3 would retain trees without dwarf mistletoe. Of this, approximately 80 percent would be in stands where dwarf mistletoe is found in less than 60 percent of the stand.

With both alternatives, overstory treatments would reduce, but not eliminate, the spread of mistletoe to understory trees. Mistletoe infected overstory would be generally reduced to 3 or fewer trees per acre. A portion of the live trees retained to provide future snag habitat (3 trees per acre) would likely be infected with dwarf mistletoe. Even with treatments designed to remove only infected overstory, it is likely trees with dwarf mistletoe would be retained. This would be due to the difficulty in some cases in seeing mistletoe in the overstory and infected overstory simply being missed during treatment implementation. Mistletoe spread to understory trees would occur along the edge of

stands where adjacent stands are infected with mistletoe. Stands larger than 20 acres would have the least proportion of their area influence by the edge (Hawksworth and Johnson 1989). Birds and mammals would continue to spread minor amounts of mistletoe seed into the interior of the unit.

Proposed treatments would not reduce the amount of mistletoe currently present in understory trees. While most of the understory is presently free of mistletoe, there are places where mistletoe has already spread to older/taller understory trees. Infected understory trees less than 6 feet tall pose little threat of the spread of mistletoe to adjacent understory trees; infections are generally located in the lower half of the crown and dwarf mistletoe seed dispersal is minimal (Hawksworth and Wiens 1996).

Where infected overstory trees are removed, mistletoe intensification would be slower in understory trees than if infected overstory trees remained. With a reduced overstory source of mistletoe, fewer understory trees would have their upper crowns exposed to mistletoe seed. There would be greater potential for these understory trees to outgrow or at least stay even with the vertical spread of mistletoe. Intensification of mistletoe in the understory would be more comparable to rates of intensification in even-aged stands.

With reduced mistletoe spread and intensification, potential for understory to utilize site growth potential would be increased (Table 8). If all three trees retained for future cavity nesting habitat are infected with dwarf mistletoe, future growth losses resulting from mistletoe infection would be approximately 15 to 20 percent. While site growth potential would be better utilized, growth loss due to mistletoe would still be 5 to 10 percent higher than is desirable according to LRMP direction. If less than 3 trees per acre are infected, future growth losses due to dwarf mistletoe may not exceed 10 percent.

Cumulative Effects

Future precommercial thinning would reduce the amount of mistletoe present in the understory. With at most 3 overstory trees per acre infected with mistletoe, there would be a better potential for precommercial thinning to reduce future volume losses resulting from understory mistletoe infection. Future growth losses due to dwarf mistletoe may not exceed 10 percent (Table 8).

Wildlife

The following subsections summarize information from the:

- Biological Evaluation (BE) of Threatened, Endangered and Sensitive (PETS) Wildlife for the Long Prairie Mistletoe Project (Project Record, prepared by Barbara Webb and approved by James Lowrie on July 6, 2005) and
- Wildlife Specialist Report for the Long Prairie Project Area (Project Record, prepared by Barbara Webb and dated September 6, 2005).

Information is also summarized from a prior analysis completed on the district titled "Mistletoe Project Effects Analysis" (Project Record, prepared by Barbara Schroeder with a revision date of 8/21/98). This prior analysis provides the basis for projecting stand development. These three documents are incorporated by reference.

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. Level of habitat analysis depends on presence of habitat and its condition, the magnitude and intensity of proposed actions, and significant issues identified. Population trends are determined by assessing how alternatives impact the structure and function of vegetation (i.e. habitat) relative to current and historic availability. Inferences regarding species diversity and relative population levels are based on habitat quality, condition, and quantity. Where needed and applicable, professional judgment, supported by available information, is used to assess habitat conditions and quality. Unless otherwise defined, short-term effects are those occurring within 20 years; long-term are beyond 20 years.

Proposed, Threatened, Endangered, Sensitive Wildlife

The project area contains no known sightings or suitable habitat for PETS animal species known to occur or potentially occur on the Bend-Fort Rock Ranger District. Due to the lack of suitable habitat, no direct, indirect, or cumulative impacts to PETS animal species are expected under any alternative. Refer to the Biological Evaluation for species list and habitat descriptions.

Cavity Nesters, Snags, and Green Tree Replacements

The Forest Plan lists "Woodpeckers (Cavity Nesters)" as Management Indicator Species (MIS). Cavity-nesting species use dead trees (snags) for nesting, foraging, and roosting. In addition to snags, cavity-nesting species can also use partially dead trees and mistletoe infected trees (Rose et al. 2001 and Bull et al. 1997). Mistletoe can provide nesting and roosting habitat for woodpeckers as well as a variety of other species (e.g. bluebirds, grouse, marten, owls, and hawks). Live trees, although not counted as snags (i.e. dead trees), may have parts that are dead that can be used by cavity-nesters (e.g. some woodpecker species have excavated cavities in the dead portions of trees). Green tree replacements are live trees retained post treatment to ensure that there are trees to recruit as future snags and down logs.

This subsection summarizes information pertaining to cavity nesters, the issue that framed alternatives. For information pertaining to MIS species other than woodpeckers, refer to the subsection titled "Management Indicator Species".

Scope of Analysis for Cavity Nesters

The following woodpeckers are MIS for the Deschutes National Forest: black-backed woodpecker, hairy woodpecker, Lewis' woodpecker, Northern three-toed woodpecker, pileated woodpecker, white-headed woodpecker, and Williamson's sapsucker (Wildlife Specialist Report, Table 2).

Pileated and Lewis' woodpeckers, both primary cavity excavators, are not suspected nor have been found within or adjacent to the project area due to the dominant stand types and average size of trees within the stands. Pileated woodpeckers, although found in areas with ponderosa pine, are more likely to be found in more wet mixed conifer areas

(Douglas-fir/fir dominant). It has been rare to see or hear a pileated woodpecker within this portion of the District. Lewis' woodpeckers are also associated with ponderosa pine, but with large, open ponderosa pine stands. They have been more commonly heard and seen near the fringe of the forest in relatively open ponderosa pine stands with mostly large diameter trees (>20" dbh). Given that pileated and Lewis' woodpeckers are not expected to occur in the project area, impacts to these species are not assessed.

Table 9 displays primary cavity excavators (including MIS woodpecker species) and secondary cavity nesters that are known to inhabit or potentially inhabit the project area. No surveys have been completed for any of these species. There are no known nest sites within the project area.

Table 9. Cavity excavators and nesters inhabiting or potentially inhabiting project area.

Habitat and Type of Cavity Nester	**Species of Cavity Nester (MIS species in *italics*)**
Mature Forest	
• Primary cavity excavators	*Black-backed woodpecker, Hairy woodpecker, Three-toed woodpecker, White-headed woodpecker, Williamson's sapsucker,* Pygmy nuthatch, and White-breasted nuthatch.
• Secondary cavity nesters	Flammulated owls and Pygmy owls.
Open Forest	
• Primary cavity excavators	Northern flicker
• Secondary cavity nesters	Kestrels, Mountain bluebirds, and Western bluebirds.

The analysis focuses on effects to the MIS primary cavity excavators listed in Table 9. Habitat features associated with these cavity nester MIS species are summarized in Table 10. It is assumed that by managing for the needs of these species, the needs of secondary cavity nesters such as pygmy and flammulated owls will be met. It is also assumed the needs of other primary cavity excavators could be met. Specifically, the needs of pygmy nuthatches and white-breasted nuthatches could be met by hairy and white-headed woodpeckers and Williamson's sapsucker's (Marshall, 1997).

Detailed habitat analysis focuses on black-backed and three-toed woodpecker habitat. The project area, and specifically the plant associations in which treatments are being considered, are best associated with providing habitat for these species. According to Goggans et al. (1988), in central Oregon these species are known to use ponderosa pine and lodgepole pine trees (black-backed) and lodgepole pine habitat (three-toed). Goggans et al. (1988) also found these species utilizing smaller diameter trees for foraging and nesting (9 to 14" dbh on average, respectively).

The spatial scale of analysis, for direct, indirect and cumulative effects, includes the Long Prairie project area and an adjacent portion of Newberry National Volcanic Monument (NNVM). This portion of the Monument is incorporated in the analysis since it is a large, non-treated block of potential cavity nester habitat immediately adjacent to the project area. It also provides high elevation mature lodgepole pine habitat for three-toed woodpeckers. It can provide a local indicator of what level of snags could be present in the absence of harvest activities.

Table 10. Habitat features of MIS cavity nesters potentially found within the Long Prairie Project Area.

Species	Habitat Features*						
	Habitat species	**Home range (acres)**	**Nest stand Canopy closure (%)**	**Log cover (%)**	**Average Nest tree size (dbh in inches)**	**Average forage tree size (dbh in inches)**	**Number of years dead for forage trees**
Black-backed woodpecker	Ponderosa and Lodgepole pines	956	46	6	11-14	13	<2 or live
Three-toed woodpecker	Lodgepole pine (generally >4500 ft. elevation)	528	18-27	17	11	9	<3
White-headed woodpecker	Large diameter ponderosa pine	800 (in fragmented landscape)	24-41	-	25-32	17	Live
Hairy woodpecker	Ponderosa and lodgepole pine	---	39	9	16	10-15	<5
Williamson's sapsucker	Ponderosa pine	---	60	10	27	8	---

*Summarized from Bull et al. (1986); Goggans et al. (1988); and Dixon (1995) as cited in Marshall (1997).

Direction for Cavity Nesters, Snags, and Green Tree Replacements

To maintain cavity nester habitat, Forest Plan Standard and Guideline WL-37 provides direction for maintaining snags and green tree replacements. Standard and Guideline WL-38 identifies that specific guidance is provided by the Deschutes Wildlife Tree and Log Implementation Strategy (DWTL; USDA Forest Service 1994b).

As previously described (pages 15 to16 of this assessment), the Eastside Screens amend Forest Plan direction provided in WL-37. According to the Screens, all sale activities will maintain snags and green replacement trees of greater than or equal to 21 inches dbh, (or whatever is the representative dbh of the overstory layer if it is less than 21 inches dbh) at 100% potential population levels of primary cavity excavators. This should be determined using the best available science on species requirements as applied through current snag models or other documented procedures.

To determine 100% potential population levels, the Decayed Wood Management Advisor (DecAID; Mellen et al. 2003) was used as one source of recent research on snag habitat. DecAID was used to compare snag densities on a regional level to existing levels within a smaller, more local area given the habitat type and structure class. Currently, DecAID does not include information for the lodgepole pine habitat type, which makes up the largest proportion of the units proposed for treatment. For the lodgepole pine type, Ohmann and Waddell (2002) and Rose et al. (2001) were used for recent snag density

information. The Deschutes Wildlife Tree and Log Implementation Strategy (DWTL; USDA Forest Service 1994b) was used in conjunction with the snag density information to determine number of green replacement trees needed to maintain snag habitat though time. See the Wildlife Specialist Report (Appendix A) for details on: 1) the use of DecAID and other recent literature and 2) the methods used to determine 100% potential population levels.

Table 11 summarizes snag and green tree replacement levels determined to be needed to meet 100% population potential levels. Also summarized is the snag density data from DecAID and associated literature. Data is summarized for ponderosa and lodgepole pine habitat types, the vegetation types where treatments are proposed. The level of snags, and particularly green tree replacements, required by current direction is comparable to the levels reported in DecAid and associated literature.

Table 11. Snags and Green Tree Replacements (GTRs) required to meet current management direction.

DecAID and Associated Literature at 50% tolerance level[1]	**Ponderosa Pine Habitats**			**Lodgepole Pine Habitats**	
	Open (PP/DF_O)	**Small/Medium (PP/DF_S/M)**	**Large (PP/DF_L)**	**LP Early**	**LP Mid**
Snags per Acre (>=10" dbh)	5.3	2.7	6.5	6-7	10-12
GTRs per Acre[2 and 3]	30	16	38	33-37	56-67
Current Direction (100% population potential based on recent literature)	**Ponderosa pine Habitats**			**Lodgepole pine Habitats**	
Snags per Acre (>=10" dbh)	4			6	
GTRs per Acre[2 and 3]	25			33	

[1]In DecAID, a 50% tolerance level means that 50% of the area (plots) in this vegetation condition had less than the reported number of snags and 50% had greater than the reported number.
[2]Assumes an 8" residual stand diameter. An 8" dbh residual stand was determined to be the point that target MIS species would actually use a stand (i.e. there would be sufficient overstory canopy closure and trees of heights that Goggans et al (1988) reported as averages).
[3]Calculated by increasing the GTR level for 8" residual stand diameter in the DWTL strategy (12.9) (USDA Forest Service 1994b) proportionately to the difference in snag density in the specified in the DWTL strategy and level reported in DecAID and associated literature (e.g. For PP/DF_O, the DecAID snag level (5.3) is approx. 2.3 times higher than 100% MPP in the DWTL (2.25). GTR level is equivalent to 30 tpa (2.3 x 12.9 GTRs/Acre = 30).

Rose et al. (2001) list major lessons learned in the period 1979 to 1999 that have tested critical assumptions of earlier snag management advisory models. Lessons listed include:

- "Calculations of numbers of snags required by woodpeckers based on assessing their "biological potential" is a flawed technique. Empirical studies are suggesting that snag numbers in areas used and selected by some wildlife species are far higher than those calculated by this technique".
- "Setting a goal of 40% of habitat capability for primary excavators, mainly woodpeckers, is likely to be insufficient for maintaining viable populations."

While Eastside Screens use of population levels is based on what Rose et al. (2001) call a "flawed technique", other elements of the Screens address lessons identified by Rose et al. (2001). These include 1) the setting of a goal of 100% of habitat capability as opposed to 40%, and 2) the use of "best available science" to set these levels.

Existing Condition

Proposed Treatment Areas

Within areas proposed for treatment, overstory trees are generally widely spaced and relatively small diameter. Young understory trees provide the majority of tree cover (Figures 1 and 2). Of the primary excavators listed in Table 9, treatment areas currently provide nesting habitat for northern flickers. Assuming cavities are present, these areas can also be used by secondary cavity nesters that select for open, early seral stand conditions (e.g. bluebirds and kestrels). Proposed treatment areas generally do not provide habitat for the other primary cavity excavators, all of which are MIS woodpeckers. Similarly, these areas do not provide habitat for secondary cavity nesters that are associated with a taller, more closed canopy.

Snags

High snag densities were present within the project area during and immediately after the beetle outbreak of the 1970s and 1980s (the beetle outbreak and past harvests are described in detail on pages 10 to 13 of this assessment). In the intervening years, these densities have been reduced by the natural falling of snags and by harvest activities. In reviewing longevity of snags, generally 30 to 60 percent and 30 to 70 percent of newly created snags were still standing after 8 years in lodgepole pine and ponderosa pine habitats, respectively (Bull, 1983). The larger the diameter of the snag, the longer it tends to stand. The Wildlife Tree and Log Implementation Strategy (USDA 1994b) assumes lodgepole pine snags stand 6 to 8 years after death and ponderosa pine snags 6 to 12 years.

Current Vegetation Survey (CVS) plot data from 1993 to 2001 was used to assess current snag densities and distribution patterns within the cavity nester analysis area (Wildlife Specialist Report, Appendix A).

Average snag densities compared to management direction are displayed in Table 12 by vegetation type, location, and size class. Highest snag densities are found within NNVM, where snag densities by size class meet or exceed current direction for both lodgepole pine, ponderosa pine, and mixed conifer vegetation types. Outside of NNVM, snag densities are generally below current direction. There is a general lack of large snags, which limits the existing habitat suitability for cavity nesters associated with large snags. Management direction preceding the Eastside Screens did not require the same level of provision for snag habitat as there is currently (i.e. direction then was to leave 40 percent maximum population potential of snag habitat in a unit which equated to approximately 0.72 to 0.9 snags/acre. This, together with the natural fall rate of snags, has resulted in a landscape fragmented by open stands with few remnant overstory trees or snags.

In Table 13, average snag densities in the cavity nester analysis area are compared to regional densities reported in DecAID and associated literature. Densities are displayed by vegetation type, structural condition, and snag size class. DecAID structure stages are displayed that are comparable to those present within proposed treatment units, outside proposed treatment units, and within NNVM. In this table, the tolerance level represents the proportion of the referenced inventory plot data that exhibited that snag density.

For example, in the ponderosa pine/Douglas-fir habitat type with open structure, 50 percent of the plots measured at the regional scale, for this habitat type and this structure class, had densities less than less than 5.3 snags per acre for snags greater than 10" dbh. Fifty percent had densities higher. The average snag densities in the analysis area generally reflect the median densities in DecAID and associated literature. One obvious gap is the lack of snags within proposed units that are greater than 10 inches dbh.

Table 12. Existing snag densities in cavity nester analysis area compared with management direction.

Vegetation Type*	Number of CVS Stake positions	Location**	Average number of snags per acre by diameter (dbh) class		
			>=8"	>=10"	>=20"
LP	26	Inside/Mixed	4.3	2.2	0.0
LP	53	Outside	13.5	3.9	0.3
LP	51	NNVM	33.0	11.3	0.0
Current Direction for lodgepole pine			***n/a***	***6***	***n/a***
PP/MC	16	Inside/Mixed	1.8	0.0	0.0
PP/MC	44	Outside	6.1	2.4	0.0
PP/MC	9	NNVM	7.5	7.5	1.2
Current Direction for ponderosa pine/mixed conifer			***n/a***	***4***	***1***
MH***	20	NNVM	31.4	10.6	0.8

*LP = Lodgepole pine; PP/MC = ponderosa pine/mixed conifer; MH = mountain hemlock.
**Location of CVS plots in relation to Long Prairie Alternative 3 treatments: Inside/Mixed – plot falls within, and within and outside (i.e. borders) a unit identified for treatment; Outside – plot falls outside of an identified unit; NNVM – plots within the southern portion of the Monument.
***Current direction for the mountain hemlock plant association (equivalent to the Montane mixed conifer vegetation type in DecAID) is not displayed because there are no proposed treatment units within this association.

Current Vegetation Survey plot data was analyzed to further assess spatial distribution. In the lodgepole pine vegetation type, 88 to 90 percent of the CVS plots in the project area have no snags greater than or equal to 10 inches dbh as compared to 65 percent in the Monument. Approximately 5 to 8 percent of the CVS plots within the project area have greater than 20 snags per acre greater than 10 inches dbh, compared to 26 percent in the Monument.

In the ponderosa pine/mixed conifer vegetation type, local snag distribution patterns were also compared to regional patterns described in DecAID for the ponderosa pine/Douglas fir habitat type. Approximately 84 percent of the CVS plots in the project area and 56 percent of the plots in the Monument had no snags greater than or equal to 10 inches dbh. By comparison, approximately 54 to 68 percent of the DecAID plots representing all structure types in the ponderosa pine/Douglas fir habitat type had no snags in this size class. When considering snags greater than or equal to 20 inches dbh, approximately 78 percent of the plots in the Monument had no snags in this size class. There were no plots within the Long Prairie Project area with this size class of snags. By comparison, approximately 62 to 81 percent of the DecAID plot data had no snags in this size class.

Table 13. Existing snag densities within cavity nester analysis area compared to those reported in DecAID and associated literature.

Data Reference and Snag Size Class	**Snags per Acre by Vegetation Type and Structure Stage**					
Densities in Cavity nester analysis area based on CVS plot data	**Ponderosa pine/Mixed Conifer**			**Hemlock**	**Lodgepole pine**	
	Within and on the border of Proposed Trtmnt Units	**Outside Proposed Trtmnt Units**	**Within NNVM**	**Within NNVM**	**Within and Outside Proposed Trtmnt Units**	**Within NNMV**
Snags >=10" dbh	0	2.4	7.5	10.6	6.1	11.3
Snags >=20"dbh	0	0	1.2	0.8	0.3	0
Densities reported in DecAID and Associated Literature[1]	**Ponderosa Pine_Douglas Fir[2] (50% tolerance level)**			**Montane Mixed Conifer[2] (80% tolerance)**	**Lodgepole pine (50% tolerance[3])**	
	Open[4]	**Small/ Medium Trees[4]**	**Large Trees[4]**	**Large Trees[4]**	**Early Seral**	**Mid Seral**
Snags >=10" dbh	5.3	2.7	6.5	27	6-7	10-12
Snags >=20"dbh	1.8	1.1	3.6	8.8	N/A	N/A

[1] Mellon et al. (2003), Rose et al. (2001), and Ohmann and Waddell (2002).
[2] DecAID habitat types. Ponderosa pine/Douglas –fir incorporates ponderosa pine and mixed conifer associations. Montane mixed conifer incorporates mountain hemlock associations.
[3] These figures from Ohmann and Waddell (2002) and Rose et al (2001) represent the mean (average).
[4] DecAID and associated literature structural types. Mid-seral consists of mature stands without large trees. Literature did not have the lodgepole associations in a "late" seral condition.

Snag distribution patterns in the cavity nester analysis area are similar to regional patterns reported in other snag density literature. Rose et al. (2001) found wilderness areas generally had more snags than surrounding managed land but due to elevations and stand types this largely favored black-backed and three-toed woodpeckers. This is the case in the cavity nester analysis area. The NNVM serves as the wilderness equivalent, yet it contains a large majority of lodgepole pine habitat and relatively few acres of ponderosa pine habitat (habitat for white-headed woodpeckers and flammulated owls). Ohmann and Waddell (2002) assessed regional patterns of dead wood in the upland habitats of Oregon and Washington. Lodgepole pine and eastside ponderosa pine habitats were included in their assessment. Across all habitats, they found a large proportion of their plots had no snags or downed logs. This is similar to conditions in the cavity nester analysis area.

While there are areas within the analysis area with no snags, often where there are snags they tend to be in larger clumps. This arrangement would provide suitable habitat for cavity nesters that are associated with smaller, clumped snags (e.g. black-backed and three-toed woodpeckers). Rose et al. (2001) and Bull et al. (1997) both recognized that cavity-nesting species used partially dead trees and mistletoed trees for nesting, foraging, and roosting. These types of trees are often not accounted for in snag density guidelines or recommendations. Within the analysis area, cavity-nesters may be using other trees besides snags. Snag densities may not tell the whole story in terms of habitat utilization.

Snag densities generally increase with stand age (Rose et al. 2001), so the expected trend within the analysis area will be increasing snag densities throughout due to the large percentage of mid-seral stands.

Green Tree Replacements

The number of live, large diameter trees available for future snag recruitment (green tree replacements) was reduced by widespread mortality of trees greater than 9 inches dbh during the beetle outbreak, together with subsequent harvest activities. Across the project area, there is an average of 35 trees per acre greater than or equal to 8 inches dbh Table 14). Within areas proposed for treatment, there is an average of 21 trees per acre. In these areas, risk of mistletoe or beetles killing overstory trees is relatively low in the short term. Recruitment of snags within these areas will occur primarily as a result of damage from snow, wind, or lightning.

Table 14. Density and variability of Green Tree Replacements (GTRs) >=8 inches dbh (any species).

	Alternative 1	**Alternative 2**	**Alternative 3**
GTR Clumps outside treatment units (Acres)	0 acres	5,140 acres	6,580 acres
GTR Density within clumps (Average trees per acre)[1]	---	65 tpa	65 tpa
GTR Density (Wtd Average Trees per Acre)[1]			
Within Treatment Units	21 tpa	11 tpa (3 - 24 tpa)	11 tpa (2 - 50 tpa)
Within Treatment Units and Adjacent Green Tree Replacement Clumps	21 tpa[2]	33 tpa (3 – 65 tpa)	33 tpa (2 – 65 tpa)
Project area	35 tpa	31 tpa	30 tpa
Management Direction[3]	---	24 – 33 tpa	24 – 33 tpa
GTR Variability (Acres)[1]			
Acres analyzed for treatment[4] that currently have or will be retaining >17 GTRs per acre	11,630 acres	3,451 acres	5,513 acres
Acres analyzed for treatment[4] that currently have or will be retaining 2-6 GTRs per acre	---	8,179 acres	6,117 acres
Total acres analyzed for treatment	11,630 acres	11,630 acres	11,630 acres

[1] Summarized from Long Prairie Silviculturist Report dated 9/20/2004, Appendices 2 and 3.
[2] Alternative 1 does not designate GTR clumps adjacent to units. GTR estimate is for inside treatment unit.
[3] Lowest value associated with ponderosa pine habitats. Highest value with lodgepole pine habitats.
[4] Does not include GTR clumps retained outside treatment units.

Black-backed and three-toed woodpecker habitat

Goggans et al. (1988) describe stand characteristics associated with black-backed and three-toed woodpecker use on the Deschutes National Forest. Within the analysis area, amount of this type of habitat was estimated using a combination of CVS plot data and photo interpreted stand data. Appendix B of the Wildlife Specialist Report details the methodology used to assess habitat. Table 15 summarizes the amount of black-backed and three-toed woodpecker habitat present within the assessment area. Habitat conditions preferred by black-backed and three-toed woodpecker are present on approximately 15 percent of the assessment area. The majority of this habitat is located within the Monument. Marginally suitable habitat for black-backed woodpecker is present on approximately 41 percent of the assessment area. Potential nesting habitat totals 51,188 acres (56 percent of the assessment area).

According to Goggans (1988) and Bull et al. (1986), black-backed woodpeckers use mature ponderosa pine and lodgepole pine habitat types at relatively low elevations (less than 4500 feet), but can be found at higher elevations. The Long Prairie project area ranges in elevation from approximately 4500 to 6000 feet. This would suggest that there is little to no habitat for this species, but based upon the extent of the ponderosa pine habitat type and that this species uses lodgepole pine habitat, it is likely that this species could be found within the project area. The black-backed woodpecker will use smaller snags for nesting (11-14" dbh) as well as foraging (13" dbh).

Table 15. Black-backed and Three-toed woodpecker habitat in cavity nester analysis area.

Habitat Classification*	Analysis Area Habitat (Acres)	% of Analysis Area Total	Project Area		NNVM	
			Acres	% of Analysis Area Habitat	Acres	% of Analysis Area Habitat
BB_TT	13,971	15%	3,160	23%	10,812	77%
BB_marg	37,217	41%	21,978	59%	15,239	41%
NH	35,510	39%	30,189	85%	5,322	15%
Meadow	26	0%	---	0%	26	100%
Rock	2,675	3%	810	30%	1,864	70%
Water	2,178	2%	---	---	2,178	100%
Total	91,578	100%	56,137	N/A	35,441	N/A

* Habitat classification based on research by Goggans et al. (1988).
BB_TT = suitable nesting habitat for black-backed (BB) and three-toed (TT) woodpecker.
BB_marg = marginal nesting habitat for black-backed woodpeckers.
NH = non-habitat for black-backed or three-toed woodpeckers.

The three-toed woodpecker uses higher elevation habitats of mature lodgepole pine stands or stands with a lodgepole component (Goggans et al. 1988; Bull et al. 1986). Habitat for this species, in this analysis, is found in the NNVM and lodgepole pine stands within the planning area. The three-toed woodpecker is often associated with the black-backed woodpecker. Both species utilize smaller diameter snags for foraging and nesting. One way this woodpecker competes with other woodpecker species, specifically the black-backed woodpecker, is by utilizing higher elevation habitat (Bull et al. 1986). When using Goggans et al. (1988) to compare this species habitat with the black-backed woodpecker, it appears that the three-toed woodpecker does not generally occupy a wide range of habitat conditions. Therefore, acreage classified as marginal black-backed woodpecker habitat, would not likely be three-toed woodpecker habitat. As expected, due to elevations and stand types, the most suitable habitat for three-toed woodpeckers is within the NNVM.

A majority of the proposed treatment acreage is not habitat for three-toe woodpeckers due to their early seral condition. Goggans et al. (1988) reported that three-toed woodpeckers avoided logged areas even for foraging. The best existing habitat for this species within the project area occurs in the connectivity corridors.

Williamson's sapsucker, white-headed and hairy woodpecker habitat
The project area provides limited amounts of habitat for white-headed woodpeckers, Williamson's sapsuckers, and hairy woodpeckers. White-headed woodpeckers and Williamson's sapsucker generally select large diameter ponderosa pine (>25 inches dbh) for nest trees. Hairy woodpeckers will use moderately sized ponderosa pine (16 inches dbh) for nest trees. The lack of moderate to large diameter snags in the project area (Table 12) is currently limiting habitat availability for these species.

Evaluation Criteria for Measuring Effects

Snags
1) The availability of snags greater than or equal to 10 inches dbh currently and in the future, and
2) The estimated timeframe in which new, large snags will develop.

Green Tree Replacements (GTRs)
1) The density of GTRs retained, and
2) The spatial distribution (i.e. clumpiness) of GTRs within proposed units.

Black-backed and three-toed woodpecker
1) The number of acres of habitat removed or degraded, and
2) The estimated timeframe for suitable habitat to develop.

White-headed woodpecker and Williamson's sapsucker
1) The number of acres where lodgepole pine is the desired green tree replacement over ponderosa pine, and
2) The estimated timeframe for suitable habitat to develop.

Hairy woodpecker
1) The estimated timeframe for suitable habitat to develop.

Alternative 1

Direct and Indirect Effects

Trends
Within the next 15 to 20 years, no change in local populations of cavity nesting MIS species would be expected. Snag densities in the project area would remain relatively constant, as existing snags fall and new ones are recruited. Snag recruitment would likely be highest outside of areas proposed for treatment, where stand densities are higher. Proposed treatment areas would continue to provide habitat primarily for cavity-nesting species that select for an open stand structure. These areas would remain low quality habitat for cavity nesting MIS species that select for a forest condition that is more dense and mature. Habitat for these species would continue to be found primarily outside of proposed treatment areas.

Fifteen to 30 years hence, it is estimated that local populations of cavity nesting MIS species would be stable to slightly increasing. Projections indicate after

approximately 15 to 20 years, understory trees will have grown to a height of approximately 30 feet. Residual overstory trees would likely still be present for snag recruitment. These areas could still provide suitable nesting for Northern flickers. Conditions could also have become suitable for black-backed and three-toed woodpecker nesting and roosting. Stand densities and overstory tree age would be reaching levels that increase likelihood for overstory tree mortality. Goggans et al. (1988) reported that beetle outbreaks tend to occur every 40 years. The last beetle outbreak, in and around the project area, was in the late 1970s to early 1980s. Within 15 to 20 years, there could be another outbreak in the project area may be likely. This could provide greater quantities of habitat for black-backed and three-toed woodpeckers.

It is unlikely after 15 to 20 years that proposed treatment areas would provide habitat for white-headed woodpeckers or Williamson's sapsucker. Within these areas, there would continue to be a lack of the large trees and snags required by these species. These areas may begin to provide conditions suitable for hairy woodpeckers, which have smaller size requirements for nest trees (Table 10). Even if adequate large ponderosa pine were present, understory conditions could limit these species' use of the areas. It's been suggested that a well-developed understory of trees and shrubs may encourage mammalian predation on white-headed woodpecker nests (Marshall 1997).

Beyond 30 to 40 years, there could be decreases in local populations of cavity nesting MIS species, particularly in populations of black-backed or three-toed woodpeckers. Beyond this time, few if any residual lodgepole pine overstory trees would be expected to remain within units proposed for treatments. Future snag recruitment in these areas would be dependent on remaining ponderosa pine overstory trees and the maturing understory. Intensifying levels of dwarf mistletoe in the understory together with increasing stand density will begin to reduce tree diameter growth rates (Refer to Disease and Late/Old Structure Habitat sections of this analysis). Potential for the understory to provide future large snag habitat and develop into late or old structure would be limited.

Cumulative Effects

The beetle outbreak in the 1970s to 1980s, in combination with the timber harvest that followed, contributed to the existing condition of cavity nester habitat (refer to Tables 11, 12, and 13). The FEIS for the Deschutes LRMP identified that the population density of black-backed and three-toed woodpeckers in lodgepole pine forests types would be expected to naturally decline because beetle-killed lodgepole pine or mixed pine stands would lose suitability (FEIS, page 4-36). The FEIS also identified that since the black-backed woodpecker is the most common primary excavator in lodgepole pine forest types, secondary cavity-nesting species would also decrease in population (FEIS page 4-37).

Current and foreseeable projects within the project area (Appendix 3 and discussed below) would have negligible effects on existing snag densities or future snag recruitment. Treatments may impact individual cavity nesters, but are unlikely to further impact local populations.

The Miscellaneous Post-Sale and Ponderosa Pine Release projects have units that overlap the Long Prairie project area. Both projects treat previously harvested areas. Both projects propose to hand-fell small diameter trees, impacting primarily understory trees. These projects will not decrease existing snag densities within the project area. Given the focus of treating small diameter trees (primarily less than 8 inches dbh), treatments will not affect existing level of green tree replacements available at the project level (Table 14).

Units associated with the Gem Timber Sale overlap the Long Prairie project area. Treatments associated with this project would reduce live trees available for future snag recruitment. Given the small percent of the project area impacted by this project (4%), there would be no reduction in the average number of green tree replacements available at the project level (Table 14). Treatments associated with the Gem Sale were considered when quantifying black-backed and three-toed woodpecker habitat within the project area. Habitat reductions are reflected in the Long Prairie existing condition.

The Rim Woodcutting Area overlaps slightly with the northeastern portion of the project area. Ongoing woodcutter activity is not expected to contribute to a decline in ponderosa pine snags. Woodcutters are limited to cutting standing dead and down dead lodgepole pine. Ongoing woodcutter activity is not expected to contribute to an overall decrease in the average snag density at the project level. The Firewood Synopsis for this woodcutting area indicates that most of the available wood is small and on the ground.

Treatments proposed with the Howlett Fuels CE overlap with the western portion of the Long Prairie project area. Underburning associated with this project could result in the falling of existing snags and could also create new snags. Burns would be implemented under conditions that would minimize potential for tree mortality. Increase in snag density would be relatively small and consequently average snag density within the Long Prairie project area would not increase (Table 14).

Alternative 2

Direct and Indirect Effects

Snags

No removal of existing snags is proposed. Snag removal for operator safety during logging operations may occur, but is expected to be rare due to an overall lack of hazardous snags as well as operator use of mechanized equipment.

Alternate sources of snag habitat would remain on the landscape, such as mistletoe brooms. Dwarf mistletoe would remain both within proposed treatment units and the surrounding landscape (See Disease Section).

Green Tree Replacements

To provide for future snag recruitment, live trees would be retained as scattered, individual trees within treatment units and as clumps of trees outside of treatment units. On the average, approximately 11 residual overstory trees greater than 8 inches in diameter would remain within treatment units (Table 14). Approximately 33 trees greater

than 8 inches in diameter would be retained when considering both the harvest units and adjacent green tree replacement clumps. The uneven distribution of green tree replacements, would be consistent with naturally occurring patterns of snag and log habitat (USDA Forest Service 1994b and Mellen et al. 2003).

Black-backed and three-toed woodpecker habitat
Majority of treatment areas are outside of areas classified as black-backed or three-toed woodpecker habitat (Map 13). There are, however, some units that overlap marginal habitat for black-backed woodpeckers (Map 13). A total of approximately 365 acres habitat, or approximately 1 percent of marginal habitat in the assessment area (Table 15), would be impacted. Nesting habitat for this species would not be provided following removal of overstory trees. The Wildlife Specialist Report (Table 10) details effects on spatial arrangement of habitat. In some cases, treatments would increase habitat fragmentation by creating interior gaps within larger blocks of habitat (Unit 103) or by breaking linkages between larger blocks of habitat (Units 48, 91, 121, 234, 265, and 266). In other cases, treatments would impact areas that provide isolated islands of habitat. Loss of this isolated habitat (Unit 185) or a reduction in size (Units 193 and 197) would reduce habitat, but these isolated pieces of habitat are not of an adequate size to provide a territory and consequently are of extremely low suitability. Treatments in the remaining units (118, 122, 131, 165, 206, 240, 283, and 296) are located along edges of larger blocks of habitat or in fingers that extend from larger blocks of habitat. Treatments in these areas would reduce available habitat, but would have little effect on the habitat block size. Collectively, these impacts to woodpecker habitat would be minor. Considering these impacts and marginal nature of the habitat, there would be minimal effect to local populations of black-backed or three-toed woodpeckers.

Williamson's sapsucker, white-headed and hairy woodpecker habitat
Treatment areas currently do not provide habitat for these species. No direct effects would be expected. As proposed, no trees greater than or equal to 21 inches dbh would be removed. This would retain overstory trees suitable for hairy wood-pecker nesting and white-headed woodpecker and Williamson's sapsucker foraging (Table 10). Within the next 30 years, these trees will likely grow to a size suitable for nesting by white-headed woodpecker and Williamson's sapsucker. Removal of ponderosa pine less than 21 inches dbh would reduce foraging opportunities and lengthen the time it takes to recruit additional large trees for nesting. Removal of trees in this size class, particularly those not infected with dwarf mistletoe, would also reduce recruitment of future nest trees. Trees 15 inches dbh could grow to a size suitable for white-headed woodpecker and Williamson's sapsucker nesting within the next 60 to 80 years. The majority of overstory trees that would be removed are 8 to 15 inches dbh and large enough for all but white-headed woodpecker foraging. Trees 10 inches in diameter or larger could grow to a size suitable for nesting by hairy woodpeckers in the next 30 to 50 years. Within the next 90 to 110 years, they could be large enough for nesting by the other species. Removal of current foraging habitat would have no short-term effect (<20 years) to local populations. Populations would remain limited with the removal of future potential nesting habitat.

Trends

Within the next 15 to 20 years, no change in local populations of cavity nesting MIS species would be expected as a result of this action. Similar to the No Action alternative, the open, immature stand conditions would limit use of treatment areas by cavity nesting MIS species. During this time period, snag level within treatment units would not be the factor limiting use by MIS species.

Fifteen to 30 years hence, it is estimated that local populations of cavity nesting MIS species would be stable to slightly decreasing. By this time period, understory trees would have matured sufficiently to create stand conditions favorable for use by black-backed, three-toed, and potentially hairy woodpeckers. As discussed with the No Action alternative, from this time forward, conditions could be favorable for another outbreak of mountain pine beetle. With stand conditions no longer limiting, snag levels within treatment units could impact cavity nester use. As a result of the proposed action, approximately 50 percent fewer overstory trees would be available for snag recruitment within treatment units as compared to the No Action alternative (calculated from Table 14). Across the project area, the reduction would be equivalent to approximately 12 percent. Green tree replacement clumps retained adjacent to treatment units would provide foraging habitat, in addition to nesting and roosting habitat. Potential declines in populations as a result of the proposed action would be minimized by the retention of green tree replacements at 100% population levels (MPP).

Beyond 30 years, there could be increases in local populations of cavity nesting MIS species. Similar to the No Action alternative, few lodgepole pine overstory trees would still be alive within treatment units. Future snag recruitment in treatment areas would be dependent on residual ponderosa pine overstory and the maturing understory trees. With relatively low levels of mistletoe within treatment units, understory trees would have potential to grow to diameters and densities associated with cavity nesting MIS species (see Late/Old Structural Habitat section). Habitat conditions favorable for nesting or foraging could be achieved more quickly within treatment units than with the No Action alternative. Considering the plant associations in which treatments would occur, long-term increases in habitat would be most likely for black-backed, three-toed, and hairy woodpeckers.

Cumulative Effects

Similar to the effects described for Alternative 1, the past beetle outbreak and subsequent timber harvest contributed substantially to the existing condition of cavity nester habitat. Effects of proposed treatments in combination with current and foreseeable projects (Appendix 3 and discussed below) would not be greater than direct and indirect effects previously described for the Long Prairie project.

The Miscellaneous Post-Sale and Ponderosa pine release projects have some units that overlap Long Prairie treatments. Neither project has units that overlap green tree replacement clumps identified for the Long Prairie project. Where treatments associated with these projects overlap Long Prairie treatments, there would be no cumulative

decrease in the existing density of snags. Additionally, there would be no further reduction in green tree replacements than those associated with the Long Prairie project.

Units associated with the Gem Timber Sale do not overlap areas identified for treatment with the Long Prairie project. There is some overlap with green tree replacement clumps identified for the Long Prairie project. Approximately 25 acres of GTR clumps identified for Long Prairie overlap with Gem Timber Sale units. Following activities associated with the Gem Timber Sale, these areas will no longer provide suitable numbers of green tree replacements. Acres of suitable green tree replacement clumps would be reduced by less than 1 percent. This small reduction would not change the average number of green tree replacements displayed in Table 14.

The Rim Woodcutting Area overlaps portions of units proposed for treatment with the Long Prairie project. The amount of dead standing or down trees is the primary factor that influences the amount of woodcutting activity. As a result of past treatments, Long Prairie proposed treatment areas currently have little dead or down material. Woodcutter use is expected to be negligible. No cumulative decrease in existing snag densities would be expected within Long Prairie proposed treatment units. There would be no further reduction in green tree replacements than those associated with the Long Prairie project.

Treatments associated with the Howlett Fuels CE would not overlap with Long Prairie treatment areas or with areas identified for retention as green tree replacement clumps. As with Alternative 1, snags created by underburning would not be great enough to increase the average number of snags present within the project area.

Future precommercial thinning within proposed treatments units would maintain or improve the diameter growth rates of understory trees without impacting density of green tree replacements. This treatment would help assure understory trees attain a size used by black-backed and three-toed woodpecker for nesting and foraging. Thinning in mixed ponderosa and lodgepole pine stands could reduce density around large diameter ponderosa pine trees or snags, potentially making them more suitable for nesting by White-headed woodpecker and potentially Williamson's sapsucker. Precommercial thinning, while encouraging larger average stand diameters, could prolong the period before the next mountain pine beetle outbreak. Potential increases in black-backed and three-toed woodpecker habitats may occur more gradually.

Alternative 3

Direct and Indirect Effects

Snags

Similar to Alternative 2, no removal of existing snags is proposed. Snag removal for operator safety may occur, but is expected to be rare. Snag densities displayed in Table 12 for treatment units would not substantially be reduced.

Unique to Alternative 3 is the proposal to treat mistletoe infected overstory trees greater than 8 inches dbh by girdling or pruning. This treatment would reduce mistletoe infection in the overstory while retaining some vertical structure as the understory

matures. Girdling would increase snag densities. This would create some larger diameter snags that are currently lacking in the project area. This could benefit primary and secondary cavity nesters that select for relatively open stand conditions. Snags created by girdling could remain standing for up to 8 to 12 years (Bull 1983; Parks et al. 1999; M. Patterson, Forest Technician Bend-Fort Rock Ranger District, pers. commum. 3/2005). Snags created by girdling could stand long enough to provide habitat for cavity nesters, such as nuthatches, that select for denser stand conditions.

Dwarf mistletoe would remain both within proposed treatment units and the surrounding landscape (See Disease Section). Mistletoe infected trees would continue to be available to cavity nesters for nesting, foraging, and roosting.

Green Tree Replacements
As proposed, green tree replacements would be retained within treatment units both as scattered, individual trees and as groups. Green tree replacement levels would generally be highest in those areas where treatments are focused primarily on removing trees infected with dwarf mistletoe. Green tree replacement clumps would also be retained outside treatment units. Average green tree replacement density following treatments would be similar to those for Alternative 2 (Table 14). This is the case when looking either within treatment units or within treatment units and adjacent green tree replacement clumps. While the average GTR density is the same for the two alternatives, Alternative 3 would retain a greater diversity of densities. Alternative 3 would retain more acres with relatively high levels of green tree replacements (>17 trees per acre) following treatment (Table 14).

Black-backed and three-toed woodpecker habitat
Majority of treatment areas are outside of areas classified as black-backed or three-toed woodpecker habitat (Map 14). Some units, however, overlap habitat suitable for both woodpecker species (Map 14). A total of approximately 852 acres habitat, or approximately 2 percent of woodpecker habitat in the assessment area (Table 15), would be impacted. Of this, approximately 16 acres provide habitat for both black-backed and three-toed woodpeckers. The majority of overlap would be in areas providing marginal habitat for black-backed woodpeckers. Nesting habitat for these species would not be provided following removal of overstory trees.

The Wildlife Specialist Report (Table 10) details effects on spatial arrangement of black-backed and three-toed woodpecker habitat. In some cases, treatments would increase habitat fragmentation by creating interior gaps within larger blocks of habitat (Unit 72, 103, and 260) or by breaking linkages between larger blocks of habitat (Units 48, 91, 108, 121, 234, 265, and 266). In other cases, treatments would impact areas that provide isolated islands of habitat. Loss of this isolated habitat (Unit 185 and 246) or a reduction in size (Units 193 and 197) would reduce habitat, but these isolated pieces of habitat are not of an adequate size to provide a territory and consequently are of extremely low suitability. Treatments in the remaining units (16, 40, 58, 111, 117, 118, 122, 127, 131, 141, 157, 165, 172, 206, 235, 237, 240, 244, 273, 279, 283, and 296) are located along edges of larger blocks of habitat or in fingers that extend from larger blocks

of habitat. Treatments in these areas would reduce available habitat, but would have little effect on the habitat block size. Collectively, these impacts to woodpecker habitat would be minor. Considering these impacts and marginal nature of the habitat, there would be minimal effect to local populations of black-backed or three-toed woodpeckers.

Williamson's sapsucker, white-headed and hairy woodpecker habitat
Alternative 3 proposes the most treatments within stands containing a mix of ponderosa and lodgepole pine. Treatments would have no short-term effects on nesting habitat for these species. Impacts to foraging and future nesting habitat for hairy woodpeckers, white-headed woodpeckers, and Williamson's sapsucker would be similar to those described for Alternative 2.

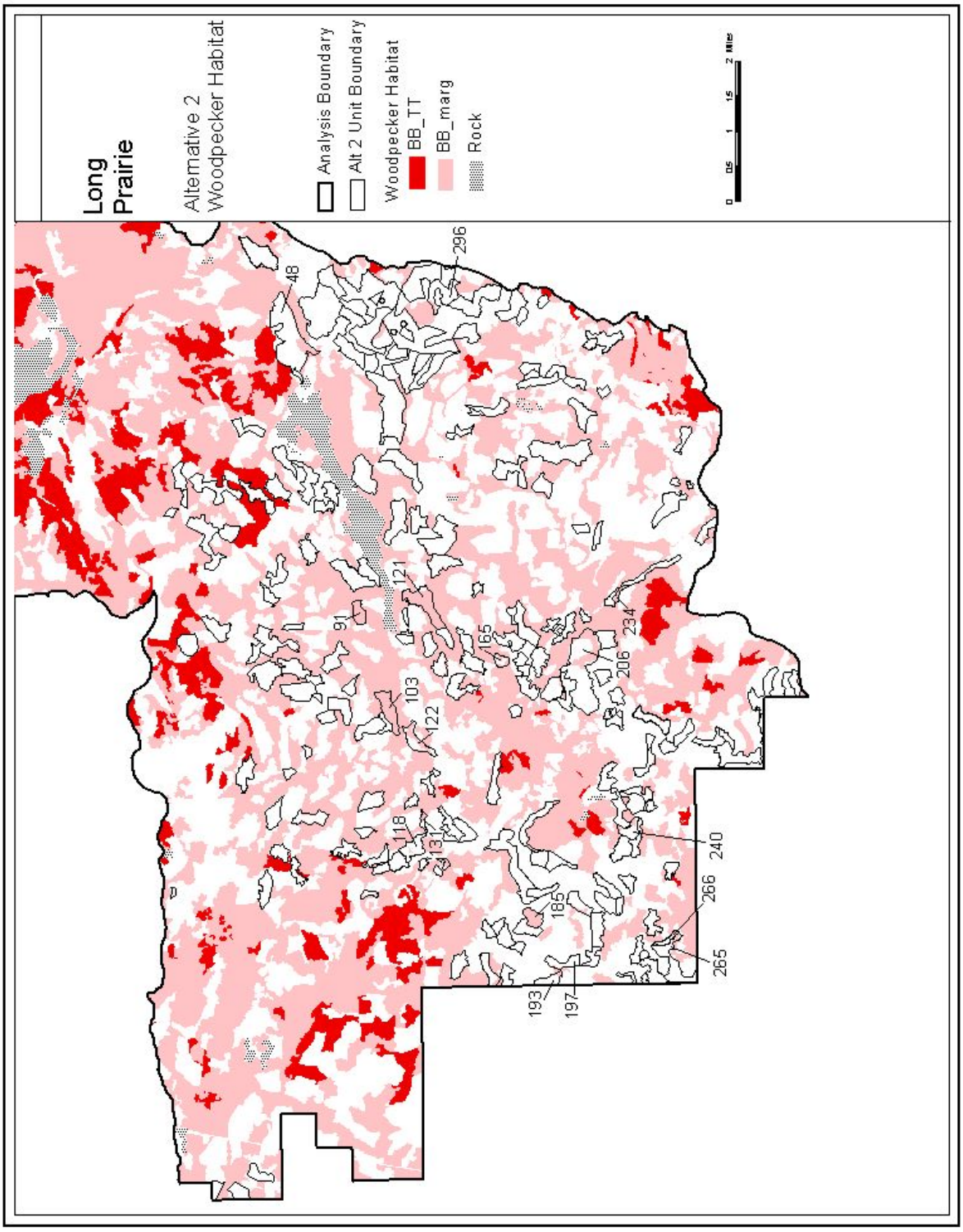
Trends
Within the next 15 to 20 years, no change in local populations of cavity nesting MIS species would be expected as a result of this action. Similar to Alternatives 1 and 2, the open, immature stand conditions would limit use of treatment areas by cavity nesting MIS species. Increased snag levels associated with girdling treatments could increase stability of populations of primary and secondary cavity nesters that select for relatively open stand conditions (Table 9).

Fifteen to 30 years hence, it is estimated that local populations of cavity nesting MIS species would remain stable. Similar to Alternatives 1 and 2, maturing understory would create favorable stand conditions for use by black-backed, three-toed, and potentially hairy woodpeckers. Similar to Alternative 2, treatments would reduce the existing overstory trees available for snag recruitment by approximately 50 percent (calculated from Table 14). This equates to a reduction across the project area of approximately 14 percent, slightly higher than that of Alternative 2. Potential for declines in populations resulting from the proposed action would be minimized by the retention of green tree replacements at the 100% population level (MPP).

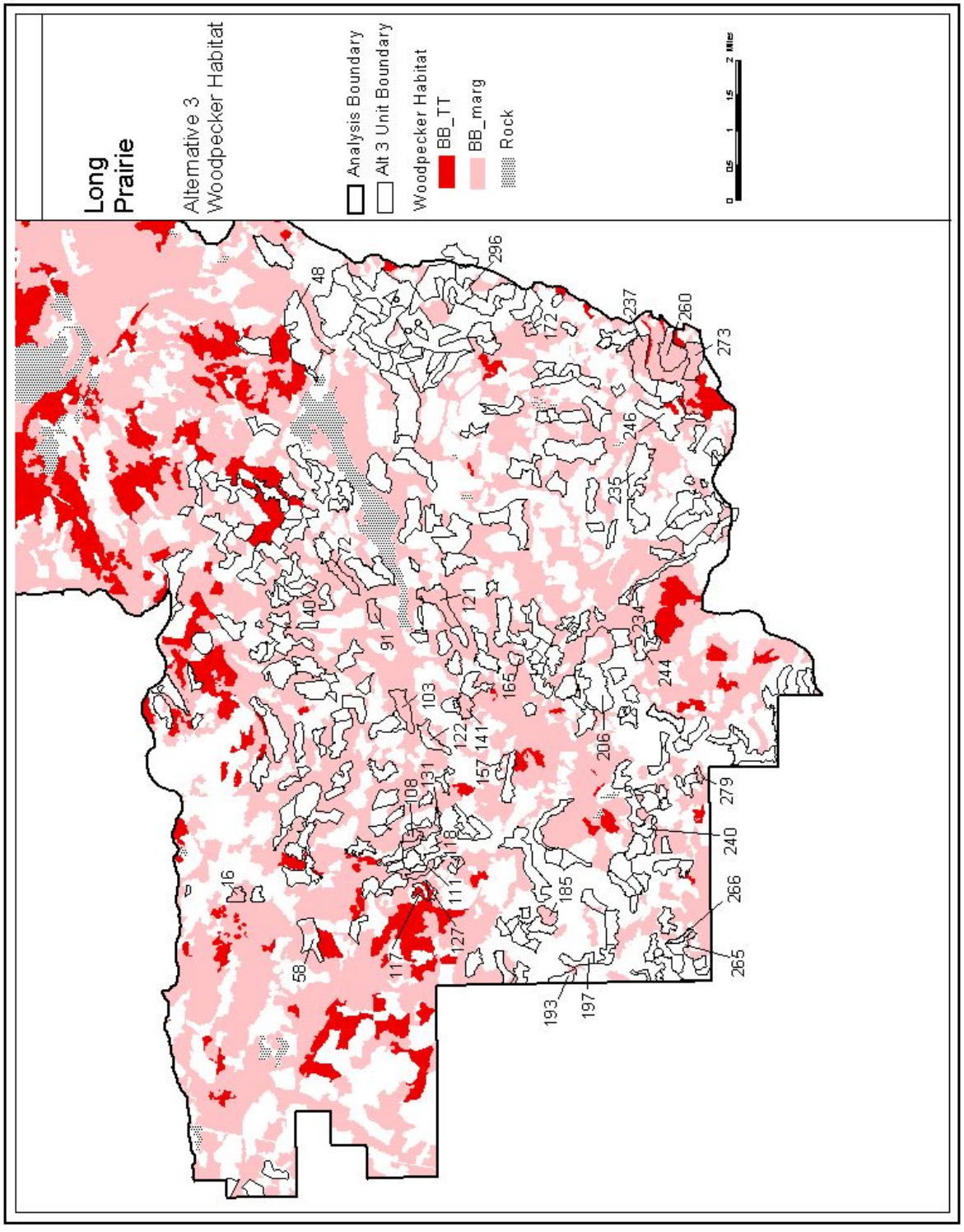
Condition of treatment units in 15 years and beyond would be similar to Alternative 2 descriptions. A difference would be number of acres with potential to provide habitat in 40 years and beyond for black-backed and three-toed woodpecker. Alternative 3 would reduce mistletoe spread on 40 percent more acres than Alternative 2. More acres would have potential to develop into late or old structure, habitat utilized by these two species.

Cumulative Effects

Cumulative effects would be similar to Alternative 2 with one exception. Approximately 60 acres of GTR clumps overlap with Gem Timber Sale units. These areas of overlap are adjacent to Long Prairie units proposed for felling/girdling/pruning. Following activities associated with the Gem Timber Sale, these areas will no longer provide suitable numbers of green tree replacements. Acres of suitable clumps would be reduced by one percent. This small reduction would not change the average number of green tree replacements displayed in Table 14.



Map 13. Alternative 2 units in relation to woodpecker habitat.



Map 14. Alternative 3 units in relation to woodpecker habitat.

Consistency with Management Direction

Treatments would retain snags and green tree replacements as directed in the Eastside Screen Interim Wildlife Standard. Harvest treatments would not remove existing snags. Green tree replacements would be retained at 100% population levels as determined using the best available science.

Consistent with the Deschutes Wildlife Tree and Log Implementation Strategy (USDA 1994b) green tree replacements would be left in a combination of patches or clumps and randomly scattered individual trees. Green tree replacement clump size, which would average 30 acres and range in size from 2 to 230 acres, would be consistent with the strategy, which indicates patches should generally be larger than 2.5 acres.

Other Wildlife Habitats

Late/Old Structural Habitat and Designated Old-Growth

According to Region 6 old-growth definitions (USDA, 1993) lodgepole pine late or old structure (LOS) is characterized by relatively dense stands (60 trees per acre) of lodgepole pine that have an average diameter of approximately 12 inches diameter at breast height (dbh). Ponderosa pine LOS is generally characterized by more open (13 trees per acre), single-story stands of large diameter ($\geq$ 21 inches dbh) ponderosa pine. Mixed conifer LOS is also characterized by stands of large diameter trees (13 trees per acre that are$\geq$ 21 inches dbh), and is more multi-storied than ponderosa pine LOS. Single-story LOS (stage 7) represents a more frequent fire regime whereas multi-story LOS (stage 6) can represent a less frequent fire regime (i.e. wetter site conditions) or areas of fire exclusion.

Existing Condition

Existing structural conditions within the project area were analyzed and compared to range of conditions estimated to have existed historically (see Vegetation section of this assessment). The analysis of existing structural conditions (Table 4) shows that acres of multi-story with large trees and single-story with large trees (late or old structure) are below levels estimated to have existed historically in ponderosa pine and mixed conifer vegetation types. Lodgepole pine LOS is within the range of conditions estimated to have been present historically. LOS habitat within the planning area is currently found in scattered small patches of either designated old-growth stands (MA-15) or remaining green stands. The current size of these existing LOS patches provides more potential habitat for small species or those requiring small home ranges, and lower quality habitat for larger species that need large home ranges.

Evaluation Criteria for Measuring Effects

1) The estimated timeframe in which LOS structure will develop within currently young stands,
2) The number of acres that retain some of the structural components of LOS (e.g. large trees, snags, and logs).

Alternative 1

Direct and Indirect Effects

There would be no direct or indirect effect to existing LOS or Forest Plan allocated old growth areas. Outside of these areas, the No Action alternative may prolong development of additional LOS habitat.

Where young understory trees are overtopped by mistletoe infected overstory, mistletoe infection is likely to spread from the infected overstory to the understory. The potential for the understory in these stands to develop into LOS would likely be diminished (see disease section of this assessment). Decreases in stand growth may prolong the establishment of new territories of species that utilize LOS (e.g. marten, goshawk, flammulated owl, and white-headed woodpecker) for decades (>80 years). Bull et al. (1997) acknowledged that heavy mistletoe infestation of a stand may adversely impact some wildlife species through a decrease in cover, tree regeneration and growth, and cone/seed output.

Growth projections for lodgepole pine stands (USDA Forest Service 1998b) have shown growth potential decreases as the number of mistletoe infected overstory trees increase. Potential for understory trees to develop into late or old structure would be highest where there are less than 3 mistletoe infected overstory trees per acre (USDA Forest Service 1998b, page 18, Table 5). When understory trees reach an age of 120 years, projections indicate stand quadratic mean diameter could be approximately 11 inches dbh (USDA Forest Service 1998b, page 21, Table 8). Trees greater than 12 inches dbh would likely be present and could be numerous enough to provide late or old structural stage conditions. These growth rate projections are similar to managed stand growth rates displayed in the Deschutes Wildlife Tree and Log Implementation Strategy (USDA Forest Service 1994b, page 31, Table 5). Growth projections from the wildlife strategy indicate it can take 127 years for lodgepole pine crop trees with a stem diameter of zero inches dbh to grow to a diameter of 12 inches dbh.

With more mistletoe infected overstory trees (3 to 10 trees per acre), potential for understory to develop into LOS would be reduced. Projected stand quadratic mean diameter at age 120 would be approximately 10 inches dbh. Using projected average rates of growth from when stand is age 80 to 120 (USDA Forest Service 1998b, page 21, Table 8), it is estimated it will take at least an additional 15 to 20 years for stands with this level of mistletoe to grow to 11 inches dbh.

There would be least potential for LOS to develop where 15 or more overstory trees per acre are infected with dwarf mistletoe. Projections indicate stand quadratic mean diameter would be approximately 9.5” dbh at 120 years of age (USDA Forest Service 1998b, page 21, Table 8). While trees greater than 12 inches dbh may be present, they would likely be too few for the stand to be considered late or old structure. At these higher levels of mistletoe infection, understory growth could be decreased to the point were stands develop into old, but relatively small diameter stands lacking large tree structure characteristic of LOS stands. Using projected average rates of growth from when stand is age 80 to 120 (USDA Forest Service 1998b, page 21, Table 8), it is

estimated it would take at least an additional 45 years for stands with this level of mistletoe to grow to 11 inches dbh. Mountain pine beetle attacking mature lodgepole pine when growth has slowed has been identified by Hopkins as a factor contributing to old growth lodgepole pine forests generally occur between ages 120 to 150 years (USDA Forest Service 1993).

In ponderosa pine stands, there is a similar relationship between infected overstory trees and understory growth potential (USDA Forest Service 1998b, page 28, Table 17).

Alternatives 2 and 3

Direct and Indirect Effects

There would be no direct or indirect effects to existing LOS or Forest Plan allocated old growth areas. Harvest treatments would not overlap these areas. Temporary roads would not go through LOS habitat, but short sections of temporary road would go through two Forest Plan Old Growth areas. Both sections of temporary roads (0.05 and 0.22 miles in length) are on existing, unclassified road prisms and go through previously harvested areas. Use of temporary roads would not change structural conditions within LOS habitat or Forest Plan Old Growth areas.

Proposed treatments would retain some of the components associated with late or old structural stage stands. In all areas proposed for treatment, existing snags and down logs would be retained. In addition to dead wood structure, both alternatives would retain varying levels of larger, live trees (Tables 2 and 3). In all areas proposed for treatment, Alternative 2 would retain an average of at least 3 live trees per acre, including all live trees greater than or equal to 21 inches dbh. Alternative 3 would also retain live, large tree structure (Table 2) on all but 105 acres (approximately 1 percent of total treatment proposed). On this relatively small area, only live trees greater than 21 inches dbh would be retained. On the average, large tree structure retained with Alternatives 2 and 3 would be similar (11 trees per acre, Table 3). Alternative 3, however, would retain a relatively high level of large tree structure (>17 trees per acre) on approximately 60 percent more acres than Alternative 2 (calculated from Table 3).

Proposed overstory treatments will not lengthen the time it takes for stands to develop into LOS. Overstory treatments proposed in both alternatives would increase the potential for the understories in treatment units to develop into LOS habitat (see Disease section of this assessment). With reduced level of mistletoe in the overstory reduced to less than 3 trees per acre, there would be potential for understory to have developed into late or old structural stage conditions by age 120 years.

Alternatives 1, 2 and 3

Cumulative Effects

Given no direct or indirect effects to existing LOS or Forest Plan allocated old growth areas, there will be no cumulative effects.

Connectivity

Connectivity refers to the ability of species that depend upon late seral habitat to move and disperse between and into to other late seral areas in order to establish either new home ranges or to complete migratory patterns.

Management Direction

The Forest Plan, as amended by the Eastside Screens, directs land management projects to establish and maintain connectivity corridors between late seral habitats at least two different ways.

Existing Condition

To the east of the project area there are a number of barricades to connectivity. These include the population center of La Pine, the Highway 97 corridor, and the Deschutes River. Newberry National Volcanic Monument, adjacent to the northeast portion of the project area, contains large blocks of LOS habitat and consequently is an important point of connection for the corridors within the project area.

Corridors connecting late or old structural stage stands or Forest Plan allocated old growth areas were established within portions of the project area under past land management projects. Additional corridors have been designated with this project to complete the corridor system through the project area. Corridors were designated in the best habitat taking into account past activities and fires. Designated corridors connect the larger blocks of late seral habitat within the project area (e.g. LOS habitat and Forest Plan Old Growth Areas) with closest blocks of late seral habitat outside the project area, including those within NNVM. Corridors were not designated eastward from the project area.

The majority of the project area consists of early and mid-structural stage lodgepole pine with inclusions of ponderosa pine in various structural stages. Much of the connectivity within the lodgepole pine exists in unharvested stringers between old units that were harvested in the mid-1980s as a result of the mountain pine beetle infestation. Due to lack of better habitat, portions of designated corridors go through early to mid-seral habitat conditions. Relatively long corridors connect small blocks of late seral habitat in the western portion of the project area with larger blocks of habitat in the eastern portion of the project and NNVM.

Evaluation Criteria for Measuring Effects

1) The degree of disruption (e.g. portion of a proposed unit within corridor and ability of corridor to meet direction), and
2) The ability of the corridor to serve its purpose in the short-term (<20 years) and long-term (>20 years).

Alternative 1

Direct and Indirect Effects

Connectivity within the project area would remain unchanged in the short-term. Dispersing and migrating wildlife would likely move through the area, but few would establish new home ranges within the project area. There would be continued reliance on the existing corridors to provide the necessary links. If a major fire or other disturbance event were to impact these corridors, linkage could be lost and habitat would be further fragmented.

In the long term, high degrees of mistletoe infection and high tree densities in existing early to mid-seral stands could adversely affect stand growth.

This could impact connectivity by reducing the potential to: 1) improve habitat conditions within the designated connectivity network, and 2) increase the number of connections, increasing corridor width, or shortening the connections.

Some corridors may also be able to function as connections in the long-term, but without treatment of mistletoe infestations adjacent to the corridors, some corridors will be lost.

In some connectivity stands, high degrees of mistletoe infection could potentially reduce stand growth. In areas highly fragmented and where overstory tree density is low, the amount of mistletoe could negatively impact the quality of connectivity in the long-term.

The designated corridors would continue to function as connections between LOS habitat for the short-term.

Cumulative Effects

Under the No Action alternative this situation of marginal connectivity would persist the longest because stands adjacent to the corridors will succumb to the effects of mistletoe infestation (stunted tree growth and ultimately death) before quality LOS habitat can develop. Although some mature trees will be removed under the action alternatives, in the long-term (>20 years) these stands are likely to grow into healthier mature stands than if the present mistletoe was allowed to spread.

Alternatives 2 and 3

Direct and Indirect Effects

Areas proposed for treatment in Alternatives 2 and 3 provide early to mid-seral habitat conditions. Consequently, proposed treatment areas generally do not serve as corridors or patches linking the corridors. In a few cases, these habitat conditions are the best available, and there is some overlap with designated connectivity corridors.

In Alternative 2, one proposed unit (Unit 121) overlaps a connectivity corridor. In Alternative 3, three proposed units overlap connectivity corridors (Units 49, 115, 121). Proposed treatments in unit 49 would not affect existing connectivity. A green tree

replacement clump within the unit overlaps the connectivity corridor. No removal of overstory would occur in the connectivity corridor. Within unit 115, the proposed treatment is to fell/girdle/prune infected overstory trees. This treatment would not reduce existing canopy closure throughout the stand, but may create small canopy gaps. Greatest potential for connectivity to be disrupted would be in unit 121. Proposed treatments could reduce canopy cover below the top one-third of the site potential.

Temporary roads associated with both alternatives would cross through connectivity corridors. The fewest miles intersecting connectivity would be associated with Alternative 3 (1.99 miles) as compared to Alternative 2 (2.44 miles). Temporary roads would be on existing, unclassified road prisms. These road prisms may have grown in with seedlings and other vegetation thereby closing the narrow, linear gap across the corridor. Opening these existing, unclassified road prisms for temporary use will temporarily restore the linear gap in the corridor. This gap may influence movements of small animals (reptiles and mammals) within the corridor but would not effect movement of birds or larger mammals (e.g. raptors, woodpeckers, and marten). This effect would be minimized by opening temporary roads in phases (Mitigation Measure 26).

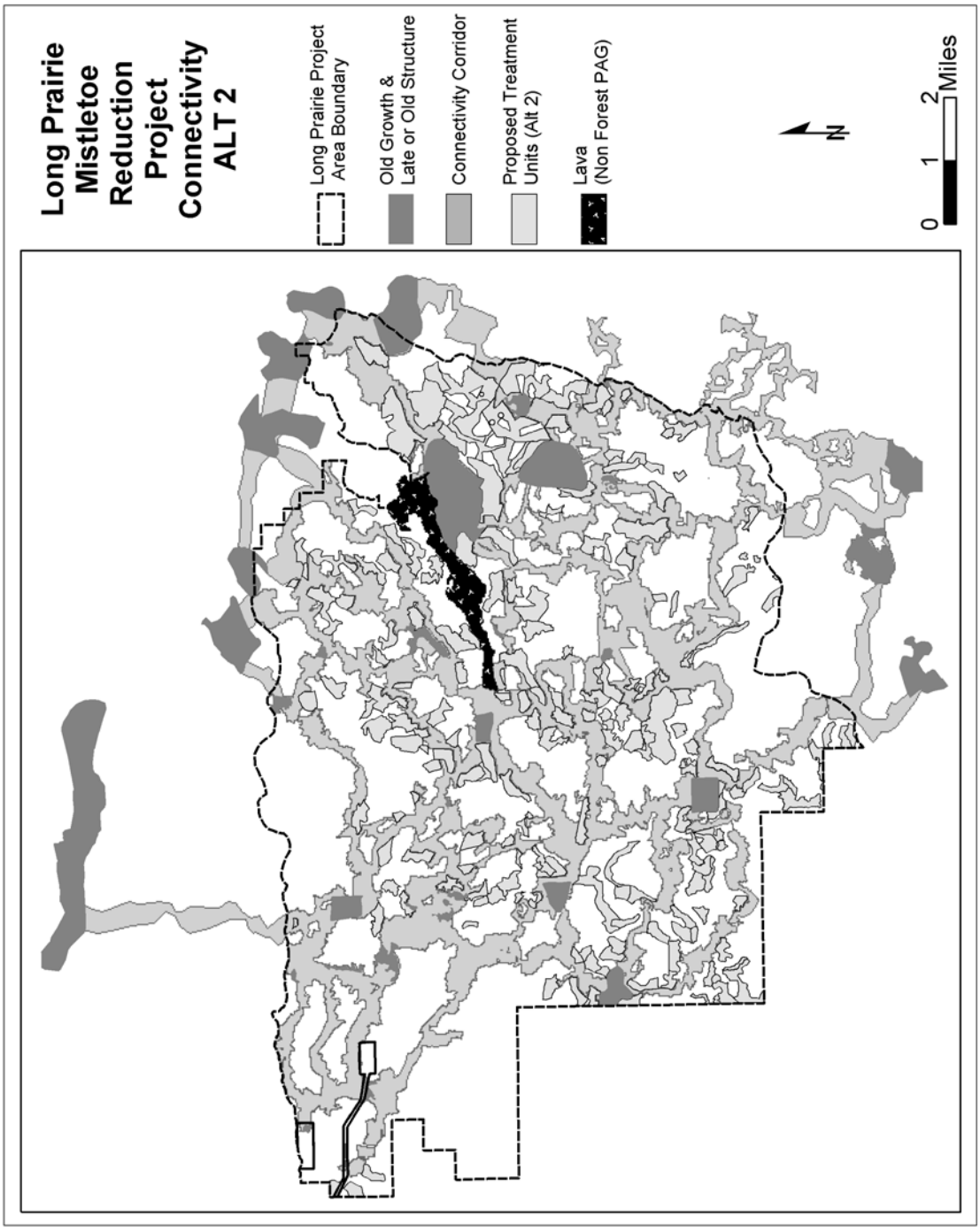
No other proposed timber harvest activities under either action alternative would occur in stands that meet the definition of connective habitat as described under the Eastside Screens (Maps 15 and 16). Understories in all units proposed for treatment range from low to high stocking. No removal of understory would occur under any alternative. Access of harvest equipment into treatment units would create short-term linear gaps in the understory. Use of designated skid trails will reduce the potential for degradation of existing connectivity provided by understory vegetation. Although the effectiveness of the connectivity habitat would be impacted where the proposed units overlap a corridor, implementation of any action alternative is expected to have no negative impacts to connectivity function on the landscape.

Similar to the No Action alternative, the highly fragmented appearance of the project area would remain in the short-term. Few new home ranges would be established within the project area. Fires or other disturbance events could impact connectivity. In contrast to the No Action alternative, Alternatives 2 and 3, by treating the stands adjacent to the existing corridors for mistletoe infestation, would contribute to the creation of wider corridors in the long-term.

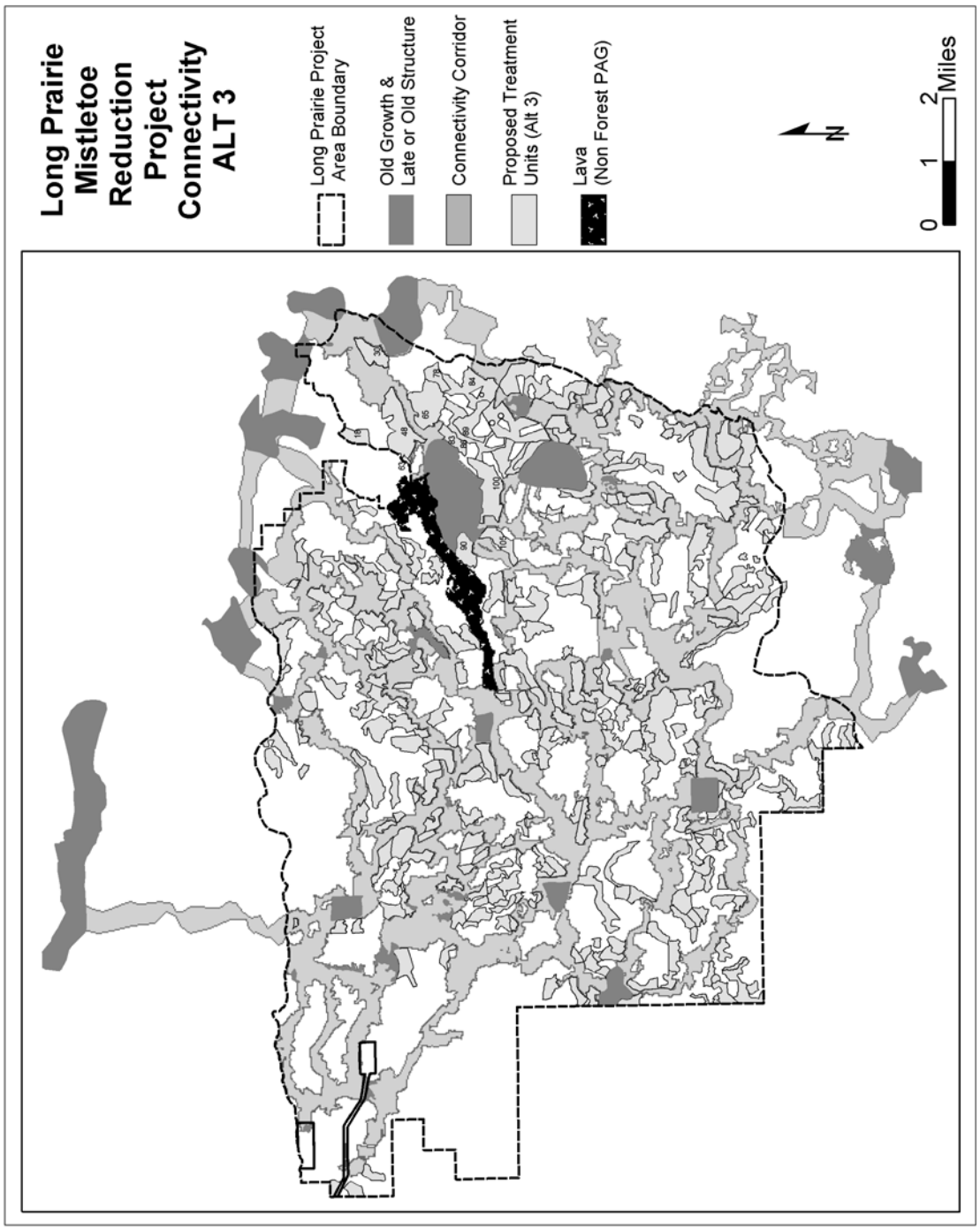
Alternatives 1, 2, and 3

Cumulative Effects

Cumulative effects were analyzed at the project area level, and specifically how the corridors connect patches of LOS habitat within and adjacent to the project area.



Map 15. Connectivity Corridors and Alternative 2 Units, Long Prairie Mistletoe Reduction Project.



Map 16. Connectivity Corridors and Alternative 3 Units, Long Prairie Mistletoe Reduction Project.

Consistency with Management Direction

The Interim wildlife standard from the Eastside Screens require that timber sale projects maintain connectivity and reduce fragmentation of LOS stands and maintain or enhance the current level of connectivity between LOS stands and between all Forest Plan designated "old growth/MR" habitats. Connectivity standards include the following:

1) Connect LOS stands and old growth areas in a contiguous network pattern by at least 2 different directions.
2) Connectivity corridor stands are described as having canopy closures within the top one-third of site potential. Stand widths should be at least 400 ft. wide. If stands meeting these descriptions are not available, leave the next best stands for connections.
3) Harvesting within connectivity corridors is permitted if all the criteria in (2) above can be met, and if some understory is left in patches or scattered to assist in supporting stand density and cover. Some understory removal, stocking control, or salvage may be possible activities, depending on the site.

Consistent with management direction, connectivity corridors are designated through the project area. One proposed unit (121) under Alternatives 2 and 3 would cause the corridor not to meet the criteria in (2) quoted above. The other units that overlap the corridors will meet the above direction because one has a green tree retention clump (i.e. no harvest) as the portion that overlaps the corridor (Unit 49) and Unit 115 is a girdle, prune, fell and leave on site prescription that will not remove any material from the corridor. This type of prescription is not expected to compromise the function of the corridor.

Coarse Woody Material

Management Direction

The interim wildlife standard of the Eastside Screens provides direction for retaining down logs. The Screens specify the diameter and length of down wood pieces and the number that should be retained. Total lineal feet of down wood to be retained ranges from 20 to 40 for ponderosa pine, and from 120 to 160 for lodgepole pine. The cubic foot equivalent for ponderosa pine types is 310 to 400 and for lodgepole pine types it is 715 to 790 cubic feet per acre. According to Screen direction, existing down logs may be removed only when they exceed the specified quantities. The wildlife standard indicates that it is not the intention of the direction to leave standing trees for future logs in addition to the required snag numbers (see Cavity Nester section), nor to fall merchantable material to meet the down log requirements.

Existing Condition

The project area contains a wide range (0 to approximately 1,900 cubic feet per acre) of existing coarse woody material (CWM). Stands proposed for treatment under the action alternatives are expected to contain low levels of CWM (approximately 160 cubic feet per acre) due to past activities. On the average, existing down logs within proposed

treatment areas are less than levels specified in the Screens. Many of the proposed units pre-date the Screen direction which requires higher levels than previous Forest Plan direction (Standard and Guidelines WL-72 and WL-73).

Scope of Analysis

Cumulative effects analysis evaluates impacts to coarse woody material within the project area. This analysis boundary was selected since: (1) proposed treatments would not remove any existing down coarse woody material, and (2) there's a wide range of coarse woody material within the treatment units and project area.

Evaluation Criteria for Measuring Effects

1) Estimated timeframe for the development of coarse woody material within existing units.

Alternative 1

Direct and Indirect Effects

No short-term impact to CWM is expected. Levels would remain low in regeneration harvest units with gradual recruitment of large pieces coming from the remaining overstory trees. Habitat for those species that depend upon CWM (e.g. marten, invertebrates, small reptiles) will likely be best found outside these areas in corridors and other non-treated patches within the project area.

Over many decades, better habitat will develop within previously regenerated areas. Within areas being considered for treatment, current green tree replacements average 21 trees per acre (Table 14) and would provide for CWM recruitment. Over the long term (>50 years) these trees would fall, creating the equivalent of approximately 450 lineal feet per acre of CWM.

Alternatives 2 and 3

Direct and Indirect Effects

Neither action alternative proposes to remove existing down logs. Existing coarse wood density and distribution is expected to remain similar to the No Action alternative in the short-term. Long-term impacts of the action alternatives include reducing existing green trees that could be recruited into the future down log component.

Within areas being considered for treatment, Alternatives 2 and 3 would retain an average of 11 (with a range of 2 to 50) green tree replacements per acre (Table 14). Over the long-term (>50 years) these trees would fall, creating the equivalent of approximately 235 lineal feet per acre of CWM (with a range of 40 to 1,070).

With Alternative 3, distribution of green tree replacements (see Cavity Nester, Snag and Green Tree Replacement Section, page 70) would result in down logs being recruited in a clumpy distribution. With Alternative 3, girdling and felling trees would contribute to more coarse wood amounts in the short term than in Alternative 2.

Alternative 1, 2, and 3

Cumulative Effects

While some ongoing activities (Appendix 3) will impact coarse woody material, no cumulative reduction in coarse woody material would be expected. The Edge Timber Sale will reduce down woody material in two, relatively small units. Underburning associated with the Howlett Natural Fuels project may remove incidental amounts of CWM. Long Prairie activity areas would not overlap with activity areas associated with these projects.

The Rim Personal Use Woodcutting Area (Appendix 3) overlaps a small portion of the project area. It overlaps portions of 15 to 18 proposed activity areas depending on the selected alternative. Dead wood in these activity areas is generally light, consequently woodcutter use is expected to be negligible. Activities associated with the Long Prairie project in combination with woodcutter activity are not expected to result in a reduction of coarse woody material currently present proposed activity areas. Outside these areas, ongoing woodcutter may further reduce coarse down wood in a small portion of the project area.

Consistency with Management Direction

Consistent with management direction, there would be no removal of existing down wood. Alternative 3 incorporates some immediate downed log recruitment.

Management Indicator Species

The Forest Plan identifies wildlife species to serve as management indicator species (MIS). These species were selected because their welfare was thought to be useful as an indicator of other species dependent on similar habitat conditions. Indicator species were considered to be useful in assessing the impact of management actions on a wide range of other wildlife with similar habitat requirements. The MIS species selected for the Deschutes National Forest include the marten, wolverine, Cooper's hawk, sharp-shinned hawk, elk, golden eagle, great blue heron, mule deer, bald eagle, goshawk, spotted owl, osprey, peregrine falcon, red-tailed hawk, western big-eared bat, waterfowl, and the woodpecker guild. The complete list of MIS species identified for the Deschutes National Forest, as well as the habitat conditions they represent, is displayed in the Wildlife Report.

Cavity nester MIS species (black-backed woodpecker, hairy woodpecker, three-toed woodpecker, white-headed woodpecker, and Williamson's sapsucker) are discussed in the previous section titled "Cavity Nesters". This section analyzes effects to the following Management Indicator Species (MIS) which have potential to be found in the project area: deer and elk, great gray owl, northern goshawk, Cooper's hawk, sharp-shinned hawk, red tailed hawk, golden eagle, and American marten.

Deer and Elk

Existing Condition

The project area consists of summer and transition range for mule deer that migrate to the Cascades in the summer months. Transition range is found in the western half of the project area and summer range in the eastern half. A good distribution of foraging habitat exists. Most lodgepole pine stands do not contain thermal cover due to the amount of mortality or past harvests as a result of beetle epidemics. Some of the existing regeneration is tall enough to mediate cold and heat. In stands of regeneration where there is some thermal value, the canopy is discontinuous.

Hiding cover is defined as vegetation capable of hiding 90 percent of a standing adult deer or elk from view of a human at a distance equal to or less than 200 feet (Thomas 1979, Forest Plan S&G WL-54). Hiding cover provides security to big game and protection from predators. It is especially important for reducing vulnerability to hunting and poaching pressure by providing concealment in areas that have high open road densities and easy access by hunters. The Forest Plan requires evaluation of hiding cover in deer summer range, which includes areas outside the Deer Habitat Management Area.

Ideally, hiding cover stands would be in close proximity to foraging areas and would make up approximately 30 to 40 percent of the land area (Forest Plan; Thomas 1979). The optimum distance between cover stands for maximum use by big game is thought to be approximately 1,200 feet with stand sizes ranging from 6 to 26 acres (Thomas 1979).

The analysis of hiding cover is based on previous hiding cover analyses conducted for the Woof Environmental Assessment (EA, 1994), Prairie Dog EA (1996), and Emerald EA (1996). In combination, these assessments cover the majority of the Long Prairie project area. Hiding cover quantities exceed minimum Forest Plan standards and guidelines, approximating ideal conditions based on Thomas (1979). Since these prior assessments, hiding cover has likely increased due to growth of seedlings and saplings into taller trees.

Table 16 displays the existing ratio of cover to foraging habitat in each of the implementation units within the Long Prairie project area. Effects of wildfires that have occurred since these prior assessments are reflected in the ratios. The applicable Forest Plan standards and guideline are also displayed.

Table 16. Existing condition of hiding cover by Implementation Unit in the Long Prairie project area.

Implementation Unit (IU)	Hiding Cover Ratio Hiding cover: forage (Percent)	LMRP Standard & Guideline for Hiding Cover
Woof		
IU #58 (23,271 acres)	40:60	30%
IU #64 (29,661 acres)	42:58	30%
Black Bark Pine areas (50-80 year old ponderosa pine)	30:70	10% in black bark pine areas.
Prairie Dog		
IU #54 (42,736 acres)	34:66	30%
Emerald		
IU #59 (19,039 acres)	42:58	30%

Scope of Analysis

Cumulative effects analysis evaluates impacts to habitat in the four implementation units listed in Table 16, which total approximately 114,707 acres.

Evaluation Criteria for Measuring Effects

1) Estimated hiding cover to forage ratios in relation to LRMP standards.

Alternative 1

Direct and Indirect Effects

Hiding cover ratios within the project area would not change in the short-term (<20 years). In the long-term (>20 years), as stands mature, amount of thermal cover would likely increase as hiding cover develops into thermal cover. In the long term, mistletoe-related mortality could reduce or remove cover in localized areas.

Cumulative Effects

Ongoing and reasonably foreseeable future actions, including the Miscellaneous Post-Sale project, the Ponderosa Pine Release project, the Edge and Gem timber sales, and the Howlett Natural Fuels project, may impact approximately 2,826 acres of hiding cover. Impacts associated with these projects are reflected in the cover to forage ratios presented in Table 16. Impacts of fires that have occurred in the recent past (McKay (1998); Black Bark Fire (1999); and Newberry 2 Fire (2000)) are also reflected in these ratios. Treatments associated with these projects are scattered across implementation units and will meet Forest Plan standards and guidelines for big game habitat. These projects may cause increased localized disturbance to big game until the projects are completed.

Over the landscape, there would be short-term effects (loss of cover and increased disturbance from road use) to big game herds as a result of these projects. In the long-term (approximately 20 years) the cover will return. Cumulative effects to deer and elk herds would be minimal.

Implementation of road closures from prior decisions would reduce the open road density in the project area to approximately 2.8 miles per square mile. Deer and elk will benefit from these closures.

Alternatives 2 and 3

Direct and Indirect Effects

Hiding cover within units proposed for treatment is composed of regenerating trees in the understory. Overstory trees currently provide little hiding cover value due to the sparse nature of existing overstory stocking. Harvest of overstory trees is expected to have little or no impact on existing hiding cover. Access by mechanical equipment has the potential to create gaps in the understory, but use of designated skid trails for harvest will minimize damage to understories currently providing cover. The girdling, pruning, and felling treatment associated with Alternative 3 would have no effect on existing hiding cover.

Open road densities would increase in the short-term due to use of temporary roads for commercial harvest. Amount of temporary road open at one time would be minimal (see Mitigation Measure 26 and Road Access section). All temporary roads, as well as roads opened to access harvest units, would be closed upon completion of operations. Within the project area, infrequently used roads are quickly grown in with lodgepole pine seedlings and saplings. Short-term increases in open road densities under the action alternatives may displace individual deer or elk, but no impacts to populations are expected. For further evaluation of road densities within the Long Prairie project area, see Appendix C of the Wildlife Specialist Report.

Cumulative Effects

Effects would be similar to those described under the No Action alternative. Additionally, areas analyzed for treatment with the Long Prairie project could be thinned in the future (Appendix 3, Precommercial Thinning Project). This thinning could reduce hiding cover within the project area. Considering these foreseeable precommercial thinning treatments, together with Alternative 2 and 3 proposed overstory treatments, reduction of hiding cover could total 5,000 acres. Reductions in cover are not expected to reduce hiding cover levels below 30 percent of the implementation unit. The future precommercial thinning project would be planned to be consistent with Forest Plan standards and guidelines for big game. Overall, juxtaposition of hiding and thermal cover and foraging habitat may change, but target ratios would be maintained on the landscape. Hiding cover would be expected to quickly recover as the understory responds to thinning. Cumulative effects to deer and elk habitat would be minimal. A stable trend in populations would be expected. Deer and elk will benefit from road closures proposed under other projects.

Great Gray Owl

Existing Condition

In central Oregon, great gray owls are often associated with meadows and openings surrounded by mature forest (Bryan and Forsman, 1987 as cited in Duncan and Hayward, 1994). Studies in the Blue Mountains (Bull et al. 1988) have shown that owls will nest in partially logged stands, but most owls nested in large trees within stands that were not logged.

Great gray owls do not build their own nests and are dependent on structures built by other species (i.e. ravens and red-tail hawks) or existing substrate like broken top snags or mistletoe platforms (Bull et al. 1988). Required habitat characteristics appear to be large diameter trees, forests for roosting, and proximity to foraging habitat. Some research shows owls nesting within 0.5 miles of a timber-harvested area, and owls will use man-made openings (generally larger than 10 acres) for foraging. Juxtaposition of nesting and foraging habitat is important for this species (USDA Forest Service and USDI Bureau of Land Management 2004). Because fledglings leave the nest before they can fly, leaning and deformed trees, and perches high enough off the ground are

important in the forest nest stand (Duncan and Hayward, 1994). Great gray owls hunt in open grassy habitat (including selective and clear-cut areas, natural meadows and open forests). In Oregon, major prey species include pocket gophers and voles (Duncan and Hayward, 1994).

Assuming the stand initiation seral stage (Table 5) compromises foraging habitat, there are approximately 14,913 acres of potential foraging habitat within the project area. This habitat is largely small pockets (less than 3 acres) of open habitat.

Potential nesting habitat occurs in mature to old stands adjacent to proposed treatment units (old regeneration-harvested stands). Mistletoe platforms in larger trees provide the most likely and available nesting substrate due to the overall lack of large snags. There is approximately 4,637 acres of potential nesting habitat within the project area. This potential habitat is of marginal quality and consequently great gray owl populations are likely to be small. No surveys have been conducted within the project area, and there are no recorded sightings for this species within or adjacent to the project area.

Scope of Analysis

Cumulative effects analysis evaluates impacts to habitat within the project area due to the marginal nature of potential habitat within proposed treatment areas and the adjacent non-treated areas.

Evaluation Criteria for Measuring Effects

1) The number of acres of foraging habitat gained.

Alternative 1

Direct and Indirect Effects

Little impact on potential habitat for this species would be expected. In the short-term (<20 years), foraging habitat would gradually grow in with taller, denser seedlings and saplings. Mistletoe platforms may remain the likely nesting habitat.

In the long-term (>20 years), as mistletoe infects the understory, mature forest habitat around the openings may become limited. The infected understory may not get to the point where it can be used for nesting but could become tall and dense enough to preclude foraging.

Cumulative Effects

Treatments associated with current and foreseeable projects (Appendix 3) will retain trees greater than 21 inches dbh. These large diameter trees can be used by great gray owls for nesting. The mistletoe treatment associated with the Miscellaneous Postsale project and the Gem Timber Sale could reduce mistletoe brooms, which can serve as nesting platforms for great gray owls. This type of nesting habitat would, however, remain common within the project area. Thinning associated with the Ponderosa Pine Release project and the Miscellaneous Postsale project would enhance development of large structure, which may provide more options in the future for nest structure.

With the small likelihood that great gray owls are currently using the project area, cumulative impacts would be minimal. Population trends would be expected to remain stable.

Alternatives 2 and 3

Direct and Indirect Effects

Removal of individual mistletoe-infected trees and other overstory trees less than 21 inches dbh would reduce potential nesting habitat. Overall level of nesting habitat, however, would not substantially change. Retention of green tree replacement clumps adjacent to treatment areas would aid in preserving potential nesting habitat for this species in the future.

Alternative 2 would increase foraging habitat in the project area by approximately 33 percent (4,895 acres). Alternative 3 would increase it by approximately 31 percent (4,654 acres). In the long-term (>20 years) foraging habitat will decrease as the understory becomes taller and denser. Reductions in mistletoe would enhance the potential for understory to develop into nesting habitat.

Alternative 3 proposes a variety of overstory treatments and green tree replacement strategies that would help retain more large trees in the future. Pruning and girdling, although it still the removes the potential mistletoe platform, would also keep some of the large structure associated with owl habitat.

Cumulative Effects

Effects of ongoing and reasonably foreseeable future actions would be similar to those described for Alternative 1. Mistletoe-infected trees would remain common on the landscape, even with the combined reduction of mistletoe-infected trees associated with these projects and the Long Prairie project. Large diameter trees on the landscape would continue to provide potential nesting habitat. Future precommercial thinning (Appendix 3) within proposed treatments units would enhance development of large structure on a relatively large number of acres, which may provide more options in the future for nest structure.

Cumulative effects to great gray owls would be minimal due to the low suitability of habitat, due in part to small blocks of foraging habitat. Population trends would largely remain stable. More large structure in the future may result in populations that are stable to slightly increasing.

Consistency with Management Direction

According to the Forest Plan, habitat suitable for 8 great gray nesting pairs are to be provided on the Forest (Standard and Guideline WL-30). There are currently at least five pairs of great gray owls in the northern portion of the Forest (Sisters Ranger District, L. Turner, Wildlife Biologist, pers. commun. 9/2005). In the central portion of the Forest (Bend-Fort Rock Ranger District), great gray owls have been heard or seen in the vicinity

of the Deschutes River and wet meadows, but nests have not been located (J. Lowrie and M. Gregg, Wildlife Biologists, pers. commun. 9/2005). There is one known great gray owl nest site in the southern portion of the Forest, with potential habitat for three or four more pairs (Crescent Ranger District, J. Kittrell, pers. commun. 9/2005). Based on this information, there appears to be suitable habitat on the Forest, outside of the Long Prairie project area, to support 8 great gray owl nesting pairs. This is consistent with recorded sightings of great gray owls on the Forest. There have been approximately 42 recorded sightings on the Forest, with none of the sightings located east of La Pine (M. Gregg, pers. commun. 9/2005, based on sightings documented in the NRIS Fauna National Wildlife Data Base).

Current direction addresses protection of active, known nest sites (Standard and Guideline WL-31 and WL-33). Mitigation Measure 10 provides for protecting nests that may be found during project implementation.

Northern Goshawk, Cooper's Hawk, and Sharp-shinned Hawk

Existing Condition

Northern Goshawk

In Oregon, goshawks tend to select mature or old-growth stands of conifers for nesting, typically those having a multi-layered canopy with vegetation extending from a few meters above ground to more than 40 meters high. Generally, nesting sites are chosen near a source of water and on a moderate slope having a northerly aspect.

Portions of the project area were surveyed in the past under the Woof, Prairie Dog, and Emerald timber sales. One old goshawk nest record is located within the project area. This nest was last active in 1987. Surveys in 1992 and 2003 did not locate a nest.

Goshawk nesting habitat is currently limited within the project area. The past widespread mortality of trees greater than 9 inches dbh during the beetle outbreak (see page 10 to 11 of this assessment), together with subsequent harvest activities (see pages 12 to 13 of this analysis), have contributed to the existing condition. There are approximately 4,370 acres (8 percent of the project area) of potential nesting habitat for goshawk. Suitable nesting habitat that remains is discontinuous and can be found within late or old structure (LOS) stands, connectivity corridors, and Forest Plan Old Growth areas. Proposed treatment units currently do not provide suitable nesting habitat due to past harvest activities and the scattered nature of the overstory.

Goshawk foraging habitat is not considered to be limited within the project area. Approximately 64 percent of the project area (approximately 35,330 acres) is potential foraging habitat. All forest structure stages (Table 5) except stand initiation and stem exclusion are considered to provide foraging habitat. Important foraging habitat components include snags, logs, woody debris, openings, large trees, and herbaceous and woody understories. Goshawks typically forage on small mammals, grouse, woodpeckers, and passerines (Reynolds et al. 1991). Proposed treatment units currently provide foraging habitat for goshawk.

Cooper's Hawk and Sharp-Shinned Hawk
The Cooper's hawk generally selects 50 to 80 year old conifer stands with a closed canopy for nesting. Its habitat consists of dense forests intermixed with openings. Where the species occurs in extensive forests, it is more likely to be found near forest edges, along roads or clearings, or at a forest opening such as stream or lake edges. Surveys of historic Cooper's hawk nest sites conducted in 2003 found two active nest sites within the project area. Neither one of these sites is within a proposed unit, but both are within 0.25 mile of some units.

Nesting habitat for the sharp-shinned hawk is similar to that described for Cooper's hawk, with the sharp-shinned hawk being able to use younger stands. The sharp-shinned hawk generally selects nest groves of even-aged stands of 40 to 60 year old conifers with a dense canopy. Nesting can occur in dense stands of second growth trees beneath an over-mature overstory. There are no known active or historic sharp-shinned hawk nest sites within the project area. Based on recent sightings (8/2005), nesting activity is suspected adjacent to a proposed treatment area.

Nesting habitat within the project area is not considered limiting. There are approximately 19,861 acres (35 percent of the project area) of potential nesting habitat for Cooper's and sharp-shinned hawk (Multi-story without large trees and LOS structural stages, Table 5).

Foraging habitat for these species is similar to that described for the goshawk. Acres of foraging habitat are the same as those described for goshawks.

Scope of Analysis
Cumulative effects analysis evaluates impacts to habitat within the project area. This analysis boundary was considered large enough to access effects since: (1) proposed treatments would not occur within suitable nesting habitat for goshawk, (2) nesting habitat for Cooper's hawk and sharp-shinned hawk is not considered to be limited in the project area, and (3) Foraging habitat for these accipiter species is not limited within the project area.

Evaluation Criteria for Measuring Effects
Northern Goshawk
1) The percentage change in foraging habitat.
2) Timeframe for the development of LOS habitat in the project area.

Cooper's and Sharp-shinned hawks
1) The number of acres and percentage of potential nesting habitat removed.
2) The estimated timeframe in which suitable habitat develops.

Alternative 1

Direct and Indirect Effects

Suitable nesting habitat would not develop within the proposed treatment units until the existing understory grows tall enough to provide screening around the live crowns of the existing overstory trees (more than 20 years). However, without treatment to some of the mistletoed trees within the units, the length of time for the understory to develop into the late or old structure habitat preferred by goshawks would be extended (>40 years for lodgepole associations and >80 years for ponderosa pine/mixed conifer associations).

Foraging habitat for these three species would likely improve across the project area in the next 30-40 years (lodgepole pine) to 80 years (ponderosa pine) as the overstory begins to die. Dead overstory trees with a dense young understory can be foraging habitat for goshawk. Competition for prey species with raptors that prefer open habitats (such as red-tailed hawks, great-horned, and barred owls) would likely increase.

Cumulative Effects

The beetle outbreak of the 1970s to 1980s and the timber harvest that followed (these disturbances described in more detail on pages 10 to 13 of this assessment) have in combination contributed to the existing condition of goshawk habitat. The FEIS for the Deschutes LRMP, identified that the population density of the northern goshawk would naturally decline as lodgepole pine forest-types lose suitability from beetle kill or prior timber harvest (FEIS page 4-36).

Current and foreseeable projects within the project area (Appendix 3) will have minor effects on habitat for goshawk, Copper's hawk and sharp-shinned hawk. Treatments associated with the Gem Timber Sale will decrease potential nesting habitat for Cooper's and sharp-shinned hawk by approximately 1 percent. Current and foreseeable actions will most commonly occur within suitable foraging habitat. Treatments associated with the Miscellaneous Post-sale project, the Rim Personal Use Woodcutting Area, the Edge Timber Sale, the Gem Timber Sale, and the Howlett Fuels Reduction project will reduce some foraging habitat components present within treatment areas, such as logs, overstory trees, and herbaceous and woody understories. Reductions in these habitat components will reduce foraging quality, but treatment areas would continue to provide foraging habitat for these accipiter species. Reductions in live tree density associated with the Miscellaneous Post-sale project, the Ponderosa Pine Release project, the Gem Timber Sale, and the Howlett Fuels Reduction project will increase the opportunity for treated stands to develop into future LOS habitat. The trend in populations may remain stable.

Alternatives 2 and 3

Direct and Indirect Effects

Proposed treatments would have no direct effect on goshawk nesting habitat. No treatments are proposed in stands suitable for nesting. Treatments would impact nesting habitat for Cooper's and sharp-shinned hawks. With Alternative 2, potential nesting habitat for these species would be decreased by approximately 2,190 acres, an 11 percent

reduction from existing condition. With Alternative 3, nesting habitat would be decreased by approximately 1,880 acres, a 9 percent reduction. Potential nesting habitat for these species will remain available on over 20 percent of the project area. Potential nesting habitat for these species, which can utilize younger stands for nesting, would develop within activity areas within the 20 to 40 years.

Both alternatives would change foraging opportunities within areas proposed for treatment. Overstory removal would reduce the presence of mistletoe brooms, which are a habitat component for these accipiter's prey species (e.g. blue grouse, Douglas squirrels). Other components of foraging habitat, such as snags, logs, openings, and herbaceous and woody understories, would remain. Retention of green tree replacements would help maintain future habitat for woodpeckers, a potential prey species for goshawk, Cooper's hawk, and sharp-shinned hawk. Goshawks could still use the proposed units and adjacent areas for foraging, however treatments may increase the potential for foraging/prey base competition by red-tail hawks, great-horned owls and barred owls. Similarly, any negative impacts to local Cooper's and sharp-shinned hawk populations are expected to be limited to increased foraging competition from other raptor species.

With Alternative 2, foraging habitat for the three species would decrease by approximately 4,840 acres, a 14 percent reduction from existing condition. Approximately 48 percent of the project area would remain foraging habitat. With Alternative 3, foraging habitat would be decreased by approximately 4,610 acres, a 13 percent reduction. Approximately 49 percent of the project area would remain foraging habitat.

Unique to Alternative 3 is the proposal to maintain more of the existing overstory structure by pruning and girdling mistletoe-infected trees. In these treatment areas, infected overstory trees may also be felled and left on-site. This combination of treatments would maintain or improve foraging habitat through snag creation (girdling) and increased recruitment of coarse woody material (felling).

Designation of green tree replacement (GTR) clumps will help maintain some dispersal, foraging and possible nesting habitat in the short-term while treated stands develop more mature structure. As the understory matures, treatment stands are unlikely to become suitable forage habitat until stems are thinned or transition naturally through the stem exclusion phase. In the long term (>40 years), proposed actions would increase the opportunity for the treated stands to develop into the Late/Old Structure (LOS) habitat selected for nesting (see Disease and Late/Old Structure Habitat sections).

In taking into account these accipiter species, the project area will transition in suitability, with short-term gaps in habitat suitability. The areas of mixed conifer and stands closest to the old-growth areas will likely have goshawk nesting habitat develop the soonest. Otherwise, all of the treatment units will likely develop into sharp-shinned hawk nesting habitat first, then as the trees age it will develop into Cooper's hawk habitat, and then finally into LOS (goshawk habitat). In some of the pure lodgepole stands, high quality

goshawk nesting habitat may never develop, but these stands would provide foraging and fledging habitat as well as Cooper's and sharp-shinned hawk nesting habitat.

Cumulative Effects

Similar to the effects described for Alternative 1, the past beetle outbreak and subsequent timber harvest have contributed to the existing condition of goshawk habitat.

There would be no cumulative effects to habitat currently suitable for nesting by goshawks. Treatments proposed in Alternatives 2 and 3, in combination with the Gem Timer Sale, would reduce potential nesting habitat for Cooper's hawks and sharp-shinned hawks by 15 to 14 percent, respectively.

Treatments associated with current and foreseeable projects (Appendix 3) could impact foraging habitat. Similar to the effects described for Alternatives 2 and 3, treatments associated with the Miscellaneous Post-sale project and the Gem Timber Sale will reduce the presence of mistletoe brooms. Other components of foraging habitat, including down logs and/or herbaceous and woody understories, will be reduced in the Rim Personal Use Woodcutting area, the Edge Timber Sale, and the Howlett Fuels CE. While certain components of foraging habitat will be reduced, other elements would remain within treatment units. Treated areas would continue to provide limited foraging opportunities for northern goshawk, Cooper's hawk, and sharp-shinned hawks. Foraging opportunities for these accipiter species will continue to not be limiting within the project area.

Direction since 1995 (Eastside Screens) includes provisions for goshawk habitat and places emphasis on developing late or old structure (LOS) characteristics. With future and foreseeable actions tending to focus on improved stand development and retention of LOS characteristics, it is likely that habitats for these accipiter species will slowly increase in the project area with the result being more individual territories. In the long-term, populations of goshawks may rise, after a short-term decrease. For Cooper's and sharp-shinned hawks, the trend would be stable populations with increasing trends in the long-term.

Consistency with Management Direction

The Eastside Screens provide direction for goshawk habitat management on the Deschutes National Forest. In summary, it states that all active and historic goshawk nests will be protected from disturbance, with a 30 acre no harvest buffer around the nest tree and designation of a 400 acre post-fledging area (PFA) that will retain LOS stands and enhance younger stands to become LOS (Interim wildlife standard Scenario A, (5) Goshawks, a-c pages 12-13). The screens define an historic nest site is as one that has had nesting activity within 5 years prior to the date of the Screens (1994/1995). Based on this definition, the old nest record predates the screens definition for needing to establish a nest core and PFA.

Consistent with the Forest Plan (WL-3, WL-28), active nests found before or during management activities would be protected from disturbance (Mitigation Measure 10). While the old goshawk nest within the project area has not been known to be active since

1987, its stand will be protected during the nesting season (Mitigation Measure 10). The newly located Cooper's hawk nest sites and suspected sharp-shinned nest site will also be protected (Mitigation Measure 10).

The Forest Plan provides direction for the amount of nesting habitat that should be retained for goshawk (WL-6), Cooper's (WL-13), and sharp-shinned (WL-21) hawks. Direction is expressed in terms of retaining nesting habitat for a specified number of pairs. As previously discussed, proposed treatments would not impact goshawk nesting habitat. Alternatives 2 and 3 comply with current direction. Potential nesting habitat will remain within the project area.

Red-tailed Hawk

Existing Condition

This species has an extremely wide tolerance for habitat variation. Generally the species selects open woodland areas associated with forest edges and large trees for nesting. The project area provides abundant habitat, due to its high amount of fragmentation. This species is known to utilize mistletoe brooms as habitat (either as platforms for nesting or as prey habitat). There are no known nests within the project area.

Scope of Analysis

Cumulative effects analysis evaluates impacts to habitat within the project area. This analysis boundary was considered large enough to access effects since: (1) the project area provides abundant habitat for this species, and (2) red-tail hawks tolerate a wide variety of habitat types (stand age and types).

Evaluation Criteria for Measuring Effects

1) The number of acres of improved foraging habitat.

Alternative 1

Direct and Indirect Effects

Habitat conditions would remain unchanged in the short-term (<20 years). Existing mistletoe-infected overstory trees would continue to provide potential nesting and prey habitat. Spread and intensification of mistletoe in the understory could have long term effects on future nesting habitat by delaying the development of new large trees.

Cumulative Effects

Current and foreseeable actions, including the Miscellaneous Post-sale project and the Gem Timber sale, will reduce the presence of mistletoe brooms which could reduce potential nesting platforms or habitat for red-tailed hawk prey species. Mistletoe infected trees will remain common on the landscape. These actions will provide the mosaic of openings and wooded areas preferred by the red-tail hawk. No negative cumulative effects to this species are anticipated.

Alternatives 2 and 3

Direct and Indirect Effects

Within treatment units, removal of overstory trees with mistletoe brooms would reduce one type of habitat utilized by red-tailed hawks for nesting. Treatments would, however, retain large diameter overstory trees (greater than or equal to 21 inches dbh), which also serve as potential nesting habitat for red-tailed hawks. Removal of mistletoe-infected overstory trees would also reduce a habitat feature utilized by the red-tail hawk's prey base. Other habitat features utilized by its prey base would remain within treatment units, including snags, logs, openings, and herbaceous and woody understories. Mistletoe infected trees would continue to be common in the surrounding landscape.

Treatments would increase foraging effectiveness for red-tails by removing overstory trees (under 21" dbh) and increasing access to prey at ground level. Alternative 2 would increase foraging effectiveness over 8,180 acres. Alternative 3 would increase foraging effectiveness over 7,865 acres. The girdling/pruning/felling activities associated with Alternative 3 (3,590 acres) would not increase foraging effectiveness, but could provide additional prey habitat, potentially increasing the available prey base for red-tailed hawks.

In the short-term, red-tailed hawks will be at an advantage against other competitors (e.g. goshawks) for hunting. Foraging habitat, however, will diminish in the long-term, as more vigorous understory trees respond with accelerated growth.

Cumulative Effects

Similar to Alternative 2 and 3 overstory treatments, the Miscellaneous Post-sale project and the Gem Timber sale (Appendix 3) would retain trees greater than or equal to 21 inches dbh but would reduce the presence of mistletoe brooms. Even with the combined reductions in mistletoe-infected trees, this source of habitat will remain common on the landscape.

Current and foreseeable actions, including the precommercial thinning project, would create or maintain openings, which would provide the mosaic of openings and wooded areas selected by the red-tailed hawk. No negative cumulative impacts to this species are anticipated.

Consistency with Management Direction

Consistent with the Forest Plan (WL-3), active nests found before or during management activities would be protected from disturbance (Mitigation Measure 10).

Golden Eagle

The golden eagle occurs in grass-shrub, shrub-sapling, and young woodland growth stages of forested areas, or in forest with open lands nearby for hunting. Essentially it needs a favorable nest site, usually a large tree or cliff, a dependable food supply, mainly of medium to large mammals and birds, and broad expanses of open country for foraging.

It favors hilly or mountain country, where take off and soaring are facilitated by updrafts; deeply cut canyons rising to open sparsely treed mountain slopes and crags represent ideal habitat.

Existing Condition

There are no known golden eagle nest sites or home ranges in the Long Prairie project area. The project area does not contain favorable nest sites for this species. The project area does contain potential foraging habitat that is of low quality.

Alternatives 1, 2 and 3

Direct, Indirect and Cumulative Effects

These alternatives would have no impact on potential foraging habitat in the project area. Treatments associated with Alternatives 2 and 3 would not occur in grass or shrubland habitats suitable for golden eagle foraging.

Consistency with Management Direction

Consistent with the Forest Plan (WL-3), active nests found before or during management activities would be protected from disturbance (Mitigation Measure 10).

American Marten

Existing Condition

The American marten prefers large, somewhat dense, stands of lodgepole pine, mixed conifer, and mountain hemlock. Abundant coarse woody material (CWM) in these stands is important to support a rodent prey base (Forest Plan WL-61). Mistletoe brooms have been reported as providing habitat for marten (Bull et al. 1997).

Approximately 57 percent of the project area is in the lodgepole pine vegetation type. The project area currently provides marginal habitat due to fragmentation, low amounts of coarse woody material, as well as low density stands. The project area has the potential to provide marginal foraging and dispersal habitat marten during winter months. The best available habitat is currently provided by late or old structure stands (LOS), connectivity corridors, and old-growth stands.

The largest tract and best habitat for marten is likely found adjacent to the project area in Newberry National Volcanic Monument (NNVM). The project area is likely important dispersal habitat for this species.

Scope of Analysis

Given this species dependence on coarse woody material, cumulative effects analysis evaluates impacts to habitat using the same boundary as described for the cavity nester, snag and green tree replacement analysis. This boundary includes the project area and the adjacent portion of NNVM.

Evaluation Criteria for Measuring Effects

1) The maintenance of habitat elements (e.g. LOS and CWM) and estimated timeframe for habitat development.

Alternative 1

Direct and Indirect Effects

Within the next 20 years, little recruitment of coarse woody material would be expected within proposed treatment units. Habitat would remain limited across the project area. Existing LOS, allocated old growth areas, designated GTR clumps and designated corridors would provide the best habitat outside the NNVM. These habitats occur in relatively small patches and may not provide for many territories.

After fifteen to 20 years, the down wood (CWM) habitat component would begin to increase as overstory trees within treatment units begin to die and eventually fall. By this time, understory may be sufficiently dense to provide protection to marten from predators. Habitat would likely improve across the project area.

No actions would be taken to reduce the spread of mistletoe to the understory in the project area. The potential for the understory to develop into the late or old structure habitat preferred by American martens would be reduced (see Disease and Late/Old Structural Habitat sections).

Cumulative Effects

The beetle outbreak in the 1970s to 1980s, in combination with the timber harvest that followed, contributed to the existing condition of pine marten habitat. The FEIS for the Deschutes LRMP, identified that the population density of pine marten in lodgepole pine forest types would naturally decline as lodgepole pine forest-types loose suitability from beetle-kill or prior timber harvest (FEIS page 4-36). The FEIS (page 4-37) further described that with the FEIS preferred alternative, the pine marten population density would "plummet" because beetle-killed lodgepole pine stands would lose suitability.

The Edge and Gem Timber Sales (Appendix 3) will remove components of marten habitat including mature canopy cover, and down woody material. The Rim Personal Use Woodcutting Area (Appendix 3) is in the northeast portion of the Long Prairie project area, adjacent to NNVM. It has and will continue to reduce primarily coarse down wood. The Firewood Synopsis for this woodcutting area indicates that most of the available wood is small and on the ground. Each of these project removes a different component of marten habitat, so habitat is not rendered completely unsuitable.

These activities will potentially increase the amount of area that martens avoid or move quickly through, but activities would not be expected to prevent movement of marten from NNVM into the project area. The NNVM would likely remain an important block of habitat for populations of this species, with individuals dispersing and traveling through the analysis area. Population trends within the analysis area are expected to

remain stable in the short-term and possibly decrease in the long-term as a result reduced growth of overstory.

Alternatives 2 and 3

Direct and Indirect Effects

Treatments would retain existing coarse woody material, both standing and down. No current suitable habitat or connective habitat would be impacted by proposed treatments. The removal of the overstory proposed with Alternatives 2 and 3 has the potential to limit future down wood recruitment. Retention of existing snags and green tree replacements within treatment units would provide future down wood (see Cavity Nester section and Coarse Woody Material).

Of the two alternatives, Alternative 3 proposes to maintain more of the existing overstory structure by pruning and girdling mistletoe-infected trees. Infected overstory trees also may be felled and left on-site over these acres. Marten habitat would be improved with these treatments through increased recruitment of coarse woody material (felling). In the long term, girdled trees (created snags) and naturally occurring snags would fall, also increasing CWM in the project area.

Mistletoe reduction may limit availability of mistletoe brooms in treatment units, but the ubiquitous presence of mistletoe on the landscape ensures availability of this unique feature outside treatment areas. In the long-term, removing the overstory trees infected with mistletoe would reduce the risk of further infecting the understory with mistletoe. This would increase the opportunity for the understory to develop into LOS (see Disease and Late/Old Structural Habitat sections).

By treating the mistletoed overstory within existing units and maintaining CWM within units, these alternatives may aid the development of marten habitat in the long-term (> 20 years). Similar to the No Action Alternative, in the meantime, areas outside of proposed treatment areas would provide the best habitat outside the NNVM. These occur in relatively small patches and may not provide for many territories.

Cumulative Effects

Cumulative effects would be similar to those described for the No Action alternative. Proposed treatment areas are not considered marten habitat. The effects of ongoing and reasonably foreseeable future actions would not be additive with the Long Prairie actions. Cumulative effects are expected to be minimal.

Activities associated with the Precommercial Thinning project (Appendix 3) in combination with overstory removal treatments would likely increase tree growth, further accelerating the development of late or old structural stage features associated with marten habitat.

Populations would likely remain limited in the short-term with the potential to increase in the long-term.

Consistency with Management Direction

The Eastside Screens provide direction for the management of down logs (see Other Wildlife Habitat, Coarse Woody Material section). Sale activities can remove currently down logs if they exceed quantities specified in the Screens. According to Screen direction, snag numbers (see Cavity Nester section) are designed to meet future down log needs. Proposed treatments are consistent with management direction. Existing coarse woody material is being retained. Snags and green tree replacements being retained and will provide for recruitment of future down logs.

Species of Concern

Bats

Existing Condition

The following bat species occur on the Deschutes National Forest: small-footed myotis, long-eared myotis, long-legged myotis, Yuma myotis, and western big-eared bat. Habitat for these species includes lava tubes, caves, rock crevices, trees, large snags, and fallen logs. The long-eared and long-legged myotis species are closely associated with old-growth forests or components of old growth. Yuma myotis is highly associated with water and riparian vegetation.

Habitat for these bat species is limited within the Long Prairie project area. There is one known cave in the project area. The cave was last surveyed for bat presence in 1995. Surveys indicated the presence of at least two species of *Myotis*. Some small lava formations occur within the project area, but due to their size, bat usage would likely be incidental. There is very little large (>21 inches dbh) snag habitat present within the project area.

Evaluation Criteria for Measuring Effects

1) The maintenance and development of large snag structure.

Alternative 1

Direct and Indirect Effects

Habitat condition would remain unchanged in the short-term. For those species that use snags, there will be a short-term increase in habitat as trees die. In the long-term, there could be a decrease in large snags due to mistletoe effects on the growth of understory trees. See Cavity Nester and Late/Old Structural Habitat sections for more details on snags and the development of late or old structure.

Alternatives 2 and 3

Direct and Indirect Effects

These alternatives propose no removal of existing snags. Large snags, which can be potential roost sites for bats, would not be removed unless there is a safety issue

(i.e. hazard tree adjacent to roadside). This would be a rare occurrence. The girdling treatment associated with Alternative 3 would increase snag habitat in the short-term.

The alternatives propose no removal of live trees greater than 21 inches dbh (potential habitat for the long-legged and Yuma myotis). Retention of green tree replacements would provide for future snag recruitment. See Cavity Nester section for more details on snags and green tree replacements.

The known cave (potential habitat for the small-footed myotis and Western big-eared bat) within the project area would be protected from disturbance and micro-environmental changes (Mitigation Measure 11).

Removing overstory trees infected with mistletoe would reduce the risk of infecting the understory with mistletoe. In the long-term, this would increase the opportunity for the understory to develop into LOS (see Disease and Late/Old Structural Habitat sections).

Alternatives 1, 2 and 3

Cumulative Effects

With no direct or indirect effects, no cumulative effects would be expected.

Consistency with Management Direction

Compliance with bat habitat direction has been met through the retention of snags and green tree replacements (see Cavity Nester section), retention of trees around cave entrance and protection of cave from disturbance (Mitigation Measure 11).

Landbirds

Landbirds, also referred to as Neotropical migratory birds (NTMB), have recently become species of concern, due to the downward trend of landbirds in the West. The decline of these populations is a result of many complex issues, but factors believed to be responsible include loss, fragmentation, and alteration of historic vegetation communities. Other probable causes for the decline include predation from feral species, nest parasitism, and use of pesticides associated with agriculture areas.

Management Direction

The Deschutes NF is currently following guidelines from the "Conservation Strategy for Landbirds of the East-Slope of the Cascade Mountains in Oregon and Washington" (Altman 2000). This conservation strategy addresses key habitat types as well as biological objectives and conservation strategies for these habitat types found in the east-slope of the Cascade Mountains, and the focal species that are associated with these habitats. The conservation strategy lists priority habitats: 1) Ponderosa Pine, 2) Mixed Conifer (Late Successional), 3) Oak-Pine Woodland, and 4) Unique Habitats.

Ponderosa pine habitats and unique habitats are priority habitats most likely to be impacted by proposed treatments. There is no Oak-Pine Woodland habitat within the project area, and the small amounts of Late Seral Mixed Conifer will remain untreated.

Ponderosa Pine
Landbird conservation in ponderosa pine forest emphasizes maintaining healthy ecosystems through representative focal species for four habitat conditions (Table 17). These include large patches of old forest with large snags and trees, an open understory with regenerating pines, and patches of burned old forest. Habitat features and focal species listed in Table 17 are those associated with the project area.

Unique Habitats
Landbird conservation is also directed toward several unique habitats in the East-Slope Cascades. Unique habitats include lodgepole pine and white-bark pine old growth, and wet and dry meadows. White-bark pine is found outside the project area at the highest elevations within Newberry National Volcanic Monument. There are no meadows within the project area. Focal species associated with lodgepole pine are listed in Table 17.

Table 17. Priority habitat features and associated focal species for conservation of the East-Slope Cascades Landbird Conservation Planning Region.

Habitat	Habitat Feature/Conservation Focus	Focal Species by Subprovince
		Central Oregon/Klamath Basin
Ponderosa Pine	large patches of old forest with large snags	white-headed woodpecker
	large trees	pygmy nuthatch
	open overstory with regenerating pines	chipping sparrow
	patches of old burned forest	Lewis' woodpecker
Lodgepole Pine	old growth	black-backed woodpecker

Existing Condition
The project area is comprised of lodgepole pine, ponderosa pine, and mixed conifer plant association groups (PAGs) (Table 4). Currently, little of the project area is in Late or Old Structure (LOS), with approximately 11 percent of the lodgepole pine PAG and less than 5 percent of the ponderosa pine PAGs in this structural condition (Table 5).

White-headed woodpeckers, pygmy nuthatches, and black-backed woodpeckers are focal species known to inhabit or potentially inhabit the project area. Effects to these species are documented in the Cavity Nester section of this assessment. Chipping sparrow habitat is closely related to red-tailed hawk forest habitat (see Management Indicator Species, Red-tailed hawk section). The project area does not contain habitat for the Lewis' woodpecker.

Scope of Analysis
Direct, indirect and cumulative effects to black-backed woodpecker, pygmy nuthatch, and white-headed woodpecker (Table 17) are analyzed in the section titled "Cavity Nesters, Snags, and Green Tree Replacements".

This section addresses effects to chipping sparrow, the focal species for ponderosa pine habitats with "open overstory and regenerating pines". The chipping sparrow is a low-tree or ground nester that uses open-overstory ponderosa pine and lodgepole pine (Marshall et.al. 2003). There are approximately 28,529 acres of potential habitat for this species in the project area (Table 5, lodgepole and ponderosa pine PAGs, understory reinitiation and multi-story without large tree structural stages). Habitat is not considered limiting in the project area.

Cumulative effects analysis evaluates impacts to habitat for this species within the project area. This analysis boundary was considered large enough due to the ample amount of habitat that is present for this species in the project area.

Evaluation Criteria for Measuring Effects

1) *Chipping sparrows*: the number of acres of suitable habitat.

Alternative 1

Direct and Indirect Effects

Areas being considered for treatment would continue to provide habitat for chipping sparrows in the short-term. In the long-term, spread and intensification of mistletoe in the understory may benefit chipping sparrow habitat by maintaining open, small diameter stands of pine.

Cumulative Effects

Activities associated with the Miscellaneous Postsale, Ponderosa Pine Release, and Howlett Natural Fuels projects (Appendix 3) would not remove habitat for chipping sparrow, but may open up areas, temporarily reducing the quality of the habitat.

Alternatives 2 and 3

Direct and Indirect Effects

Treatments are proposed within early seral pine stands. In addition to chipping sparrow, other landbirds that could utilize this type of habitat include dusky flycatcher and western bluebird. Treatments reducing overstory density to 3 trees per acre may degrade or remove nesting habitat for the chipping sparrow. Alternative 2 is expected to reduce suitable habitat by 4,768 acres (17 percent reduction). With Alternative 3, habitat would be reduced by 4,592 acres (16 percent reduction).

Treatments would not preclude occurrence of these species, but may limit nesting within portions of the project area. Removal of mistletoe trees would reduce, but not eliminate, a potential habitat component for western bluebirds. Mistletoe infected trees will remain both within treatment units and across the landscape (see Disease Section).

Disturbance associated with logging activities occurring during the nesting season (spring and summer) may interrupt nesting or cause nest failures for some breeding pairs. These disturbances are not expected to compromise populations at the landscape scale due to

the scattered nature of these operations during the nesting season. Efforts would be taken to minimize disturbance during this time period (Mitigation Measure 13).

Cumulative Effects

Activities associated with precommercial thinning (Appendix 3) would overlap Long Prairie activity areas. Impacts associated with this future action would not be expected to add to impacts associated with the overstory treatment. Thinning of understory would not remove additional habitat, but may open up areas. Quality of habitat could be temporarily reduced (less than 5 years) until understory trees respond to thinning with an increase in live crown density. Populations would likely remain stable to increasing.

Consistency with Management Direction

There is no specific direction for landbirds in the Forest Plan as amended by the Eastside Screens. Habitat provisions for many of the MIS species also provides habitat for various landbirds and meets the intent of the Conservation Strategy.

Proposed, Threatened, Endangered, Sensitive Plants __

The Biological Evaluation for Threatened, Endangered and Sensitive Plants for the Long Prairie Mistletoe Project (Project Record, written by Pat Joslin and dated June 30, 2005) is incorporated by reference and summarized below.

Existing Condition

Endangered, Threatened, Candidate, or sensitive plant species considered in this assessment are those species listed on the current Regional Forester's list (FSM 2670.4, July 2004) as suspected or documented to occur on the Deschutes National Forest. Species considered, listing status, and associated habitats are documented in Appendices A through D of the Biological Evaluation.

Within the Long Prairie Project Area, no habitat exists that would support any federally listed Endangered, Threatened, or Candidate plant species. Habitat does exist for the sensitive species *Botrychium pumicola* (BOPU), whose common name is pumice grapefern. Within the project area, BOPU grows in the lodgepole pine matrix, preferring relatively flat, open basins where frost heaving tends to prevent establishment of trees seedlings and most other vegetation as well.

Potential habitat for BOPU located within the project area was surveyed in 1990, 1991, and 1992. These past surveys located 10 scattered populations of BOPU with a total of approximately 280 plants. This represents approximately 1 percent of the total number of the world's BOPU plants. These 10 populations are outliers of a large area of BOPU that grows within the Katati Basin, located outside of the project area to the southeast.

Treatments proposed with the Long Prairie project would avoid known BOPU populations and suitable habitat. For this reason, additional surveys for BOPU were considered unnecessary. Proposed treatments would occur in areas that have had previous ground disturbance and have a tree canopy that is closing or has closed. On rare

occasions, an isolated BOPU plant may be found within this type of unsuitable habitat. Plants found in such unusual habitat tend not to survive. Given the extensive surveys conducted in the past and the transient nature of plants found outside suitable habitat, the number of BOPU that may have been missed in previous surveys is likely to be small.

Alternative 1

Direct, Indirect, and Cumulative Effects

No direct, indirect or cumulative effects would be expected in the absence of treatments.

Alternatives 2 and 3

Direct and Indirect Effects

There would be no direct or indirect effects to Endangered, Threatened or Candidate species due to the absence of suitable habitat within the proposed treatment units.

Proposed treatments would generally have no direct or indirect effects on known populations of BOPU or on suitable BOPU habitat. There are no known BOPU sites or suitable habitat within proposed treatment units. The known BOPU site closest to a treatment area would be avoided during logging activities (Mitigation Measure 21). Temporary roads would not cross through known BOPU sites or suitable habitat. While no suitable habitat is present within proposed treatment units, isolated, individual BOPU plants may on rare occasions be present. Proposed treatments may result in the loss of some isolated individual plants.

Ground disturbance offers a moderate level of risk of noxious weeds being introduced into the project area (see Noxious Weed/Exotic Species section of this assessment). There is an associated risk that noxious weeds could spread into BOPU populations.

Cumulative Effects

With no direct or indirect effects, no cumulative effects are anticipated.

Findings

The analysis of effects on species viability found the following:

The project may impact isolated individuals of *Botrychium pumicola*, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.

Noxious Weeds/Exotic Species

The Noxious Weed Risk Assessment for the Long Prairie Mistletoe Project (Project Record, written by Pat Joslin and dated June 13, 2003) and an associated letter to the files (Project Record, written by Tanya Skurski and dated September 8, 2003) is incorporated by reference and summarized below.

Management Direction

Forest Service Manual (FSM) direction requires that Noxious Weed Risk Assessments be prepared for all projects involving ground-disturbing activities. For projects that have a moderate to high risk of introducing or spreading noxious weeds, Forest Service policy requires that decision documents must identify noxious weed control measures that will be undertaken during project implementation (FSM 2081.03, 29 November 1995).

Project practices must be consistent with direction from the February 3, 1999 Executive Order on Invasive Species (Executive Order #13112), which requires federal agencies to use relevant programs and authorities to prevent the introduction and spread of invasive species (Noxious Weed Risk Assessment, Appendix B).

Introduction

Aggressive non-native plants, or noxious weeds, can invade project areas and cause long-lasting management problems by displacing native plant communities, increasing fire hazards, reducing the quality of recreation experiences, poisoning livestock, and replacing wildlife forage. By simplifying complex plant communities, weeds reduce biological diversity and threaten rare habitats.

Noxious weeds of concern in the project area are listed in Table 18. In addition to noxious weeds, which are designated by the state of Oregon, there is a group of non-native plants that are also aggressive but not officially termed "noxious". These are also included in the weed assessment.

Existing Condition

Currently, no noxious weeds are known to exist within the project area. Noxious weeds are present at a water site located outside the project area along the Little Deschutes River (by County Road 43). This site has been used in the past as a water source. Actions are ongoing to suppress or eradicate noxious weeds located at this site.

Table 18. Deschutes National Forest noxious weed list, with weeds of concern identified for the project.

Scientific Name	Common Name	Presence on the Forest	Of concern in the Project Area
Agropyron repens	Quackgrass	Documented	
Cardaria (Lepidum) draba	Whitetop	Potential	
Carduus nutans	Musk thistle	Potential	
Carduus pycnocephalus	Italian thistle	Potential	
Centaurea diffusa	Diffuse knapweed	Documented	**X**
Centaurea maculosa	Spotted knapweed	Documented	**X**
Centaurea pratensis	Meadow knapweed	Potential	
Centaurea repens	Russian knapweed	Potential	
Centaurea solstitialis	Yellow starthistle	Potential	
Centaurea virgata ssp. squarrosa	Squarrose knapweed	Potential	
Cirsium arvense	Canada thistle	Documented	
Cirsium vulgare	Bull thistle	Documented	**X**
Conium maculatum	Poison hemlock	Potential	
Cynoglossum officinale	Common houndstongue	Documented	

Scientific Name	Common Name	Presence on the Forest	Of concern in the Project Area
Cytisus scoparius	Scotch broom	Documented	
Euphorbia esula	Leafy spurge	Documented	
Hypericum perforatum	St. Johswort	Documented	
Isatis tinctoria	Dyer's woad	Documented	
Kochia scoparia	Kochia	Potential	
Linaria dalmatica	Dalmation toadflax	Documented	**X**
Linaria vulgaris	Butter and eggs	Documented	
Lythrum salicaria	Purple loosestrife	Potential	
Onopordum acanthium	Scotch thistle	Documented	
Salvia aethiopis	Mediterranean sage	Potential	
Senecio jacobaea	Tansy ragwort	Documented	
Taeniatherum caput-medusae	Medusahead	Documented	

Alternative 1

Implementation of Alternative 1 has been determined to have a **low** level of risk associated with the introduction of noxious weeds due to use of the analysis area by recreationists and Forest Service personnel.

Alternatives 2 and 3

Prevention of the introduction of noxious weed invasion is required by law (Executive Order #13112). To address noxious weed invasion issues, the USDA Forest Service has compiled a "Guide to Noxious Weed Prevention Practices" (Noxious Weed Risk Assessment, Appendix C). The following summarizes Required Prevention Measures and Optional Prevention Measures that applicable to the project.

1. District contract administrators have been trained in noxious weed identification and have noxious weed information available to give to contractors.
2. Old landings and skid trails will be reused for the Long Prairie project.
3. For timber harvest operations, timber sale purchaser road maintenance and road decommissioning, use standard timber sales contract provisions such as WO-C/CT 6.36 to ensure appropriate equipment cleaning.
4. Some logging over snow may occur.
5. No new roads are planned. Old roads to the units are to be reopened.
6. Major roads within the Long Prairie project area (Road 22, 2121, 2210, 2215, 2220, 2222, 2225, and 9736) were inspected for the presence of noxious weeds during the 2003 field season. No noxious weeds were found.
7. Skid trails and landings are to be monitored for noxious weed invasions for 2 years following completion of the Long Prairie project. Any new infestations will be inventoried and treated as appropriate.

With the above prevention measures and Mitigation Measure 7, implementation of Alternatives 2 or 3 has been determined to have a **moderate** level of risk associated with the introduction of noxious weeds.

Soil Resource

This section summarizes the Soil Resource Specialist Report for the Long Prairie Mistletoe Reduction Project. This report (Project Record, written by Rod Jorgenson and dated February 8, 2005) is incorporated by reference.

Introduction

The long-term sustainability of forest ecosystems depends on the productivity and hydrologic functioning of soils. Ground-disturbing management activities directly affect soil properties, which may adversely change the natural capability of soils and their potential responses to use and management. A detrimental soil condition often occurs where heavy equipment or logs displace soil surface layers or reduce soil porosity through compaction. Indirect effects from these impacts include increased runoff and accelerated soil erosion. Detrimental disturbances reduce the soils ability to supply nutrients, moisture, and air that support soil microorganisms and the growth of vegetation. The biological productivity of soils relates to the amount of surface organic matter and coarse woody debris retained or removed from affected sites.

Management Direction

The Forest Plan specifies that management activities are prescribed to promote maintenance or enhancement of soil productivity by leaving a minimum of 80 percent of an activity area in a condition of acceptable productivity potential following land management activities (Forest Plan page 4-70, SL-1 and SL-3). This is accomplished by following Forest-wide standards and guidelines to ensure that soils are managed to provide sustained yields of managed vegetation without impairment of the productivity of the land. Standard and Guideline SL-4 directs the use of rehabilitation measures when the cumulative impacts of management activities are expected to cause damage exceeding soil quality standards and guidelines on more than 20 percent of an activity area. Standard and Guideline SL-5 limits the use of mechanical equipment in sensitive soil areas. Operations will be restricted to existing logging facilities (i.e., skid trails, landings) and roads, whenever feasible.

Forest Plan Management Areas MA-8, MA-9, and MA-15 do not contain specific standards and guidelines for the soil resource in this area. The Forest-wide standards and guidelines apply to this project proposal.

The Pacific Northwest Region developed soil quality standards and guidelines that limit detrimental soil disturbances associated with management activities (USDA Forest Service, 1998a). This Regional guidance supplements Forest Plan standards and guidelines, which are designed to protect or maintain soil productivity. Detrimental soil impacts are those that meet the criteria described in the Soil Quality Standards listed below.

Detrimental Compaction in volcanic ash/pumice soils is an increase in soil bulk density of 20 percent, or more, over the undisturbed level.

Detrimental Puddling occurs when the depth of ruts or imprints is six inches or more.

Detrimental Displacement is the removal of more than 50 percent of the A horizon from an area greater than 100 square feet, which is at least 5 feet in width.

Severely Burned soils are considered to be detrimentally disturbed when the mineral soil surface has been significantly changed in color, oxidized to a reddish color, and the next one-half inch blackened from organic matter charring by heat conducted through the top layer.

The Regional supplement to the Forest Service Manual (FSM 2520, R-6 Supplement No. 2500-98-1) provides policy for planning and implementing management practices which maintain or improve soil quality. The following excerpt is taken from FSM 2520.3:

"When initiating new activities:

1. Design new activities that do not exceed detrimental soil conditions on more than 20 percent of an activity area. (This includes the permanent transportation system).
2. In activity areas where less than 20 percent detrimental soil impacts exist from prior activities, the cumulative amount of detrimentally disturbed soil must not exceed the 20 percent limit following project implementation and restoration.
3. In activity areas where more than 20 percent detrimental soil impacts exist from prior activities, the cumulative detrimental effects from project implementation and restoration must, at a minimum, not exceed the conditions prior to the planned activity and should move conditions toward a net improvement in soil quality".

This Regional policy is consistent with the LRMP interpretation of Forest-wide standards and guidelines SL-3 and SL-4, which is filed in the Deschutes National Forest Supervisor's Office (USDA Forest Service 1996, Final Interpretations, Soil Productivity).

Scope of Analysis

The soil resource may be directly, indirectly, and cumulatively affected within each of the activity areas proposed within the project area. An activity area is defined as "the total area of ground impacted activity, and is a feasible unit for sampling and evaluating" (FSM 2520 and Forest Plan, page 4-71). For this project proposal, activity area boundaries are considered to be the smallest identified area where the potential effects of different management practices would occur. Thus, the discussion of soil effects and soil quality standards will be focused on the units proposed for silvicultural treatments. The activity areas range from approximately 3 acres to 242 acres in size.

Quantitative analyses and professional judgment were used to evaluate the issue measures by comparing existing conditions to the anticipated conditions which would result from implementing the action alternatives. The temporal scope of the analysis is defined as short-term effects being changes to soil properties that would generally revert to pre-existing conditions within 5 years or less, and long-term effects as those that would substantially remain for 5 years or longer.

Affected Environment

The landscape is generally characterized by gentle to uneven lava plains with cinder cones and buttes associated with the Newberry Crater complex. Ash deposits from Mount Mazama (Crater Lake) and Newberry Crater volcanoes have covered most of the planning area, except for a few barren lava flows of minor extent. Most of the water yielded from these lands is delivered to streams as deep seepage and subsurface flows that emerge at lower elevations. There are no perennial or intermittent stream channels within the project area. Ephemeral drainage channels flow only during high precipitation events.

Approximately 80 percent of the planning area is composed of gentle to uneven lava plains and ridges that rise above gently-sloping outwash plains and flats that comprise about 10 percent of the area. Slopes generally range from 0 to 30 percent with the exception of a few cinder cones and steeper side-slopes (30 to 70 percent) on ridges and buttes that comprise less than 5 percent of the planning area.

Except for occasional areas of exposed bedrock associated with some of the youngest lava flows, the majority of the planning area (approximately 95 percent) has been covered by a moderately thick layer of volcanic ash deposits. The volcanic ash-influenced soil generally varies from 20 to 40 inches thick and consists mostly of sand-sized soil particles. Previously developed soils are buried at depths that range from approximately 15 to 60 inches. Bedrock consists dominantly of basalt and andesite lava.

Dominant soils are moderately deep (20 to 40 inches) to deep with loamy-sand textures that readily drain excess moisture over much of the project area. The underlying residual soils and bedrock materials have a moderate capacity to store water. These soil types generally have moderate productivity potential for the growth of vegetation. Less productive soils are commonly found on south and west aspects and on convex slope positions such as basalt ridges and side-slopes of buttes and cinder cones. Approximately 10 percent of the project area is comprised of landtypes that contain shallow soils (less than 20 inches) and areas of exposed bedrock that generally produce surface runoff only during high intensity storms. The more productive soils are commonly found on north and east aspects, and on concave slope positions such as toe slopes, swales and depressions. The deep soils (greater than 40 inches in depth) in these landscape positions commonly reflect areas of dense vegetation.

Soils derived from Mazama ash tend to be non-cohesive (loose) and they have very little structural development due to the young geologic age of the volcanic parent materials. These ash-influenced soils have naturally low bulk densities and low compaction potential. However, mechanical disturbances can still reduce soil porosity to levels that limit vegetative growth, especially where there is a lack of woody debris and surface organic matter to help cushion the weight distribution of ground-based equipment. Due to the absence of rock fragments on the surface and within soil profiles, these soils are well suited for tillage treatments (subsoiling) that loosen compacted soil layers and improve the soils ability to supply nutrients, moisture, and air that support vegetative growth and biotic habitat for soil organisms. The sandy-textured surface layers are also easily

displaced by equipment operations, especially during dry moisture conditions. The maneuvering of equipment is most likely to cause soil displacement damage on the steeper landforms.

Sensitive Soil Types
Criteria for identifying sensitive soils to management are listed in the Deschutes LRMP (Appendix 14, Objective 5). Sensitive soils within the Long Prairie project area include: 1) soils on slopes greater than 30 percent, 2) soils associated with frost pockets in cold air drainages, 3) soils that occur in localized areas of rocky lava flows, and 4) soils with high or severe hazard rating for surface erosion.

Table 19. Soil Resource Inventory (SRI) Landtype acres that contain localized areas of Sensitive Soils within the Long Prairie project area.

SRI Map Unit (USDA Forest Service 1976)	Geomorphology (Representative landforms)	Management Concern**	Landtype Acres	Percent of Planning Area
1, 11	Rough, uneven lava flows	3	1,013	1.8%
7, 15	Depressions or Flats	2	1,841	3.3%
18, 84, 89	Steep slopes of buttes and lava ridges	1, 4	241	0.4%
81, 82, 83	Cinder cones	1	1,315	2.3%
TOTAL			4,410	7.9%

****Management Concern**

1) On slopes greater than 30 percent, loose sandy soils are susceptible to soil displacement.
2) Very low productivity due to frost heaving, low fertility, and temperature extremes.
3) Sensitive soils with variable depths in pockets and cracks of rocky, uneven lava flows.
4) Sensitive soils with a high or severe hazard for surface erosion.

Approximately 8 percent (4,410 acres) of the project area contains landtypes with localized areas of sensitive soils (Table 19). Only portions of these total landtype acres contain localized areas with sensitive soils. Sensitive soil areas that occur within proposed activity areas are discussed under the direct and indirect effects of implementing the action alternatives.

Existing Condition of the Soil Resource

Detrimental Soil Disturbance
There is currently little or no evidence of detrimental soil conditions from natural disturbance events within the Long Prairie project area. Enough time has passed since the occurrence of past wildfire events that existing vegetation and forest litter are providing adequate sources of ground cover to protect mineral soil from water and wind erosion. There are no natural or management-related landslides within the planning area.

The primary sources of detrimental soil conditions from past management are associated with existing roads and ground-based logging facilities which were used for timber management activities between 1974 and 2001. Although ground-based railroad logging was used to harvest large-diameter ponderosa pine in portions of the project area during the 1920s and 1930s, it is expected that natural processes have restored soil quality over the past 70 to 80 years. Visual evidence of old logging facilities is very difficult to

observe due to the abundance of ground cover vegetation and forest litter. Based on more recent harvest history, various silvicultural prescriptions have occurred over the past 30 years. Temporary roads, log landings, and primary skid trails were constructed and used to access individual harvest of past timber sales. Research studies and local soil monitoring have shown that soil compaction and soil displacement account for the majority of detrimental soil conditions resulting from ground-based logging operations (USDA Forest Service 1995a, 1996a, 1997, 1999; Page-Dumroese, 1993; Geist, 1989; Powers, 1999). Some long-term adverse effects to soil productivity still exist where surface organic layers were displaced and/or multiple equipment passes caused deep compaction.

The extent of detrimentally disturbed soil is dependent on a number of variables including the types of silvicultural prescriptions, the intensity of equipment use with each entry, and the spacing distances between main skid trails. Soil monitoring results on local soils have shown that 15 to 30 percent of the unit area can be detrimentally disturbed by ground-based harvest systems depending on harvest prescriptions, the spacing of skid trails, and soil conditions at the time of harvest (USDA Forest Service 1995a, 1996a, 1997, and 1999).

A combination of past harvest history, research references, and field observations was used to estimate existing soil conditions within each of the activity areas planned for this project. Varying degrees of soil compaction and displacement were observed in previously managed areas of the project area. Since multiple harvest entries have been made and approximately 40 percent of these past disturbances occurred prior to LRMP direction (1990), conservative estimates were used to predict how much surface area is currently impacted by existing roads and logging facilities.

The majority of the past treatments were regeneration harvest prescriptions that typically cause more soil disturbance than intermediate or thinning prescriptions because equipment use is more intensive throughout activity areas (USDA Forest Service 1996a, 1997, 1999). Based on field investigations of previously managed areas on similar landtypes and soils, activity areas which were managed with intermediate harvest prescriptions generally average about 23 percent detrimental soil conditions associated with existing skid trails and log landings. Past regeneration treatments (e.g., shelterwood, overstory removal) generally cause about 6 percent more detrimental soil conditions (29 percent) and commercial thinning treatments cause about 6 percent less soil impacts (17 percent) than disturbed area estimates for skid trail networks and log landings. Based on past harvest history and the proportionate extent of overlap with proposed activity areas, these percentages were used to calculate existing amounts of detrimental soil conditions within the activity areas planned for this project.

Appendix 2 displays existing and predicted amounts of detrimental soil conditions for each of the action alternatives and specific activity areas planned for mechanical vegetation treatments. The amount of disturbed soil currently committed to existing roads, primary (main) skid trails and log landings is included in the estimated percentages. The detailed information in Appendix 2 is summarized in Table 20.

Existing detrimental soil conditions range from 8 to 35 percent and average 21 percent for the combined total of 240 activity areas proposed with the action alternatives.

Table 20. Summary of detrimental soil conditions within activity areas proposed for mechanical harvest.

Alternative	Number of Activity Areas	Estimated Detrimental Soil Conditions[1]		
		Percent		Acres
		Range	Average	
Alternative 1 (Existing Condition)	240[2]	8 to 35%	21%	
Alternative 2				
All units (8,180 acres)				
Existing Condition	203	8% to 35%	20%	1,575 acres
Following Harvest		11% to 42%	26%	2,120 acres
Following Restoration (Subsoiling)		11% to 31%	21%	1,734 acres
Units with >20% detrimental condition prior to harvest				
Existing Condition	88	21% to 35%	27%	
Following Harvest		25% to 42%	34%	
Following Restoration (Subsoiling)		15% to 31%	25%	
Units with <20% detrimental condition prior to harvest				
Existing Condition	115	8% to 20%	14%	
Following Harvest		11% to 27%	20%	
Following Restoration (Subsoiling)		11% to 20%	18%	
Alternative 3				
All units (7,870 acres)				
Existing Condition	196	8% to 35%	21%	1,638 acres
Following Harvest		11% to 42%	28%	2,150 acres
Following Restoration (Subsoiling)		11% to 32%	22%	1,728 acres
Units with >20% detrimental condition prior to harvest				
Existing Condition	109	21% to 35%	27%	
Following Harvest		25% to 42%	34%	
Following Restoration (Subsoiling)		15% to 32%	25%	
Units with <20% detrimental condition prior to harvest				
Existing Condition	87	8% to 20%	14%	
Following Harvest		11% to 27%	20%	
Following Restoration (Subsoiling)		11% to 20%	18%	

[1] Summarizes unit specific information found in Appendix 2.
[2] Total combined number of activity areas with mechanical harvest for Alternatives 2 and 3

Much of the random disturbance between main skid trails and away from landings has decreased naturally over time. Research has shown that the detrimental effects of soil compaction generally require more than 3 to 5 equipment passes over the same piece of ground (McNabb and Froehlich, 1983). Where logs were skidded with only 1 or 2 equipment passes, soil compaction was shallow (2 to 4 inches) and the bulk density increases did not qualify as a detrimental soil condition. Frost heaving and freeze-thaw cycles have gradually restored soil porosity in areas with slight to moderately compacted layers near the ground surface. Other factors that have helped the recovery process include root penetration, rodent activity, wetting and drying cycles, and surface organic matter. The establishment of vegetative ground cover and the accumulation of litter and organic matter has also been improving areas of past soil displacement. There is no

evidence that post-harvest, broadcast burn treatments caused any severely burned soil in random locations off designated logging facilities in previously managed areas.

Subsoiling treatments have rehabilitated disturbed soil on skid trails and landings in portions of 113 past harvest units. These restoration acres were deducted in the calculated estimates of existing detrimental soil conditions where the proposed activity areas overlapped with these previously managed areas. Soils committed to existing logging facilities in other activity areas will remain in a detrimental condition until reclamation activities are implemented to improve the hydrologic function and productivity on disturbed soils.

The minor extent of detrimental soil conditions from recreational activities and livestock grazing is expected to have a negligible effect on overall site productivity within the individual activity areas proposed for this project (Soil Specialist Report). Soil disturbances from these activities are generally confined to small concentration areas, and the extent of disturbed soil is relatively minor in comparison to existing roads and past logging disturbances. There are no developed campgrounds or system trails for hiking and/or OHV use that cross through any of the proposed activity areas. Impacts from dispersed recreation activities are usually found along existing roads and trails. Field observations indicate little or no evidence of dispersed campsites within the proposed activity areas. User-created trails typically occur where vegetation has been cleared on or adjacent to old skid trail networks of past harvest areas. Conservative estimates were used to account for soil disturbances from existing logging facilities (i.e., main skid trails and landings), and the extent of these impacts is likely included in the estimates of existing detrimental soil conditions (Appendix 2). The project area contains portions of four inactive sheep allotments that have been vacant for over ten years. Native vegetation has recovered in areas of past grazing use, and upland sites are currently providing adequate surface cover to meet soil resource objectives.

Coarse Woody Debris (CWD) and Surface Organic Matter

Decaying wood on the forest floor is critical for maintaining the soils ability to retain moisture and provide both short and long-term nutrient supplies and biotic habitat for microorganism populations. Mycorrhizal fungi and other soil organisms depend upon the continuing input of woody debris and fine organic matter. A balance between management practices and ensuring adequate amounts of coarse woody debris (CWD) and surface organic matter is an important goal for maintaining long-term soil productivity. Using mycorrhizal fungi as a bio-indicator of productive forest soils, research studies were used to develop conservative recommendations for leaving sufficient CWD following management activities (Graham et al. 1994, Brown et al. 2003). A minimum of 5 to 10 tons per acre of coarse woody debris (greater than 3 inches in diameter) should be retained on dry, ponderosa pine sites and 10 to 15 tons per acre on mixed conifer or lodgepole pine sites to maintain soil productivity. A sufficient number of standing dead snags and/or live trees should also be retained for future recruitment of organic matter.

It is expected that adequate amounts of coarse woody debris and surface organic matter currently exist to protect mineral soil from erosion and provide nutrients for maintaining soil productivity within the majority of activity areas. There are some older activity areas, prior to LRMP direction (1990), where management activities likely resulted in less than desired amounts of coarse woody debris (CWD) on the ground. Although the project area contains a wide range of existing down logs and current levels are not known for all activity areas, it is expected that previously managed areas have been improving towards optimum conditions as additional woody materials have accumulated through natural mortality, windfall, and recruitment of fallen snags over time. Annual leaf and needle fall, small diameter branches, twigs and other forest litter have increased organic matter levels for short-term nutrient cycling.

Environmental Effects

Introduction

The potential for detrimental changes to soil physical properties was quantitatively analyzed by the extent (surface area) of temporary roads, log landings, and designated skid-trail systems that would likely be used to facilitate yarding activities within each of the proposed activity areas. Professional judgment was used to evaluate changes in the amount and composition of coarse woody debris and surface organic matter. This analysis also considered the effectiveness and probable success of implementing the soil mitigation and resource protection measures.

The following section, Important Interactions, provides a discussion of the potential effects on soil and biological conditions from implementing the various vegetation management treatments. After this discussion, the environmental effects of each of the alternatives are presented and tracked by the issue measures used to evaluate the estimated impacts on soil productivity.

Important Interactions

The proposed management activities include mechanical harvest and hand-felling of infected trees to reduce the spread of dwarf mistletoe. Mechanically harvested trees would be whole-tree yarded using a track-mounted harvester and grapple skidders. Most of the slash generated from these activities would be machine piled and burned at the log landings. There would be no machine piling of slash in random locations of activity areas, and prescribed underburning is not being considered at this time. Unique to Alternative 3 is the proposal to prune, girdle, or hand-fell overstory trees; there would be no use of ground-based equipment in these activity areas. Most felled trees would remain on the ground to provide surface cover and source of nutrients. Existing snags and down woody materials would be retained on site. No new roads would be constructed and retained as part of the transportation system. There would be no road decommissioning (obliteration) treatments on existing classified roads.

The best information about the proposed actions (EA, Alternative Descriptions) was used in conjunction with the location of activities to analyze the potential effects on the soil resource. The types and locations of soil disturbance vary by alternative, but the nature of

the effects to the soil resource is similar for project activities that use ground-based equipment to accomplish management objectives. The same types of mechanical treatments would be used on similar landtypes, but the overall extent and locations of new soil disturbance would be somewhat different for each action alternative.

Soil condition assessments for similar soils and the same types of ground-based harvest systems, research references, and personal communications with timber sale administrators were used to predict the extent of detrimental soil disturbance anticipated from mechanized harvest and yarding activities. Estimates for predicted amounts of detrimental soil conditions following project implementation account for the expected amount of volume removal, the type of logging equipment, the spacing of skid trails, and the number of log landings that would be needed to deck accumulated materials.

Mechanical harvest would likely be accomplished using a ground-based machine equipped with a felling head (harvester shear). Feller bunchers are one of the most common harvester machines used in this geographic area. It is expected that similar equipment would be used in proposed activity areas for this project. Felled trees would be whole-tree yarded to main skid trail networks and rubber-tired grapple skidders would then transport bunched trees to landings for processing and loading. Skidding equipment would be restricted to designated skid trails at all times. It is estimated that skid trails would have an average disturbed width of 12 feet and the average spacing distance between main trails would be approximately 100 feet or approximately 11 percent of the unit area (Froehlich et.al. 1981, Garland 1983). The Forest average for log landings is one landing (100 feet by 100 feet) for 10 acres of harvest, which equates to approximately 2 percent of the unit area. Mechanical harvesters would only be allowed to make a limited number of equipment passes on any site-specific area between skid trails or away from log landings. The slight-to-moderately compacted surface layers in these areas are not expected to qualify as a detrimental soil condition. The majority of soil impacts would be confined to heavy use areas (i.e., roads, log landings, and main skid trails) in known locations that can be reclaimed by subsoiling treatments when these facilities are no longer needed for future management.

The development and use of temporary roads, log landings, and skid trail systems are the primary sources of physical disturbance that would result in adverse changes to soil productivity. Even with careful planning and implementation of project activities, the extent of detrimental soil conditions can be expected to increase by 5 to 10 percent with each successive entry into a stand (Craigg, 2000). Although existing skid-trail networks and log landings would be used wherever possible, the creation of some new facilities will likely be necessary because not all existing logging facilities can be reutilized due to their orientation within units. Conservative estimates were used to predict how much surface area would likely be needed to accommodate the harvest and yarding of commercial material. For regeneration harvest prescriptions (e.g., final removal) proposed for this entry, the creation of new logging facilities would likely cause a 7 percent increase in detrimental soil conditions. Appendix 2 displays percentages of detrimental soil conditions following harvest and restoration activities for each of the action alternatives and individual activity areas planned for this project.

Most of the slash generated from harvest activities would be machine piled and burned on log landings and/or main skid trails. Burning large concentrations of machine-piled logging slash would cause severely burned soil because heat is concentrated in a localized area. However, this slash disposal method would not cause additional soil impacts because burning would occur on previously disturbed soils that already have detrimental soil conditions. Soil restoration treatments would be implemented to reduce the amount of detrimentally disturbed soil committed to logging facilities following these post-harvest activities.

The action alternatives also include hand treatments for reducing fuel accumulations in portions of some activity areas. The hand pile and burn method would be used to burn small concentrations of woody materials that are well-distributed within activity areas. This non-mechanical fuels treatment does not cause soil displacement or compaction damage. Due to much smaller piles with less fuels, ground-level heating is usually not elevated long enough to detrimentally alter soil properties that affect long-term site productivity. These activities are conducted at times and under conditions that reduce the risk of resource damage, including impacts to soils and understory vegetation. Soil heating is reduced when the soil surface layer is moist, so piles are typically burned following periods of precipitation. Nutrient releases may actually benefit site productivity in localized burned areas. Conservative estimates were used in Appendix 2 to account for the cumulative amount of surface area that could be potentially impacted within activity areas. The cumulative effects to soils from this activity would be relatively minor in comparison to harvest and yarding activities. Therefore, the overall extent of detrimental soil conditions is not expected to increase above the predicted levels in any of the activity areas proposed for these hand treatments.

Commercial harvest and whole-tree yarding can affect soil productivity through the removal of nutrients in the form of tree boles, limbs and branches. Although these forest practices remove potential sources of future CWD, ground-based harvest activities also recruit CWD to the forest floor through breakage of limbs and tops and toppling of some trees during felling and skidding operations. This would accelerate the accumulation of woody debris and where these materials may be currently deficient. These organic materials also provide additional soil cover that improves the soils ability to resist surface erosion.

The soil mitigation and resource protection measures are designed to avoid, minimize, or rectify potentially adverse impacts to the soil resource. These measures provide options for limiting the amount of surface area covered by logging facilities and controlling equipment operations to minimize the potential for soil impacts in random locations between main skid trails and away from log landings. The effects of only two passes by tracked machinery on any site-specific area are not expected to qualify as a detrimental soil condition. Natural processes, such as frost heaving and freeze-thaw cycles, can offset soil compaction near the soil surface. Other examples include avoiding equipment operations during periods of high soil moisture and operating equipment over frozen ground or a sufficient amount of compacted snow.

Soil restoration treatments (subsoiling) would be applied to reduce the cumulative amount of detrimentally compacted soil within some of the proposed activity areas. This would include subsoiling on temporary roads and some of the primary skid trails and log landings following post-harvest activities. Individual activity areas that would receive soil restoration treatments are identified by unit number in Mitigation Measure 6. Subsoiling treatments are designed to promote maintenance or enhancement or soil quality, and these conservation practices are consistent with LRMP interpretations of standards and guidelines SL-3 and SL-4 (USDA Forest Service 1996b) and Regional policy (FSM 2520, R-6 Supplement No. 2500-98-1).

As previously described under Affected Environment, extensive areas of the project area have been covered by loose, non-cohesive ash deposits with little or no structural development. These sandy-textured materials are the inherent soil properties which are typically affected by mechanical forces that either reduce or improve soil porosity in the compaction zone. Equipment traffic can decrease soil porosity on ash-influenced soils, but compacted sites can be mitigated by tillage with a winged subsoiler (Powers et.al. 1999). The winged subsoiling equipment used on the Deschutes National Forest has been shown to lift and shatter compacted soil layers in greater than 90 percent of the compacted zone with one equipment pass (Craigg, 2000). Although rock fragments can limit subsoiling opportunities on some landtypes, hydraulic tripping mechanisms on this specialized equipment help reduce the amount of subsurface rock that could potentially be brought to the surface by other tillage implements. Most of the surface organic matter remains in place, and any mixing of soil and organic matter does not constitute detrimental soil displacement because these materials are not removed off site. Subsoiling treatments likely improve subsurface habitat by restoring the soils ability to supply nutrients, moisture, and air that support soil microorganisms. Since the winged subsoiler produces nearly complete loosening of compacted soil layers without causing substantial displacement, subsoiled areas on this forest are expected to reach full recovery within the short-term (less than 5 years) through natural recovery processes.

Subsoiling treatments have rehabilitated disturbed soil on previously used roads and logging facilities in portions of some activity areas. Subsoiled areas would be avoided, as much as possible, to protect established vegetation and minimize the potential for surface erosion. Depending upon orientation within activity areas, some of these reclaimed sites may need to be re-used to facilitate yarding activities. Since the inherent properties of these ash-influenced soils have little or no structural development, it is expected that subsequent subsoiling on previously treated sites would have similar effects as described above and the primary effects would be a reduction in existing ground-cover vegetation.

The magnitude and duration of potential effects, both physical and biological changes in soil productivity, depend on the intensity of site disturbance, the timing and location of activities, and the inherent properties of the volcanic ash-influenced soils within affected activity areas. Direct effects occur at essentially the same time and place as the actions that cause soil disturbance, such as soil displacement and compaction from equipment operations. Indirect effects occur sometime after or some distance away from the initial

disturbance, such as increased runoff and surface erosion from previously compacted areas. Cumulative effects include all past, present, and reasonably foreseeable actions that cause soil disturbance within the same activity areas proposed with this project.

Alternative 1

Direct and Indirect Effects

Detrimental Soil Disturbance

There would be no increase in the amount of surface area with detrimental soil conditions because no additional land would be removed from production to build roads or other management facilities. Although disturbed soils would continue to recover naturally, the existing percentages of detrimental soil conditions would likely remain unchanged for an extended period of time. This alternative would defer opportunities for soil restoration treatments that reduce the extent of detrimental soil conditions and help move conditions toward a net improvement in soil quality.

Soil productivity would not change appreciably unless catastrophic wildfires cause intense heating of the forest floor that results in detrimental changes to soil properties. Severe burning may cause soils to repel water, thereby increasing surface runoff and subsequent erosion. The loss of protective ground cover also increases the risk for accelerated wind erosion on the loose, sandy textured soils, which are widespread throughout the project area.

Coarse Woody Debris (CWD) and Surface Organic Matter

In the short term, the amount of coarse woody debris and surface litter would gradually increase or remain the same. Levels of CWD will continue to increase through natural mortality, windfall, and recruitment of fallen snags. Short-term nutrient sources will also increase through the accumulation of small woody material from shrub and tree branches, annual leaf and needle fall, and decomposition of grass and forb plant materials.

In the long term, the accumulation of CWD and forest litter would increase the potential for intense wildland fires which may completely consume heavy concentrations of fuel and ground cover vegetation. Intense ground-level fire would likely create areas of severely burned soil and increase the potential for accelerated wind erosion. The loss of organic matter would adversely affect ground cover conditions and the nutrient supply of affected sites.

Alternatives 2 and 3

Direct and Indirect Effects

Detrimental Soil Disturbance

Use of ground-based equipment to harvest overstory trees would cause cumulative increases in the amount of detrimentally disturbed soil within the proposed activity areas (Appendix 2). The development and use of temporary roads, log landings, and skid trail systems are the primary sources of new soil disturbance that would result in adverse changes to soil productivity. Most soil impacts would occur on and adjacent to these heavy-use areas where multiple equipment passes typically cause detrimental soil

compaction. Soil mitigation and resource protection measures would be applied to avoid or minimize the extent of new soil disturbance in random locations between main skid trails and away from log landings.

Soil restoration treatments (subsoiling) would be applied to reduce the cumulative amount of detrimentally compacted soil within specific activity areas that are expected to exceed Regional and LRMP standards and guidelines for detrimental soil conditions. Subsoiling treatments would improve the hydrologic function and productivity on disturbed soils by fracturing compacted soil layers and increasing porosity within soil profiles. Subsequently, this would contribute to increased water infiltration and enhanced vegetative root development. Subsoiled areas are expected to return to natural bulk density levels within the short-term through natural recovery processes (USDA Forest Service 1995a).

Subsoiling treatments are expected to be highly effective in restoring detrimentally compacted soils. Dominant soils within the project area are well suited for tillage treatments due to naturally low bulk densities and the absence of rock fragments within soil profiles. The winged subsoiling equipment used locally has been shown to lift and shatter compacted soil layers in greater than 90 percent of the compacted zone with one equipment pass (Craigg, 2000). This results in nearly complete loosening of compacted soil particles without causing substantial displacement. Subsoiled areas on this forest are expected to reach full recovery within the short-term through natural recovery processes (USDA Forest Service 1995a, 1996a, 1997, 1999).

The minor extent of incidental soil disturbances from the proposed slash disposal treatments are not expected to cause measurable increases in the percentages of detrimental soil conditions within any of the activity areas.

Tables 18 and 19 summarize predicted changes in detrimental soil conditions displayed in Appendix 2. Table 20 summarizes existing and predicted amounts of detrimental soil conditions following the proposed harvest and soil restoration treatments. Table 21 summarizes by unit the net change in detrimental soil conditions from current levels.

Table 21. Summary of detrimental soil conditions following proposed harvest and soil restoration.

Net Change in Detrimental Soil Condition from Existing Condition[1]	**Alternative 2**			**Alternative 3**		
	Detrimental Soil Condition			**Detrimental Soil Condition**		
	<=20%	**>20%**	**Total**	**<=20%**	**>20%**	**Total**
Existing Condition	**115 units**	**88 units**	**203 units**	**87 units**	**109 units**	**196 units**
No change	20 units	7 units	27 units	14 units	17 units	31 units
Increase, but within 20% LRMP Standard	94 units	---	94 units	71 units	---	71 units
Decrease	11 units	71 units	82 units	14 units	80 units	94 units
Post-Project Condition	**125 units**	**78 units**	**203 units**	**99 units**	**97 units**	**196 units**

[1] Summarizes unit specific information found in Appendix 2.

Under **Alternative 2**, ground-based equipment would be used in 203 activity areas that total approximately 8,180 acres. It was concluded that 88 of these activity areas currently have detrimental soil conditions that exceed 20 percent of the unit area. It is predicted that the proposed harvest and yarding activities would result in a total increase of approximately 545 acres of additional soil impacts associated with new logging facilities. Detrimental soil conditions would remain at or below the LRMP standard within 55 of these activity areas. In the remaining 148 activity areas, it is estimated that the cumulative amount of detrimental soil conditions would exceed the 20 percent standard following ground-based logging activities. Portions of these activity areas would receive subsoiling treatments to rehabilitate approximately 386 acres of detrimentally compacted soil associated with temporary roads, log landings and primary skid trails. It is predicted that 82 of the 148 activity areas would result in a net improvement in soil quality following restoration activities (Appendix 2 and Table 21). Detrimental soil conditions within the total number of 203 activity areas would range from 11 to 31 percent with an average of 21 percent (Table 20).

Under **Alternative 3**, ground-based equipment would be used in 196 activity areas that total approximately 7,870 acres. It was concluded that 109 of these activity areas currently have detrimental soil conditions that exceed 20 percent of the unit area. It is predicted that the proposed harvest and yarding activities would result in a total increase of approximately 512 acres of additional soil impacts associated with new logging facilities. Detrimental soil conditions would remain at or below the LRMP standard within 43 of these activity areas. In the remaining 153 activity areas, it is estimated that the cumulative amount of detrimental soil conditions would exceed the 20 percent standard following ground-based logging activities. Portions of these activity areas would receive subsoiling treatments to rehabilitate approximately 422 acres of detrimentally compacted soil associated with temporary roads, log landings and primary skid trails. It is predicted that 94 of the 153 activity areas would result in a net improvement in soil quality following restoration activities (Appendix 2 and Table 21). Detrimental soil conditions within the total number of 196 activity areas would range from 11 to 32 percent with an average of 22 percent (Table 20).

The analysis indicates that the extent of detrimental soil conditions relative to existing conditions would either: 1) remain the same, 2) increase, but remain within the LRMP standard of 20 percent, or 3) decrease levels below existing conditions (Appendix 2 and Table 21). Implementation of Alternative 2 would result in the greatest extent of detrimental soil conditions following the proposed activities, and Alternative 3 would result in the least overall increase in soil impacts due to fewer activity areas and treatment acres. Under Alternative 2, the extent of detrimental soil conditions would be the same or less than the existing condition in 54 percent of the mechanical treatment units following the proposed harvest and restoration activities. In comparison, Alternative 3 would result in 64 percent of the activity areas with detrimental soil conditions which are equal to or less than existing conditions. Consequently, both action alternatives would result in fewer activity areas with detrimental soil conditions that exceed the LRMP standard compared to existing conditions (Table 21).

The harvest and restoration treatments (subsoiling) proposed in both action alternatives are consistent with Regional policy (FSM 2520, R-6 Supplement No. 2500-98-1) and LRMP interpretations for Forest-wide standards and guidelines SL-3 and SL-4 that limit the extent of detrimental soil conditions. In activity areas where less than 20 percent detrimental impacts exist from prior activities, the cumulative amount detrimentally disturbed soil would not exceed the 20 percent limit following project implementation and restoration. In activity areas where more than 20 percent detrimental impacts exist from prior activities, the cumulative detrimental effects would not exceed conditions prior to the planned activity and some activity areas would result in a net improvement in soil quality following restoration activities. Both action alternatives balance the goal of maintaining and/or improving soil quality with the goal of maintaining established vegetation on existing logging facilities that would not be used during this entry.

Sensitive Soils

The majority of activity areas proposed for mechanical harvest do not occur on landtypes that contain sensitive soils. Only a small percentage of the acres proposed for treatment contain sensitive soils in localized areas. Total affected acres and proposed units that contain small areas of sensitive soils are displayed by action alternative and concern category in Table 22. The majority of overlap occurs on low productivity sites where the potential for successful regeneration is limited by frost heaving, low fertility and climatic factors. None of the proposed activity areas overlap landtypes that contain sensitive soils with high or severe ratings for surface erosion or potentially wet soils with seasonally high water tables.

Table 22. Summary of Activity Areas proposed for Mechanical Harvest on Landtypes with Sensitive Soils.

Management Concern	Alternative 2	Alternative 3
Slopes greater than 30 percent	**7 acres** in 5 units that total 358 acres (2% of unit acreage).	**5 acres** in 4 units that total 287 acres (2% of unit acreage).
Low productivity sites limited by frost heaving, low fertility and climatic factors	**94 acres** in 17 units that total 673 acres (14% of unit acreage).	**52 acres** in 8 units that total 636 acres (8% of unit acreage).
Soils with variable depths in areas of rocky lava flows	**10 acres** in 4 units that total 392 acres (3% of unit acreage)	**5 acres** in 2 units that total 255 acres (2% of unit acreage)

Soil displacement from harvest activities occurs when soil organic layers are scraped or pushed away by equipment or gouged by logs during skidding operations. This type of soil disturbance is most likely to occur on the steeper portions of harvest units (slopes are over 30 percent). Portions of following units contain slopes greater than 30 percent: 25, 83, 84, 97, and 296. Only Alternative 2 includes unit 296. In order to minimize the potential for soil displacement damage, ground-based equipment would be restricted to existing roads and designated skid trails at all times (Mitigation Measure 1), and operators would be required to winch logs to skidders (Mitigation Measure 2). The majority of activity areas proposed for mechanical harvest are located on gentle to moderately sloping terrain where the maneuvering of equipment generally does not remove soil surface layers in areas that are at least 5 feet in width (FSM 2520). These

smaller areas of soil displacement or the mixing of soil and organic matter would not constitute detrimental soil displacement.

The potential for successful regeneration is limited by properties such as soil depth, soil fertility, and temperature extremes on low productivity sites such as frost pockets, cold air drainages, and localized areas of rocky lava flows. Under both action alternatives, all proposed activity areas currently have adequate stocking levels from past regeneration harvest treatments. This indicates that management concerns associated with these sites were successfully addressed by past silvicultural practices. With the overstory removal proposed for this entry, reforestation objectives are less of a concern now that adequate regeneration currently exists on these sites.

Subsoiling is proposed in some activity areas that overlap landtypes containing soils with variable depths on rocky lava flows. Although rock fragments on the surface and within soil profiles can limit subsoiling opportunities, hydraulic tripping mechanisms on winged subsoiling equipment helps reduce the amount of subsurface rock that could potentially be brought to the surface. Most of the surface organic matter and smaller logging slash would remain in place because the equipment is designed to allow adequate clearance between the tool bar and the surface of the ground.

Coarse Woody Debris (CWD) and Surface Organic Matter
A minimum amount of 5 to 10 tons per acre of CWD on ponderosa pine sites and 10 to 15 tons per acre on mixed conifer or lodgepole pine sites is recommended to ensure adequate nutrient supplies and desirable biological benefits for maintaining soil productivity (Graham et al. 1994).

The proposed harvest activities would reduce potential sources of future CWD, especially where mechanized whole-tree yarding is used in activity areas. However, both action alternatives would likely retain sufficient amounts of CWD following post-harvest activities to meet recommended guidelines. Existing snags and down woody materials would be retained on site. Harvest activities would recruit additional CWD to the forest floor through breakage of limbs and tops during felling and skidding operations. Understory trees, damaged during harvest operations, would also contribute woody materials that provide ground cover protection and a source of nutrients for maintaining soil productivity on treated sites.

Slash disposal treatments would reduce CWD and some of the forest litter by burning slash accumulations at the log landings. Prescribed underburning would not be used as a post-harvest treatment within any of the proposed activity areas. Burning small concentrations of logging slash by the hand pile-and-burn method would have only a minor effect on the overall amount of CWD and surface organic matter within the proposed activity areas.

Cumulative Effects

Of the ongoing or foreseeable future actions (Appendix 3), the Miscellaneous Post-Sale project and the Ponderosa Pine Release project have units that overlap Long Prairie

treatments. In the areas of overlap, the Miscellaneous Post-Sale project and the Ponderosa Pine Release project propose to hand-fell small diameter trees. No ground-based equipment would be used and the hand felled trees would be retained on site. There would be no cumulative increase in the estimated percentages of detrimental soil conditions for the activity areas planned with the Long Prairie project (Appendix 2). These non-mechanical vegetation treatments may actually provide beneficial effects to soil productivity by reducing the potential for surface erosion and supplying nutrients as these woody materials gradually decompose on treated sites.

The Rim Woodcutting Area, in the northeastern corner of the project area, overlaps portions of 15 to 18 proposed activity areas depending on the selected alternative. The amount of dead standing and down trees is the primary factor that influences the amount of soil disturbance that can be anticipated within woodcutting areas. Past treatments in these activity areas generally did not retain a great deal of dead fiber. Woodcutter use is expected to be negligible. Many of the existing logging facilities from past timber sales are typically used by woodcutters because vegetation has already been cleared to allow access. Since conservative estimates were used to account for existing soil conditions, it is expected that the soil disturbance that may occur from woodcutting activities is already included in the estimates of detrimental soil conditions for these activity areas (Appendix 2). Consequently, no measurable increase in detrimental soil conditions is expected from the combined effects of these activities.

Under all action alternatives, the overall effects to soils from the action alternatives combined with all past, present, and reasonably foreseeable management activities comply with Regional (FSM 2520, R-6 Supplement No. 2500-98-1) and LRMP direction for planning and implementing management practices in previously managed areas.

Consistency with Management Direction

Under the action alternatives, equipment operations would cause some new soil disturbances in portions of previously managed areas where ground-based logging is proposed for this entry. The Regional supplement to the Forest Service Manual (FSM 2520, R-6 Supplement No. 2500-98-1) provides policy for planning and implementing management practices in previously managed areas.

Management objectives for this project are as follows:

- In activity areas where less than 20 percent detrimental soil impacts exist from prior activities, the cumulative amount of detrimentally disturbed soil must not exceed the 20 percent limit following project implementation and restoration.
- In activity areas where more than 20 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effects from project implementation and restoration must, at a minimum, not exceed the conditions prior to the planned activity and should move conditions toward a net improvement in soil quality.

Plans for projects must include provisions for mitigation of ground disturbances where activities are expected to cause resource damage that exceeds Regional and LRMP

standards and guidelines. Soil restoration treatments would be applied to rectify impacts by reducing the cumulative amount of detrimentally compacted soil committed to temporary roads and logging facilities within specific activity areas (Appendix 2). This would help move conditions toward a net improvement in soil quality for 40 percent of the 203 activity areas proposed for mechanical treatment under Alternative 2 and 48 percent of the 196 activity areas proposed under Alternative 3 (Table 21).

Some activity areas would still have detrimental soil conditions that exceed the 20 percent standard following implementation of project and restoration activities. This is consistent with Regional policy (FSM 2520, R-6 Supplement) and the LRMP interpretation of Forest-wide standards and guidelines SL-3 and SL-4, which is filed in the Deschutes National Forest Supervisor's Office (USDA Forest Service 1996b).

Irreversible and Irretrievable Commitments

The action alternatives are not expected to create any impacts that would cause irreversible damage to soil productivity. There is low risk for mechanical disturbances to cause soil mass failures (landslides) due to the inherent stability of dominant landtypes and the lack of seasonally wet soils on steep slopes. Careful planning and the application of Best Management Practices and project design elements would be used to prevent irreversible losses of the soil resource.

The development and use of temporary roads and logging facilities is considered an irretrievable loss of soil productivity until their functions have been served and disturbed sites are returned back to a productive capacity. The action alternatives include soil restoration activities (subsoiling) that would improve the hydrologic function and productivity on detrimentally disturbed soils within the short-term (less than 5 years).

Short-Term Uses of the Human Environment and the Maintenance of Long-Term Productivity

Forest Plan management requirements and mitigation measures built into the action alternatives ensure that long-term productivity will not be impaired by the application of short-term management practices. The action alternatives would improve soil productivity in specific areas where soil restoration treatments (subsoiling) are implemented on soils committed to temporary roads and logging facilities.

Fisheries and Hydrology

Existing Condition

The project area is within the Little Deschutes 4th Field Watershed and within the Long Prairie 5th Field Watershed. There are no perennial or intermittent stream channels within the project area. Ephemeral drainage channels flow only during high precipitation events or snow melt. The closest surface water is: 1) Paulina Lake, approximately 2.5 miles northeast of the project area, 2) the Little Deschutes River, approximately 2.5 miles west of the project area, and 3) Paulina Creek, approximately 2.7 miles north of the project area. Paulina Creek and the Little Deschutes River are listed by the Oregon

Department of Environmental Quality as 303(d) water bodies. Paulina Creek is listed for summer water temperatures. The Little Deschutes River is listed year round for water temperature and dissolved oxygen. Within the project area, water carried in ephemeral drainage channels drains away from Paulina Lake and Paulina Creek. The minor amount of water carried in ephemeral drainage channels does not leave the project area, infiltrating the soil well before reaching the Little Deschutes River.

Given the lack of perennial or intermittent stream flow, there are no fish populations or fish habitat within the Long Prairie project. There is no proposed critical habitat for bull trout, nor is there any Essential Fish Habitat for chinook salmon. There are no water bodies listed by the Oregon Department of Environmental Quality for water quality impairment (303(d)) list. There are no Riparian Habitat Conservation Areas as described in INFISH.

Alternatives 1, 2, and 3

Direct, Indirect and Cumulative Effects

Due to the lack of surface water within or near the Long Prairie Mistletoe Reduction project area, there would be no effects to Oregon Department of Environmental Quality 303(d) listed water bodies, fish populations or habitat, or Essential Fish Habitat for Chinook (Magnuson-Stevens Act).

Scenic Resources

"Scenic attractiveness is the primary indicator of the intrinsic scenic beauty of a landscape and the positive responses it evokes in people. It helps determine landscapes that are important for scenic beauty, based on commonly held perceptions of the beauty of landform, vegetation pattern, composition, surface water characteristics, land use patterns, and cultural features" (USDA Forest Service 1995b).

Approximately 5,587 acres of the Long Prairie Mistletoe Reduction Project Area are within MA-9, the Forest Plan Management Area designated for scenic views. This Management Area is allocated as Partial Retention areas, which include Foreground and Middleground distance zones. The project area contains three distinct subdivisions within its MA-9, each with its own objectives. They are:

- **Lodgepole Pine-Foregrounds**: Older lodgepole pine stands normally lack visual diversity. Because their crowns are relatively small, and the older trees tend to have a deteriorating appearance, management emphasis in lodgepole pine foregrounds will not be to produce large diameter, older trees. Instead, the emphasis will be on managing healthier, fuller crowned, younger trees (LRMP M9-51).
- **Ponderosa Pine-Foregrounds**: Ponderosa pine in Foreground Scenic Views will be managed to maintain or create a visual mosaic of numerous, large diameter, yellow-barked trees with stands of younger trees offering scenic diversity as seen from sensitive viewer locations, such as from a travel corridor (LRMP M9-4).

- **Mixed Conifer-Middlegrounds**: Mixed conifer stands viewed as middlegrounds will be managed to maintain or create a mosaic of stands with essentially continuous tree canopies with scenic diversity provided by natural-appearing openings which resemble those found in the natural landscape. From these viewing distances, immature trees are visually more important than larger old-growth trees, because the crowns of the younger trees are normally fuller and contribute to the overall textural element when viewed from a distance (LRMP M9-34).

Existing Condition

With the bark beetle epidemic in the 1980s, and the subsequent regeneration harvest treatments, approximately 35 to 40 percent (between 19,550 to 22,300 acres) of the project area has been impacted. The majority of management activities of this regeneration harvest occurred in lodgepole pine dominated stands. Treatment also occurred in stands of mixed forest, including lodgepole pine, ponderosa pine, and occasionally white fir. Many of the relatively healthy trees, those with good live crown structure, were retained as seed trees and/or shelterwood trees to assure good regeneration of new stands. These leftover trees were retained at wide spacing (an average of 40 to 60 foot spacing or 12 to 27 trees per acre) to assure distribution of seed across the stand, healthy natural regeneration, and in consideration of other resources such as wildlife habitat. The original intent was to remove these overstory trees once adequate natural regeneration had been established.

Presently, natural regeneration has been mostly well established throughout the project area. The high-density understory trees are approaching or exceed a height of 5 feet. Dwarf mistletoe is found in many of the trees throughout the project area. It is also present in overstory trees retained in regeneration harvest units.

The strong line, form, color, and textural contrast between the young and vigorous natural regeneration stands and the sparse, tall, and mistletoe infected overstory trees is a contradiction to the expected landscape character, especially within lodgepole pine stands. The contrast and contradiction appears unnatural to casual visitors to the area and degrades the overall scenic quality and scenic integrity within the project area. This condition does not meet Desired Visual Condition as specified under the Deschutes NF LRMP and does not represent the landscape character of Central Oregon.

Alternative 1

Direct and Indirect Effects

Under this alternative, the Long Prairie project area would not be altered by any proposed management activity. Scenic quality, scenic integrity level, and landscape character would remain about the same during the short-term period, and the Desired Visual Condition would continue to not be met. The current vegetation condition would continue to degrade, thus affecting long-term scenic quality.

Under this alternative, the Desired Future Condition for Scenic Resources (MA-9) within the Long Prairie project area under the Deschutes National Forest LRMP direction would not be met.

Alternatives 2 and 3

Direct and Indirect Effects

The proposed treatments represent approximately 50 to 60 percent of natural regeneration units within the Long Prairie project area. Alternative 2 proposes treatments in the following units that would have a direct effect on scenic resources along the Road 22 scenic corridor: Units 98, 108, 109, 110, 118, 138, 139, 160, 173, 178, 190, 203, 204, 205, 219, and 246. Alternative 3 proposes treatments in these units, and adds Units 157 and 237.

The proposed treatment activities would enhance both short-term (0 to 5 years) and long-term (5 years and beyond) scenic quality, while at the same time meeting the Desired Future Condition (M9-15, M9-34, M9-64).

- **Lodgepole Pine-Foregrounds** (SV2=Partial Retention Foreground)**:** A total of 646 acres (approximately 11.6 percent of the 5,587 acres within the Scenic Views allocation area) within the Lodgepole pine foregrounds and 72 acres (approximately 1.3 percent of the 5,587 acres) within the Lodgepole pine Middleground (SV4= Partial Retention Middleground) would be treated to remove the mistletoe infected overstory. In this short term, this would eliminate the existing contradiction between the actual and expected landscape characters, and in the long term would move treatment units within this subdivision toward the desired visual quality condition encouraging the development of healthy, full crowned young trees.
- **Ponderosa Pine-Foregrounds (SV2=Partial Retention):** A total of 152 acres (2.7 percent of the Scenic Views allocation area) within the Ponderosa Pine foreground would be treated to remove mistletoe infected trees in this subdivision would be consistent with LRMP M9-5, which states that trees may be removed as necessary to control disease problems. A visual mosaic, as described in LRMP M9-4, would be maintained or created by retaining the existing overstory in retention areas and outside units, while encouraging the growth of healthy younger trees within treatment units.
- **Mixed Conifer-Foregrounds** (SV2=Partial Retention Foreground) **and** Mixed Conifer **Middlegrounds** (SV4=Partial Retention Middleground): Treatments in this subdivision would encourage the development of healthy immature trees, and would be consistent with LRMP M9-32, which indicates that large trees may be removed if there is a significant disease problem in the stand. However, since the proposed treatments in this subdivision represent such a small percentage of the total treatments (11 acres or 0.2 percent of the 5,587 acres) the effects to the Mixed Conifer-Middleground subdivision are expected to be insignificant.

With the help of effective management practices, including protection and retention of residual trees, post treatment activities, effective implementation of recommended mitigation measures, and on-site monitoring, and the following results are expected:

- The short-term (within a period of 0 to 5 years) effects would be slightly altered landscape character, scenic quality and scenic integrity. Such short-term effects may be visible to local residents and casual forest visitors.
- The long-term (beyond 5 years) effects would be beneficial to landscape character, scenic quality, and scenic integrity level. The existing strong line, form, color, and textural contrast would be greatly reduced to a more uniform, consistent pattern, particularly within lodgepole pine stands.
- The residual slash and debris, following treatment activities, would be minimal and would blend well with the existing environment. The effect is not expected to be highly noticeable or visible to visitors to the project area two years after treatment activities are completed.

Both action alternatives would contribute toward the development of the Desired Visual Condition described in the Deschutes LRMP.

Cumulative Effects

Based on reasonably foreseeable future actions proposed along Forest Road 22 scenic corridor, the cumulative effect(s) on scenic resources is expected to slightly alter existing landscape character, scenic quality, and scenic integrity level. These proposed actions include: miscellaneous post treatment activities, ponderosa pine release thinning, pre-commercial thinning of lodgepole pine, whip falling, and dwarf mistletoe control. All these proposed actions are expected to add to the short and long-term alteration of landscape character, scenic quality, and scenic integrity level of Road 22 travel and scenic corridor within the Long Prairie analysis area.

Recreation

The Documentation of Analysis for the Recreation Resource (Project Record, prepared by Barbara P. Schroeder (May 2, 2005) and reviewed by District Recreation Staff) is incorporated by reference and summarized below.

Existing Condition

Recreation use on the Bend-Fort Rock Ranger District has been increasing since the early-1980's, when Bend and central Oregon became destination points for a variety of year-round outdoor pursuits. The Long Prairie project area has not seen the dramatic increase in recreation use that has been seen in other locations on the District. This is due, in part, to the lack of water-based facilities and recreation opportunities within the project area.

Much of the project area can be characterized as providing the recreation activity, setting, and experience of Roaded Natural or Roaded Modified (USDA Forest Service 1990. Appendix 2. Recreation Opportunity Spectrum).

There are no developed recreation sites in the project area. One of the closest developed recreation sites is the Rosland Recreation Site, a Bureau of Land Management (BLM)

developed Off-Highway Vehicle (OHV) recreation site. It is located northeast of La Pine and approximately 2.5 miles northwest of the project area.

The project area provides a variety of dispersed recreation opportunities. Dominant uses include big game hunting (deer and elk), fuelwood gathering, and snowmobiling. Dispersed camping is popular during the hunting seasons. Dispersed camp sites are scattered throughout the project area and are located mostly in forested areas along main and spur roads. Most sites are relatively small, accommodating one or two camp trailers. The Rim Personal Use Woodcutting Area is located in the northeastern portion of the project area. Portions of two snowmobile trails (Newberry Trails #2 and #65) are within or adjacent to the project area. These trails are located primarily on existing roads and they connect with a larger trail system centered around Newberry National Volcanic Monument. Other forms of dispersed recreation that occur within the project area include off-highway vehicle (OHV) use and driving for pleasure. Off-highway vehicle use in the project area is relatively low compared to other areas of the District.

Unmanaged recreation has been identified as one of the Four Threats to the Health of the Nation's Forests and Grasslands (USDA Forest Service 2005a). Off-highway vehicle use has been specifically identified as one form of recreation with potential to cause undesirable impacts (USDA Forest Service 2005a). These impacts can include: soil erosion, user conflicts, spread of invasive species, damage to cultural sites, disturbance to wildlife, destruction of wildlife habitat, and risks to public safety (USDA Forest Service 2005b).

Management Direction

The Deschutes Forest Plan provides the following direction for managing recreation within the project area.

- Manage General Forest to provide the Recreation Opportunity Spectrum (ROS) category of Roaded-Natural or Roaded Modified (S&G M8-5). Generally manage Scenic Views to provide the ROS category of Roaded Natural (S&G M9-3).
- Hunter camps provide dispersed recreation opportunities and attempts will be made to retain the character of these sites during and after treatments (S&G M8-2).
- Within General Forest, which makes up the majority of the project area, OHV use is generally allowed (S&G M8-4). Closures and restrictions will be established where off road vehicle use will threaten or damage other resource values such as plantations, soils, and wildlife (S&G M8-4). Within the Old Growth Management Area, concentrated use by off-highway vehicles and snowmobiles will not be permitted but incidental use of OHV's and snowmobiles will generally be permitted (S&G M15-3). The Forest Plan does not address use of OHVs within the Scenic View Allocation.

Alternative 1

Direct, Indirect and Cumulative Effects

There would be no direct, indirect or cumulative effects on dispersed recreation use within the project area.

Off-highway vehicle use would continue within the project area. At the current levels of use, resource values such as plantations, soils, and wildlife would generally not be threatened or damaged. Greatest potential for OHVs to cause soil damage would be on buttes or areas with steeper slopes. Recreation user conflicts would be generally low due to the lack of developed recreation sites and the relatively low dispersed recreation use. There would continue to be potential for OHVs to spread invasive weeds, damage cultural sites, and disturb wildlife.

Alternatives 2 and 3

Direct, Indirect and Cumulative Effects

Treatment areas and the project area would continue to provide the recreation activity, setting, and experience category of Roaded Modified or Roaded Natural.

Proposed treatments would have no direct, indirect, or cumulative effects on dispersed recreation opportunities. The existing character of hunting camps would be maintained (Mitigation Measure 22). Since no removal of dead wood is proposed, fuelwood gathering opportunities would not be reduced. Snowmobile trails in the northeast portion of the project area are within or adjacent to proposed treatment areas (Table 23). These trails are located on roads that would serve as haul routes for timber harvest. Within Unit 5, a portion of the snowmobile trail extends beyond the end of a system road. Treatments within units can vary by alternative (Table 23). Harvest operations would not affect use of snowmobile trails (Mitigation Measures 23, 24, and 25). Girdling, a non-harvest treatment specific to Alternative 3, would not increase hazard of falling trees along snowmobile trails (Alternative 3 Mitigation Measure 1).

Table 23. Long Prairie treatment units bordering or intersecting snowmobile trails.

Alternative	Treatment Method	Unit Number
2	Harvest	5, 7, 10, 11, 12, 13, 14, 21, 48 and 63
3	Harvest Non-Harvest	7, 11, 13, 18, 48, and 63 3, 4, 5, 10, 12, 14, and 21

Proposed treatments would not affect overall OHV use in the project area, but could slightly increase OHV use in some treatment units. Increased potential for OHV use would be associated only with harvest treatments proposed in Alternatives 2 and 3. There would be no increased potential where Alternative 3 proposes to treat overstory trees by girdling, pruning, or felling.

Mechanical harvest would create linear gaps in existing understory vegetation, thereby increasing suitability for OHV travel. Increased suitability would be diminished by the closure of temporary roads and subsoiling following timber harvest. Residual understory would limit OHV use within treatments units to primarily those areas disturbed by harvest operations (skid trails, landings and temporary roads). OHV use in treatment units would not add to the effects described in the soil resource section or heritage resource section of this document. OHV use could spread invasive weeds and disturb wildlife.

With both alternatives, harvest treatments are proposed adjacent to areas with steeper slopes and allocated old growth areas. Currently, many of these areas have the potential to be accessed by OHVs from existing roads. There would be little to no increase in OHV use of these areas due to harvest activities. Closure of temporary roads and residual vegetation would limit OHVs from accessing steep slopes and old growth areas by driving through harvest units. These assumptions would be validated by monitoring steep slopes and old growth areas with the greatest potential to have increased OHV use due to harvest treatments (Monitoring Item 1).

Cultural Resources

Introduction

Cultural resources include historic and archaeological sites and resources used by humans in the past. Cultural resources are fragile and non-renewable resources that chronicle the history of people using the forested environment. They include:

- Historic properties; places that are eligible for inclusion in the National Register of Historic Places (NRHP) by virtue of their historic, archaeological, architectural, engineering, or cultural significance. Buildings, structures, sites, and non-portable objects (e.g., signs, heavy equipment) may be considered historic properties. Historic properties are subject to the NRHP's Section 106 review process;
- Traditional cultural properties (TCPs); localities that are considered significant in light of the role(s) they play in a community's historically rooted beliefs, customs, and practices may also be considered historic properties;
- American Indian sacred sites located on federal lands. These may or may not be historic properties; and
- Cultural uses of the natural environment (e.g., subsistence use of plants or animals) that must be considered under NEPA.

Management Direction

Management direction for cultural resources is found in the Deschutes National Forest Resources Management Plan, in the Forest Service Manual section 2360, in Federal Regulations 36CFR64 and 36CFR800 (amended May 1999), in the 1995 and 2003 Programmatic Agreements Among USDA Forest Service Region 6, Oregon State Historic Preservation Office and the Advisory Council on Historic Preservation Regarding Cultural Resource Management in the State of Oregon, and in various federal laws including the National Historic Preservation Act (NHPA) of 1966 (as amended), the National Environmental Policy Act, and the National Forest Management Act.

The Forest Plan requires consideration of the effects on cultural resources when considering projects that fall within the Forest's jurisdiction. Further direction indicates that the Forest will determine what cultural resources are present on the forest, evaluate each resource for eligibility to the National Register of Historic Places, and protect or mitigate effects to resources that are eligible (CR-2, CR-3, and CR-4).

Under the National Historic Preservation Act, as amended, and its implementing regulations found in 36 CFR 800, "effect" means alteration to the characteristics of an historic property qualifying it for inclusion in or eligibility for the National Register of Historic Places (36 CFR 800.16 (i)). Integrity of the property's location, design, setting, materials, workmanship, feeling, or association is considered when determining site eligibility. Examples of adverse effects on historic properties include but are not limited to physical destruction, damage, or alteration of all or part of the property.

Existing Condition

In accordance with Forest Plan Standards and Guidelines (CR-1), a professionally supervised cultural resource inventory program has been developed for the Forest and District level projects. In the early 1990s a Geographic Information Systems (GIS) database was developed to summarize and compile known and newly recorded cultural resource information identified through surveys. Surveys are conducted using standards meeting the inventory plan and research design agreed to by the Forest Service and the Oregon Historic Preservation Office (OSHPO). A GIS analysis for previous surveys and sites was completed for the Long Prairie Project area. An analysis for the entire project area for the total number of previous surveys and sites was made. The analysis shows 27,860 acres or 50 percent has been previously surveyed. A total of 45 cultural resource sites have been recorded, 17 small sites (2 acres or less), 25 larger sites (over 2 acres), and 3 linear features. Sixteen sites have been determined to be eligible for the National Register of Historic Places (NRHP); 12 sites have been determined ineligible; and the remaining 17 sites have not been evaluated and are potentially eligible for the NRHP. There are 5 small sites in proposed treatment units; three are unevaluated and are potentially eligible, and the remaining two are not eligible. There are 8 larger sites in units to be treated, with 5 sites being eligible and 3 sites unevaluated and potentially eligible. Unit boundaries have been configured to avoid the sites through project design. There is one line feature that runs through a unit, but it is not eligible and needs no further management or protection.

The Long Prairie Mistletoe Reduction Project area lies outside of lands ceded to the Confederated Tribes of Warm Springs according to the 1855 Treaty with the Tribes of Middle Oregon, it does however, fall with the aboriginal lands of the Klamath Tribes, and may have also received use by ancestors of the Burns Paiute Tribe.

Alternative 1

Direct and Indirect Effects

Under this alternative none of the proposed actions would be implemented and there would be no direct impacts to cultural resources. Fire risk would continue to increase as fuel loads accumulate over time and could have an effect on cultural properties by exceeding temperature thresholds that are known to damage sites or reveal new sites.

Cumulative Effects

There would be no cumulative effects associated with the No Action alternative.

Alternatives 2 and 3

Direct and Indirect Effects

The primary management option to mitigate potential adverse impacts to lithic scatter sites caused by ground disturbing is site avoidance. The three unevaluated small sites located in treatment units will be flagged for avoidance prior to project implementation.

Under these alternatives fuel treatments would reduce fire risk to cultural properties by eliminating much of the fuel loading that accumulates over time that could cause high temperatures that are known to damage sites.

Cumulative Effects

Present and reasonably foreseeable future actions that may have effects on sites include continued management of roads and plantations. These actions can be viewed as long term effects. In an archaeological sense, they are irreversible because the resource is finite and non-renewable. Whether they are irretrievable effects would depend on whether archaeologically significant information is still present, despite the impacts. Natural processes also contribute to cumulative effect, although they are not within our control. Erosion, weathering, and decomposition of perishable materials are examples of on-going, natural processes. Incrementally, these impacts affect site context and integrity.

Findings

Following guidelines in the 1995 Regional Programmatic Agreement (PA) among USDA Forest Service, the Advisory Council on Historic Preservation, and the Oregon State Historic Preservation Office, a finding of "Historic Properties Avoided" under Section 106 of the National Historic Preservation Act (NHPA) has been determined for this project. Consultation has occurred under the Programmatic Agreement with the State Historic Preservation Office (SHPO) and Tribes. All historic properties will be flagged and avoided.

Road Access

Management Direction

Roads analysis at the project scale is not automatically required, but may be undertaken at the discretion of the Responsible Official (FSM 7712.13c, 12/16/2003). An example of where a roads analysis may not be necessary is when temporary roads are needed for short-term access. The basis for concluding that a roads analysis is not needed for a project must be documented.

For management allocations within the project area, the Forest Plan identifies an open road density guideline of 2.5 miles per square mile as an average for entire implementation units (Forest Plan S&G TS-12). Densities are to be used as thresholds for evaluation and not to serve as the basis for assessing Forest Plan conformance (Forest Plan S&G TS-12). If a preferred project alternative exceeds road density guidelines, a

detailed analysis is required to determine the effects of open road density on wildlife habitat use (Forest Plan S&G TS-13).

Similar direction is found in Forest Plan S&G WL-53. This standard and guidelines states the following: "Target open road densities are 2.5 miles per square mile to achieve deer summer range habitat effectiveness targets unless impacts on deer can be avoided or the proposed project would result in a net benefit to deer habitat. The density will be applied as an average for an implementation unit and will be used as a threshold requiring further evaluation…The final judgment on open road density will be based on the further evaluation rather than the density guidelines."

Scope of Analysis

The Long Prairie Project Area includes portions of seven implementation units that total approximately 196,000 acres and range in size from approximately 12,000 to 43,000 acres. For this assessment, the Long Prairie project area, instead of the 7 entire implementation units, is used to evaluate open road density. At approximately 56,000 acres (87.29 square miles), the project area is considered large enough to assess, without bias, average open road density. Further division of the project area is considered unnecessary since open roads are relatively evenly distributed across the area.

Existing Condition

There are approximately 327.7 miles of open Forest Service roads within the project area. There is a Cooperative Travel Management Area (TMA) in the southwestern portion of the project area. Oregon Department of Fish and Wildlife identifies the TMA as the Spring Butte Closure. Motor vehicle use in the closure area is limited year round to specific roads. Within the portion of the TMA that overlaps the Long Prairie project area, approximately 30 miles of road are closed to public travel. The Spring Butte Closure reduces the length of open roads to 287.1 miles. This equates to a current open road density within the project area of 3.3 miles per square mile. This is approximately 0.8 miles per square mile over the deer summer range open road density guideline identified in the Forest Plan (2.5 mi/mi^2, Standard and Guideline TS-12).

Alternative 1

Direct, Indirect Effects and Cumulative Effects

Approximately 45.3 miles of road closures from prior decisions (Appendix 3 and Project Planning Record) will be implemented through time as funding allows. Implementation of all planned road closures would reduce open road density within the project area to 2.8 miles per square mile. Infrequently used roads would likely begin to become impassable due to establishing lodgepole pine seedlings and saplings.

Alternatives 2 and 3

Direct and Indirect Effects

For both alternatives, temporary roads would be needed to access areas proposed for timber harvest. Alternative 2 would require an estimated 39 miles of temporary roads,

impacting approximately 0.14 percent of the project area. Of the total mileage, approximately 4.9 miles would go through either connectivity corridors, habitat for black-backed woodpeckers, and/or Forest Plan Old Growth areas. Alternative 3 would require 33 miles of temporary roads, impacting approximately 0.11 percent of the project area. Of the total mileage, approximately 4.1 miles would go through corridors, woodpecker habitat and/or Old Growth areas.

Temporary roads would be located on pre-existing, unclassified road prisms. Re-use of these road prisms would necessitate removal of tree seedlings/saplings and shrubs that have established since the prior harvest. Temporary roads would be located on relatively flat ground (less than 10 percent slope). Earthwork, such as cuts, fills, or drainage structures, would not be required. Temporary roads would not cross any type of water course.

Use of temporary roads for harvest operations would be of short duration and limited scale. Timber sale contract provisions require the closure of temporary roads by the purchaser when harvest operations are complete. No more than 4 miles of temporary roads would be open at any given time (Mitigation Measure 26 and Monitoring Item 4). For the project area, this would equate to a density of no more than 0.1 miles per square mile. Following closure of temporary roads, road prisms would naturally regenerate to lodgepole pine, shrubs, and grasses. Within 10 to 15 years, vegetation would further render the road prisms impassable to vehicles.

Short-term increases in open road densities may displace individual wildlife, but impacts to populations are not expected. Additional effects associated with temporary roads are addressed in the wildlife, soil, and recreation sections of this document.

Cumulative Effects

Some roads needed to access units proposed for timber harvest with the Long Prairie project have been identified in past decisions for closure (Appendix 3 and Project Planning Record). Long Prairie harvest treatments may provide opportunities in terms of equipment and funding (Connected Action Item 5) to accomplish previously planned road closures. Past decisions related to road closures may be implemented more quickly with Alternatives 2 and 3, than would occur with the No Action alternative. As with the No Action alternative, implementation of all planned road closures would reduce open road density within the project area to 2.8 miles per square mile.

Consistency with Management Direction

Consistent with management direction, the decision to not undertake a roads analysis for this project and the basis for the decision are documented (Project Record, Letter to File, File Code 7710-2/1950-1, signed by Walter C. Schloer, Jr., dated September 29, 2004).

Existing open road density is approximately 32 percent higher than the Forest Plan threshold for further evaluation. Following implementation of prior decisions to close roads within the project area, road density would be approximately 12 percent higher than the threshold. Consistent with Forest Plan direction (S&G TS-13), an analysis was

completed to determine how future open road density would affect wildlife habitat use. This analysis (Project Record, Appendix C of Wildlife Specialist Report for Long Prairie Project Area prepared by Barbara Webb on June 30, 2005) is incorporated by reference. In this further evaluation, it was concluded that "the net effect of the project is compatible with the LRMP and will enhance conformance of the area with wildlife objectives."

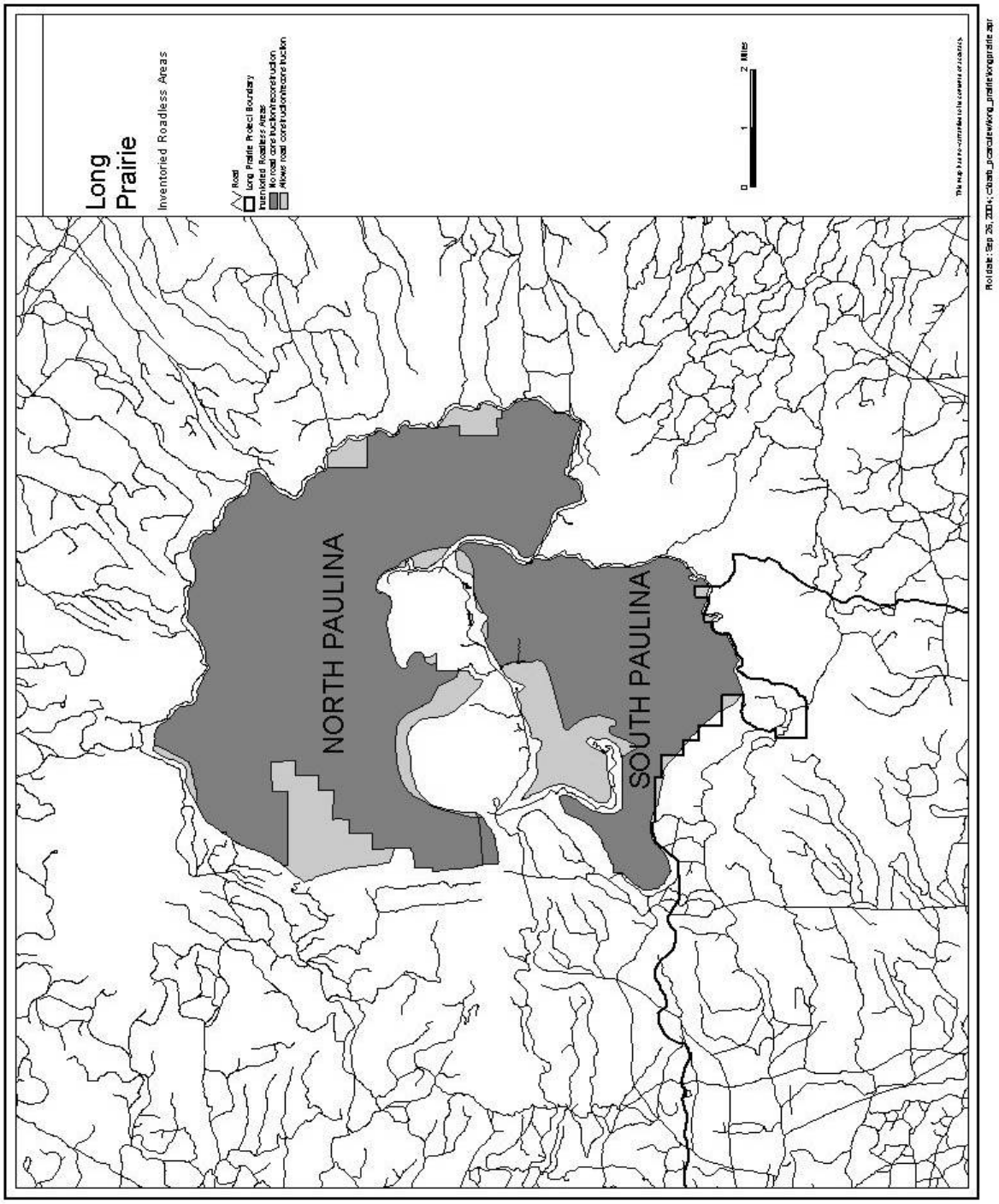
Inventoried Roadless Areas

Existing Condition

The FEIS for the Roadless Conservation Final Rule (Volume 2 – Maps) identifies two Inventoried Roadless Areas (IRA) northeast of the Long Prairie Project Area (Map 17). Both IRAs are within Newberry National Volcanic Monument. The FEIS for Newberry National Volcanic Monument Comprehensive Management Plan and Appendix C of the FEIS for the Deschutes National Forest Land and Resource Management Plan (LRMP) identify these roadless areas as the North and South Paulina Roadless Areas. The FEISs for the Monument Plan (Pages 196-199) and the Deschutes LRMP (Appendix C-7 and C-48 through C-61) include descriptions and maps of the roadless areas. The remainder of this section summarizes information from these documents. Information focuses on the South Paulina Roadless Area due to its adjacency to the Long Prairie Project Area. Unless otherwise referenced, information is summarized from the Monument FEIS.

The North and South Paulina Roadless Areas form two crescents surrounding Newberry Caldera. The North Paulina Roadless Area contains about 22,000 acres, and the South Paulina Roadless Area encompasses about 10,000 acres. Both areas were considered for formal wilderness designation during the Roadless Area Review and Evaluation (RARE II) process in the 1980s. They were not included for formal wilderness designation. Both areas were absorbed into Newberry National Monument and its legislation in 1990.

The North Paulina Roadless Area stretches from inside the caldera between the lakes north up to the rim of the caldera, and then down the northern flanks of Newberry Volcano. The South Paulina Roadless Area forms a crescent south of the caldera. The northern portion is adjacent to an area of developed recreational use. Developed sites include a number of popular day use areas in the caldera, such as The Big Obsidian Flow and Paulina Peak. Recreational use is moderate. The proximity to developed day use sites means more visitors will "spill over" into parts of the Roadless Area for recreation. Overall, the opportunity for primitive recreation is low (Appendix C, Deschutes LRMP). This is due primarily to the lack of diverse recreational opportunities compared to other existing wilderness and undeveloped areas. Overall, there is moderate opportunity for solitude (Appendix C, Deschutes LRMP). The Roadless Area is not large enough to adequately buffer outside influences, especially noise.



Map 17. Inventoried Roadless Areas Adjacent to Long Prairie Project Area.

Most of the wildlife in this Roadless Area is associated with the "late successional" (mature) lodgepole pine forests. Deer, elk, ground squirrels, American marten, black bear, and a variety of birds are the principal species of observed wildlife in this area. Unique geologic features include part of the Big Obsidian Flow and outstanding scenery. The view along Paulina Peak ridge is described in the Monument FEIS as "spectacular." On a clear day, the Cascades can be seen north into Washington and south into California. The Oregon High Desert can be viewed to the south and east. Included in this desert view is Fort Rock, site of one of the oldest archaeological finds in North America.

Approximately 1 percent of the South Paulina Inventoried Roadless Area is included within the boundary of the Long Prairie project area. There are six separate areas where this overlap occurs (Map 17). Five are large enough to be visible on the map. Areas of overlap range in size from 1 to 52 acres. These areas are all located outside of the boundary of Newberry National Volcanic Monument. The Roadless Area Conservation Map (2000) for the Deschutes National Forest, identifies these small portions of the IRA outside of the Monument as allowing road construction and reconstruction.

The effects discussion will focus on the following resources or features identified in the Final Rule for Roadless Area Conservation (36 CFR Part 294, January 12, 2001) as often being present in and characterizing inventoried roadless areas:

1) High quality or undisturbed soil, water , and air;
2) Sources of public drinking water;
3) Diversity of plant and animal communities;
4) Habitat for threatened, endangered, proposed, candidate, and sensitive species and for those species dependent on large, undisturbed areas of land;
5) Primitive, semi-primitive non-motorized and semi-primitive motorized classes of dispersed recreation;
6) Reference landscapes;
7) Natural appearing landscapes with high quality scenic quality;
8) Traditional cultural properties and sacred sites; and
9) Other locally identified unique characteristics.

Alternative 1

Direct and Indirect Effects

There would be no direct effects on the Inventoried Roadless Areas from the No Action alternative. No activities would take place that would have direct effect on the roadless character of the areas.

Cumulative Effects

Past timber harvest and woodcutting activities within the Long Prairie project area have created landscape textures and patterns that are evident from view points along Paulina Peak ridge. From these viewpoints, it is obvious to the casual observer that the area has been modified by human activity.

All ongoing and reasonably foreseeable future actions are located outside of the Paulina Inventoried Roadless Area. Actions occurring closest to the IRA include those in the: Rim woodcutting area, Miscellaneous Postsale project, Ponderosa Pine Release project, and future precommercial thinning projects. The northern boundary of the Rim woodcutting area is Road 2125. The southern IRA boundary is approximately 200 feet north of Road 2125. Future precommercial thinning treatments would be 200 feet or farther from the IRA boundary. Areas treated with the ponderosa pine release project would be 400 feet or farther from the IRA boundary. Areas treated with the Miscellaneous postsale project would be 2 miles or farther from the boundary.

These ongoing and future actions would have no effect on soil, water, air, diversity of plant and animal communities, landscapes, or cultural properties that are present in the Paulina IRA. Changes in vegetation outside of the IRA resulting from these actions would generally not be discernable from the view points along Paulina Peak ridge. These ongoing and future actions could have short-term impacts on the feeling of solitude that recreationists may experience within the South Paulina Roadless Area. Proposed treatments would be evidenced primarily by the sounds of chainsaw operations.

Alternatives 2 and 3

Direct and Indirect Effects

No treatments are proposed within Inventoried Roadless Areas.

Alternative 2 and 3 treatments would have no effect on roadless area characteristics in the North Paulina Roadless Area. Proposed treatments and the Roadless Area are geographically separated by Newberry Crater, which would block sites and sounds associated with proposed treatments.

Alternatives 2 and 3 treatments would have no effect on soil, water, diversity of plant and animal communities, landscapes, or cultural properties that are present in the Paulina IRA. Proposed treatments are 200 feet or farther from the southern boundary of the Paulina IRA. Treatments could have a short-term impact on the feeling of solitude that may be experienced by recreationists within the South Paulina Roadless Area. Proposed harvest treatments would be evidenced primarily by the sounds of harvest operations and the sight of smoke rising from landing piles being burned. There could be a short-term impact on air quality if smoke from pile burning drifts into the Roadless Area. Changes in vegetation resulting from proposed actions would generally not be discernable from vista points along Paulina Peak ridge. Connectivity would be retained between late or old structural stage forests within the Inventoried Roadless Area and the Long Prairie Project Area.

Cumulative Effects

Cumulative effects would be similar to those described under Alternative 1.

Unroaded Areas

Unroaded areas are defined in the FEIS for the Roadless Area Conservation Final Rule as "any area, without the presence of a classified road, of a size and configuration sufficient to protect the inherent characteristics associated with its roadless condition. Unroaded areas do not overlap with the inventoried roadless area." (USDA Forest Service 2000). Unroaded areas have typically not been inventoried and are, therefore, separate from inventoried roadless areas. This document uses the term "unroaded area" to differentiate these areas from inventoried roadless areas. There are no Forest-wide or Management Area standards specific to unroaded areas in the Deschutes Forest Plan.

The Oregon Natural Resources Council (ONRC) submitted a map that displays two unroaded areas within the Long Prairie Project Area. ONRC identified one of the areas as being lava. The other unroaded area was identified as the Topso Butte unroaded area. According to ONRC, the Topso unroaded area is 1,989 acres and has significant ecological value. ONRC also stated activities that enter this area threaten to degrade the special character of this unroaded area. ONRC indicated the Forest Service should acknowledge this unroaded area and disclose the impacts of proposed treatments.

Using the ONRC Roadless Map as a starting point, three unroaded areas were delineated in the Long Prairie Project Area (See Map 18). Boundaries were changed from those on the ONRC map to better correspond with existing roads. Unroaded Area 1 (3,289 acres) includes the area ONRC identifies as the Topso roadless area. Areas 2 (1,142 acres) and 3 (802 acres) include the area identified by ONRC as a lava flow.

Existing Condition

The Deschutes LRMP allocates these unroaded areas to General Forest (GFO), Old Growth (OGR), and Scenic Views Partial Retention Middleground (SV4) (Map 19). Plant association groups (PAG) in unroaded areas include lodgepole pine dry, ponderosa pine dry and mixed conifer dry (Table 24). Lodgepole pine is the dominant PAG. The majority of the ponderosa pine dry PAG, is within allocated old growth areas. Approximately half of the mixed conifer PAG is within allocated old growth. Extensive timber management activities have occurred within the general forest and scenic view allocations in area 1 and 2 (Map 18). The eastern portion of Area 1 includes Topso Butte, portions of Box and Kweo Buttes, and one unnamed butte. Area 2 includes one unnamed butte. In Areas 1 and 2, allocated Old Growth areas are located around the buttes. Surveyors Lava Flow makes up Area 3.

Table 24. Proportion of plant association groups and past harvest activities within unroaded areas.

Unroaded Area	Plant Association Groups				Past Harvest	
	Lodgepole pine dry	Ponderosa pine dry	Mixed Conifer dry	Lava/Pumice/ Cinder	Acres	% of Area
1 (3,289 acres)	78%	4%	18%	<1%	1,426	43%
2 (1,142 acres)	75%	17%	8%	<1%	535	47%
3 (802 acres)	6%	7%	----	87%	4	<1%

The Deschutes LRMP identifies the General Forest management area will be managed to provide the recreation activity, setting, and experience of the Recreation Opportunity Spectrum (ROS) category of Roaded-Natural[1] or Roaded Modified[2] (Standard and Guideline M8-5). The ROS standard in the Scenic Views management area will normally be Roaded Natural, but may also include Primitive, Semi-primitive Non-motorized, Semi-primitive Motorized and Semi-primitive Motorized Winter Only standards.

Resources or features often present in roadless areas were previously listed in the Inventoried Roadless Area Section. Many of these resources or features are currently not present within these unroaded areas.

There are no water resources within the unroaded areas. Consequently, the unroaded areas do not provide a source of public drinking water. There is no habitat for threatened, endangered, proposed, candidate, or sensitive species. These areas provide the recreation activity, setting, and experience (ROS) of roaded modified or roaded natural. These areas have been heavily modified by human activity. Harvest activities have occurred on 40 to 50 percent of unroaded areas 1 and 2 (Table 24). Access to the perimeter of the areas is generally easy for highway vehicles. There are no known traditional cultural properties or sacred sites in the unroaded areas. No unique characteristics have been identified within the unroaded areas.

Alternative 1

Direct and Indirect Effects

There would be no direct effects on the existing characteristics of the unroaded areas. No activities would take place that would have direct effects on the roadless character of the areas.

Cumulative Effects

The Rim Personal Use Woodcutting Area overlaps with Unroaded Area 1. Woodcutting has the potential to disturb soil in areas not previously harvested. These areas generally have the greatest amount of dead wood fiber. Slight increases in detrimental soil conditions will occur from woodcutters driving off of classified roads to access dead wood fiber. Woodcutting will have no effect on the diversity of plant and animal communities within the unroaded area. Woodcutting is limited to the removal of standing dead and down dead lodgepole pine. Removal of down dead could reduce foraging habitat for the American marten. The majority of woodcutting activity is

[1]**Roaded Natural.** Area is characterized by predominately natural appearing environment with moderate evidence of the sights and sounds of humans. Such evidence usually harmonizes with the natural environment. Interaction among users may be low to moderate, but with evidence of other users prevalent. Resource modification and utilization practices are evident, but harmonize with the natural environment. Conventional motorized use is provided for in construction standards and design of facilities. Large mammals tolerant of humans may be present; those not tolerant present infrequently. There is a prevalence of smaller wildlife species (Deschutes LRMP, Appendix 2).

[2]**Roaded Modified.** This area is characterized by a setting that is heavily modified by human activity. Access is generally easy for highway vehicles. The setting is generally the result of intensive commodity production. There is no size criteria. Concentration of users is low, but there is considerable evidence of others. Users have a moderate degree of isolation from the sights and sounds of other people (Deschutes LRMP, Appendix 2).

occurring adjacent to system roads. Down wood away from system roads within the interior of the unroaded areas is generally inaccessible to woodcutters. No woodcutting is allowed within old growth areas. While marten foraging habitat could be reduced, large, somewhat dense stands of lodgepole pine and mixed conifer will remain. Woodcutter slash and tree stumps provide additional evidence of human activity.

The Miscellaneous Postsale project includes 3 treatment areas that extend approximately 300 to 600 feet into the eastern portion of Unroaded Area 1. The project also has one treatment area that extends approximately 1,000 feet into the southern portion of Unroaded Area 2. The Ponderosa Pine Release Project has one treatment area that extends approximately 600 feet into the western portion of Unroaded Area 2. Treatments associated with these projects will have no effects on undisturbed soils within the unroaded areas. With both projects, treatments will occur in areas previously harvested. Treatments will not affect the existing diversity of plant and animal communities within the unroaded areas. Past treatments have opened up the forest canopy. The felling of small diameter trees that will occur with these projects will not change the existing diversity of plants within the treatment areas. Treatments are located along the edges of the unroaded areas. Treatments will not reduce the amount of interior, undisturbed areas.

Alternatives 2 and 3

Direct and Indirect Effects

There would be no direct or indirect effects from the action alternatives to Unroaded Area 3 (Surveyors Lava Flow). No activities from the action alternatives would take place in that area.

Table 25 and Map 20 display treatments that would overlap Unroaded Areas 2 and 3. All units overlap areas that have been previously harvested. Temporary roads used in the past to access these areas were closed following harvest activities. With the exception of Unit 30, proposed treatment units are within General Forest (GFO). Unit 30 is within Scenic Views Partial Retention Middleground (SV4). With Alternative 2, approximately 6.6 miles of temporary roads would be needed to provide access for proposed harvest (HFR). With Alternative 3, which proposes less harvest in the unroaded areas, approximately 4.5 miles of temporary roads would be needed. Maps 20 and 21 display temporary roads that would be needed in the unroaded areas. Temporary roads would be primarily within proposed treatment units. They would be located on pre-existing, unclassified road prisms. Temporary roads would be closed following treatments. In units 48, 65, and 83, logging facilities, including temporary roads, would be subsoiled to rehabilitate detrimentally compacted soils. There would be no permanent road construction in the unroaded areas.

Alternative 2 and 3 treatments would not affect areas with undisturbed soils. Treatments would occur in areas with past harvest activities. Detrimental soil conditions presently exist (Appendix 2). The proposed overstory treatments would not affect the existing diversity of plant and animal communities within the unroaded areas. Past treatments have opened up the forest canopy. Overstory treatments would not change the existing diversity of plants within these previously treated areas. Treatments would not reduce the

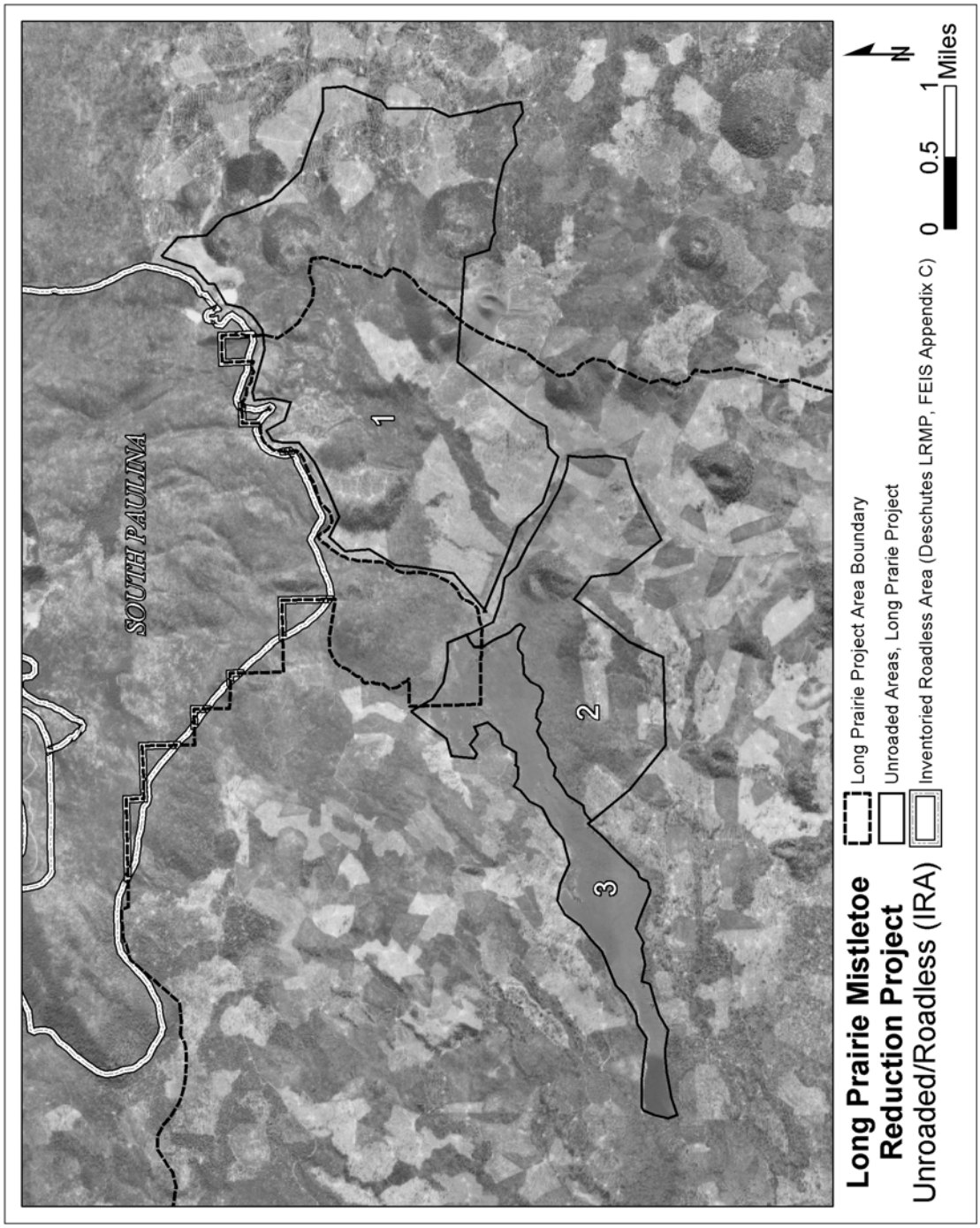
amount of large, undisturbed areas with denser forest canopy in the interior of the unroaded areas. Proposed treatments would not change the class of dispersed recreation present within the unroaded areas (Roaded Natural and Roaded Modified). Harvest treatments would be evidenced by the sites and sounds of harvest operations, skid trails, landings, temporary roads, stumps, and damaged understory trees. Proposed fall/prune/girdle treatments would be evidenced in the short term by the sites and sounds of chainsaw operation, felled trees retained on site, and girdle bands on tree boles. Alternative 3, with less mechanical harvest proposed in the unroaded areas, would have the least impact of the two action alternatives.

Table 25. Proposed treatments within unroaded areas.

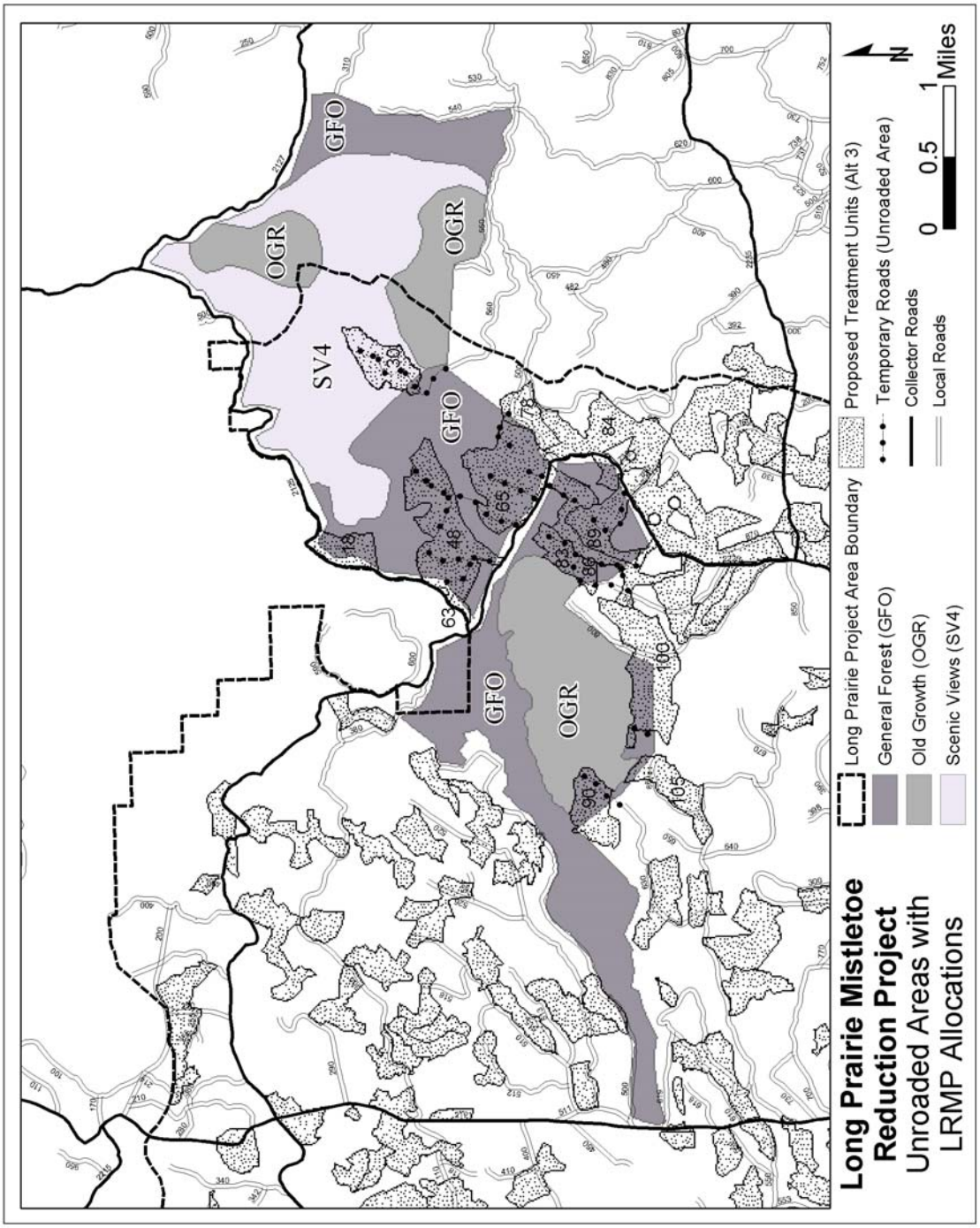
Unroaded Area/ Treatment Unit Number	Management Allocation	Acres	Alternative 2 Proposed Treatment	Alternative 3 Proposed Treatment	Temporary Road (Length and Area)
Area 1					
Unit 18	GFO	58	None	Seedtree Removal (HFR)	None
Unit 30	SV4	84	Seedtree Removal (HFR)	Fall/Prune/Girdle	0.99 miles 1.4 acres
Unit 48	GFO	217	Seedtree Removal (HFR)	Seedtree Removal (HFR)	2.07 miles 3.0 acres
Unit 65	GFO	190	Seedtree Removal (HFR)	Seedtree Removal (HFR)	0.92 miles 1.3 acres
Area 2					
Unit 83	GFO	56	Seedtree Removal (HFR)	Seedtree Removal (HFR)	0.76 miles 1.1 acres
Unit 86	GFO	77 (Alt 2) 106 (Alt 3)	Seedtree Removal (HFR)	Seedtree Removal (HFR)	0.79 miles 1.1 acres
Unit 89	GFO	96	Seedtree Removal (HFR)	Fall/Prune/Girdle	0.58 miles 0.8 acres
Unit 90	GFO	80	Seedtree Removal (HFR)	Fall/Prune/Girdle	0.37 miles 0.54 acres
Unit 100	GFO	182	Seedtree Removal (HFR)	Fall/Prune/Girdle	0.15 miles 0.22 acres

Cumulative Effects

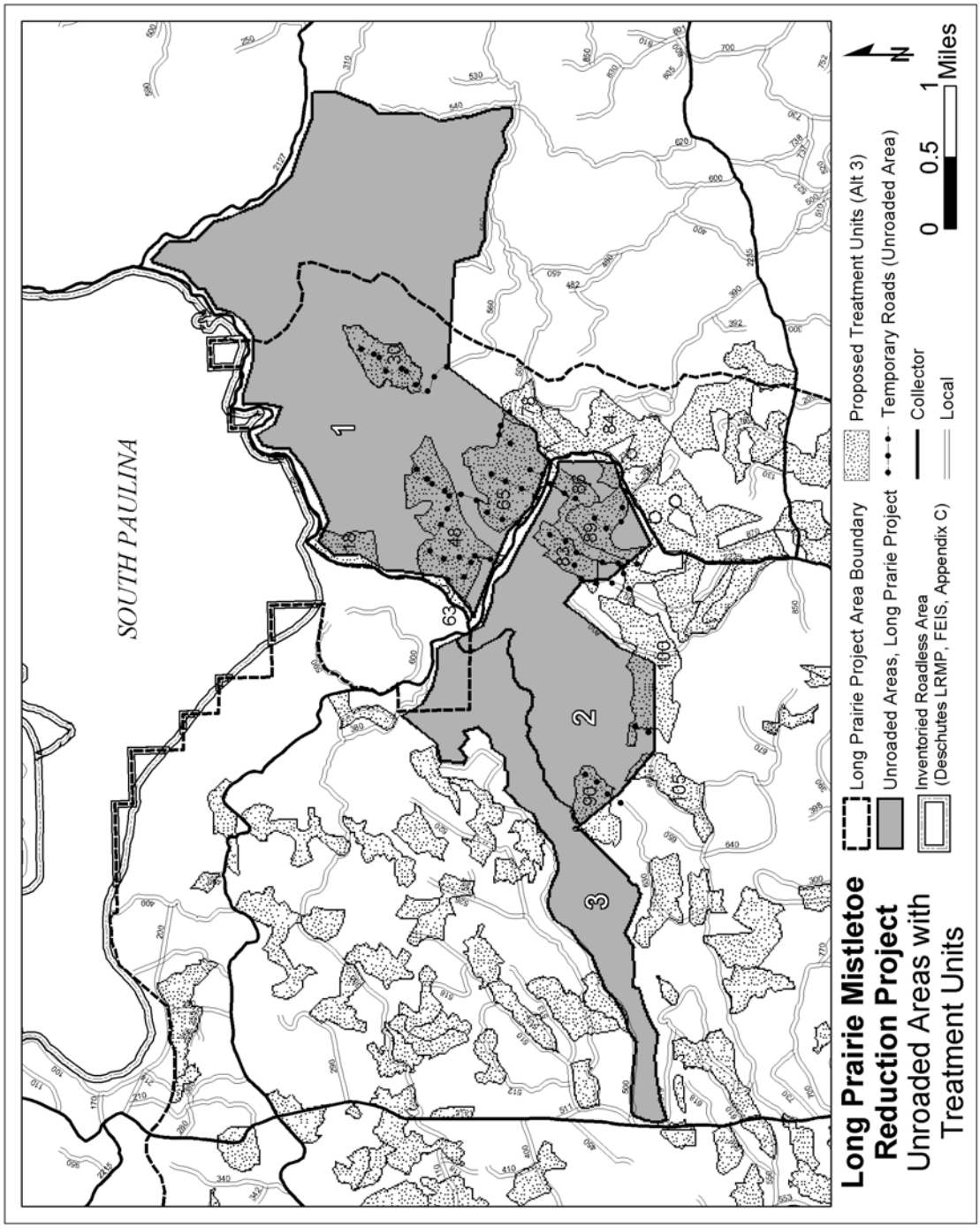
Treatment areas included in the Miscellaneous Postsale project and the Ponderosa Pine Release project do not overlap with areas proposed for treatment in the Long Prairie Project. Treatment areas in these three projects would be aggregated together in areas that have been previously harvested. Collectively, these treatments will not reduce existing undisturbed areas located in the interior of the unroaded areas. Effects of the Rim Personal Use Woodcutting Area would be as described for Alternative 1.



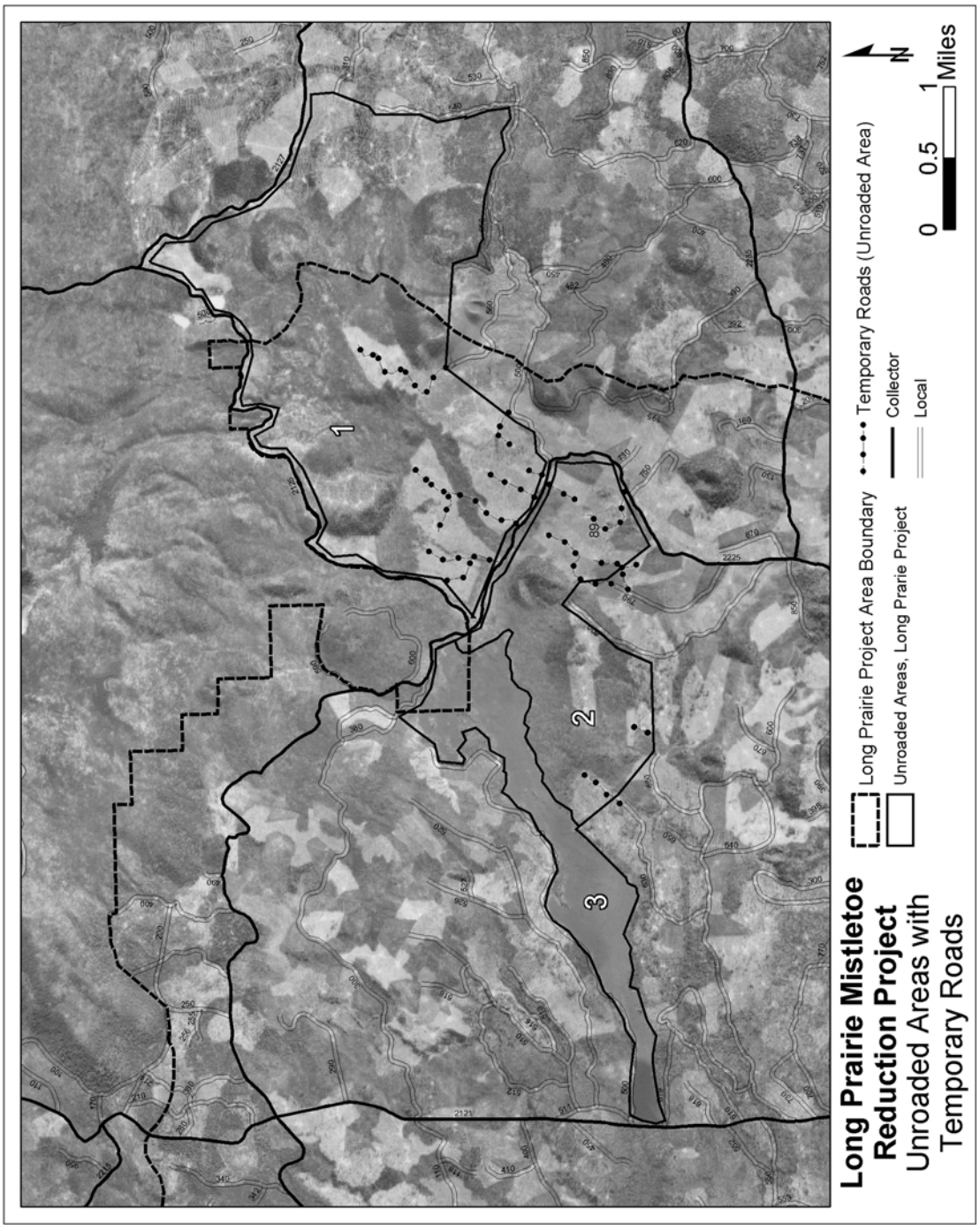
Map 18. Unroaded Areas in the Long Prairie Mistletoe Reduction Project Area.



Map 19. Deschutes LRMP Management Areas in Unroaded Areas in the Long Prairie Mistletoe Reduction Project Area.



Map 20. Proposed Treatment Units in Unroaded Areas in the Long Prairie Mistletoe Reduction Project Area.



Map 21. Proposed Temporary Roads in Unroaded Areas in the Long Prairie Mistletoe Reduction Project Area.

Grazing

Existing Condition

The Long Prairie project area overlaps portions of four grazing allotments (Table 26). The Big Hole, Crater Buttes, Sand Flat, and Spring Butte Allotments are vacant sheep and goat allotments. Allotments classified as vacant require that appropriate and current analysis (NEPA) be completed before their status is changed.

Table 26. Grazing allotments and their status.

Allotment	Total Allotment Acres	Permitted Livestock Type	Last Year Actively Grazed/Status
Big Hole	33,310	Sheep	1990/Vacant
Crater Buttes	26,416	Sheep	1975/Vacant
Sand Flat	29,325	Sheep	1990/Vacant
Spring Butte	28,805	Sheep	1990/Vacant

Alternatives 1, 2, and 3

Direct and Indirect Effects

Given the vacant status of the allotments, there would be no direct or indirect effects.

Cumulative Effects

The Crater Buttes Allotment is currently under analysis with the Cluster II Range EA. With all alternatives under consideration, including the No Action alternative, there would be no grazing of animals in this allotment. The other three allotments in the project area will be analyzed in the future either by 2011 under the 1995 Recessions Bill direction, or during the upcoming Forest Plan revision.

Given the vacant status of the allotments, and no foreseeable plans for future grazing, there would be no cumulative effects.

Fire/Fuels and Air Quality

The Fire, Fuels and Air Quality Report for the Long Prairie Mistletoe Reduction Project (Project Record, written by Steven Burns and Dated March 24, 2005) is incorporated by reference and summarized below in the following sections. Table 27 summarizes the acres of fuels treatments proposed in each alternative.

Fire/Fuels

Existing Condition

Within the areas being analyzed for treatment, past management activities have removed most of the down dead woody material. In the event of a fire start, fire behavior in these areas would generally be expected to be low.

Alternative 1

Direct, Indirect and Cumulative Effects

Under the No Action alternative, no fuels management activities would occur.

Alternative 2

Direct and Indirect Effects

Fuel treatment would consist of whole tree yarding material to a landing and burning the landing piles (8,180 acres). Understory trees damaged but not killed during mechanical harvest would generally not add to the dead and down woody fuel loading. Removal of overstory trees would reduce the risk of long range spotting in the event of a wildfire.

Alternative 3

Direct and Indirect Effects

Fuel treatment in areas proposed for commercial harvest would consist of whole tree yarding material to a landing and burning the landing piles (7,865 acres). Understory trees damaged but not killed during mechanical harvest would generally not add to the dead and down woody fuel loading. Removal of overstory trees would reduce the risk of long range spotting.

In areas proposed for felling/girdling/pruning, trees felled within 200 feet of a two or four digit road would be treated to reduce fuel loadings. Treatment consists of severing branches from those trees that are felled, hand piling a portion of the slash, and burning the hand piles (3,590 acres).

Table 27. Fuel treatment acres.

Fuels Treatment	Alternative 1	Alternative 2	Alternative 3
Landing Piles	0 acres	8,180 acres	7,865 acres
Hand Piles	0 acres	0 acres	3,590 acres
Total	0 acres	8,180 acres	11,455 acres

Alternatives 2 and 3

Cumulative Effects

Trees damaged during the removal of overstory trees would likely be priority for felling with future **precommercial thinning treatments** (Appendix 3). Slash created by future precommercial thinning would be treated as needed to maintain fuel loadings within Forest Plan standards. Considering 1) the current low level of dead, down woody within treatment areas and 2) the slash treatments associated with present overstory treatments and future precommercial thinning treatments, fuel loadings would remain within the standards set forth in the Forest Plan (Standard and Guideline M8-27).

Consistency with Management Direction

Slash treatments associated with Alternatives 2 and 3 would maintain fuel loadings within the standards set forth in the Forest Plan (Standard and Guideline M8-27).

Air Quality

Alternative 1

Direct and Indirect Effects

During a high intensity wildfire, smoke emission particulate matter of 10 microns and less in size (PM 10) could range from 500 lbs. per acre to 2,000 lbs. or more per acre. Where down fuels have accumulated and/or stands are dense the PM 10 production could exceed these estimates. Under this alternative, PM 10 emission levels would not be produced from burning of activity-generated fuels. The No Action Alternative does not provide any opportunities to reduce existing forest fuels and the hazard they pose in wildland fires. During the flaming phase of a catastrophic wildfire, air quality degradation could exceed Federal and State standards as far as 50 miles down wind. Forest fuels would continue to increase with biomass production out-producing the decomposition rates in this climate. Smoke from wildfires would likely impact the city of La Pine.

Alternatives 2 and 3

Direct and Indirect Effects

Pile burning would be conducted in compliance with National Ambient Air Quality Standards and Oregon Department of Forestry Smoke Management regulations and restrictions. Burning would occur during favorable existing and forecasted weather conditions to assure smoke dispersion away from the city of La Pine. Table 28 summarizes the estimated smoke emissions from pile burning in the project area.

Table 28. Estimated smoke emissions from pile burning activities.

		Alternative 1	Alternative 2	Alternative 3
Landing Piles	Tons burned	0	20	17
	Tons/Acre PM10	0.000	0.002	0.002
Hand Piles	Tons burned	0	0	4
	Tons/Acre PM10	0.000	0.000	0.001

Alternatives 2 and 3

Cumulative Effects

Underburning proposed with the **Howlett Fuels CE** (Appendix 3) would be conducted in compliance with the National Ambient Air Quality Standards and Oregon Department of Forestry Smoke Management regulations and restrictions. Fuel moisture conditions desirable for the burning of landing and/or handpiles would generally be different that those conditions desirable for broadcast underburns. It is unlikely pile burning associated with the Long Prairie Project would occur at the same time as underburning associated with the Howlett Fuels CE. The Oregon Department of Forestry Smoke Management regulations and restrictions help assure that smoke emissions resulting from planned ignitions on any given day within the La Pine basin do not exceed National Ambient Air Quality Standards.

Economic and Social

The following summarizes the economic analysis completed for the Long Prairie Mistletoe Reduction project and can be found in the project file.

Introduction

Forest Service Handbooks 1909.17 and 2409.18 direct the evaluation of Economic Efficiency for proposed projects. To assess economic efficiency of Alternatives 2 and 3, the anticipated timber volumes and costs were entered into TEA.ECON, a spreadsheet developed by the Forest Service to assess economic efficiency. The analysis can be used to compare alternatives, not to give an absolute number for the outputs. Numbers useful for comparing alternatives include a benefit/cost ratio, discounted benefits, discounted costs, and present net value. Effects on the local economy include estimated number of jobs created or maintained.

This analysis does not place a value on indirect benefits which may occur (such as increased future yields resulting from reduced mistletoe levels). Other amenity values, such as dispersed recreation or wildlife habitat, also were not included in the analysis. Table 29 summarizes this analysis.

Alternative 1

Direct and Indirect Effects

With this alternative, no commercial forest products would be provided to the economy. There would be no net sale value, and no additional jobs would be created or maintained. There would be no benefits to the local economy.

Although Alternative 1 would generate no current revenues to returns, there is a cost resulting from the expenditure of planning monies. The present net value would be a negative $70,000. Since there are no revenues predicted it is not possible to calculate a benefit/cost ratio.

Alternatives 2 and 3

Direct and Indirect Effects

Factors contributing to differences in the benefit/cost ratio and the present net value for Alternatives 2 and 3 are: 1) the amount of fiber/saw timber proposed for removal, 2) sale preparation costs, 3) cost of soil restoration and associated noxious weed monitoring, and 4) the cost of girdle/prune/fell treatment. Alternative 2 would provide approximately 10 percent more commercial forest products than Alternative 3. Alternative 3 sale preparation costs are approximately 10 percent higher ($8,000) than Alternative 2. The higher sale preparation costs in Alternative 3 reflect costs associated with identifying trees without mistletoe for retention. The cost associated with the felling/girdling/pruning treatment is the primary factor contributing to Alternative 3 having a lower benefit/cost ratio and present net value than Alternative 2.

Table 29. Summary of economic efficiency analysis.

Economic Measure	Alternative 1 (No Action)	Alternative 2	Alternative 3
Benefits			
Acres of Commercial Harvest	0	8,180 acres	7,335 acres
Volume (Total) Million Board Feet (MMBF) Hundred Cubic Feet (CCF)	 0 0	 5.9 MMBF 11,400 CCF	 5.3 MMBF 10,222 CCF
Discounted Benefits[1]	0	$285,001	$255,347
Costs			
Environmental Analysis	$70,000	$70,000	$70,000
Sale Preparation	----	$8.00/ccf	$8.75/ccf
Subsoiling	----	$45,550	$49,800
Noxious Weed Monitoring	----	$2,500	$2,500
Girdle/Prune/Fell	----	----	$215,400
Discounted Costs[1]	$70,000	$247,843	$253,215
Summary			
Returns to Federal Government (Total Timber Value)		$326,937	$292,919
Benefit/Cost Ratio[1]	----	1.15	1.01
Present Net Value[1]	-$70,000	$37,158	$2,131
Jobs maintained or created[2]	0	57	51
Estimated Employee Income[3]	0	$1,813,227	$1,622,361

[1] Assumes 4% discount rate.

[2] Calculated using figures for the Deschutes National Forest from Appendix B-5 of the FY 1997 Timber Sale Program Annual Report. Excluding firewood from the volume harvested on the Deschutes National Forest, an estimated 9.6 jobs per million board feet were maintained or created.

[3] Derived by multiplying (a) the number of jobs maintained or created by (b) $31,811, the average 1999 salary in Central Oregon for lumber and wood products jobs. Source of salary information: Oregon Covered Employment & Payrolls by County and Industry, Oregon Employment Department, and US Bureau of Labor Statistics.

Cumulative Effects

Over the last 10 years, an annual average of approximately 68.2 MMBF of timber has been sold from the Deschutes National Forest. In the near future, the amount of timber offered for sale is expected to be near this annual average. The Deschutes National Forest is expected to continue offering timber for sale and is expected to continue making contributions to the local economy as a result of timber harvest activities. Timber proposed for harvest with Alternatives 2 and 3 would be approximately 8 to 9 percent of the Forest's annual average timber sale program.

Native Americans, Minority Groups, Women, and Civil Rights

There are no known direct, indirect, or cumulative effects on Native Americans, minority groups, women, or civil rights beyond effects disclosed in the Deschutes LRMP.

Environmental Justice

Executive Order 12898 on environmental justice requires federal agencies to identify and address any disproportionately high and adverse human health or environmental effects on minority and low-income populations. For all alternatives, there would be no disproportionately high or adverse effects to minority or disadvantaged groups qualifying under the environmental justice order identified.

Other Effects and Findings

No old growth stands, Wild and Scenic Rivers or parkland would be adversely affected by the proposed activities. No significant irreversible or irretrievable commitment of resources would occur under Alternative 2 (Proposed Action) or Alternative 3. There would be some negligible irretrievable losses of dust caused by mechanical operations.

The alternatives are consistent with the goals, objectives and direction contained in the Deschutes National Forest Land and Resource Management Plan and accompanying Final Environmental Impact Statement and Record of Decision dated August 27, 1990 as amended by the Regional Forester's Forest Plan Amendment #2 (6/95) and Inland Native Fish Strategy, and as provided by the provisions of 36 CFR 219.35 (f) (2005), which address Management Indicator Species.

None of the alternatives establishes a precedent for future actions, nor a decision in principle about a future consideration.

No significant adverse effects to public health or safety have been identified. Harvest activities would not expose the public to an elevated risk of injury. Limiting snag creation within 100 feet of roads would minimize public risk of injury from falling snags.

The effects of implementation of the alternatives are well known, not highly controversial, and do not involve any unique or unknown risks. Effects meet or exceed state water and air quality standards.

Implementation of Alternative 1 (No Action), Alternative 2 (Proposed Action), or Alternative 3 would be consistent with relevant federal, state and local laws, regulations, and requirements designed for the protection of the environment including the Clean Air and Clean Water Act. None of the alternatives establish a precedent for future actions or a decision in principle about a future consideration.

Consultation and Coordination

ID TEAM MEMBERS:

Barbara Schroeder	IDT Leader; Silviculturist; Writer/Editor
Rod Jorgensen	Soil Scientist
Pat Joslin	Botanist
Doug Middlebrook	Wildlife Biologist
Jim Lowrie	Wildlife Biologist
Barbara Webb	Wildlife Biologist
Ronnie Yimsut	Landscape Architect
Steve Burns	Fuels Specialist
Lucy Hamilton	Archaeologist

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During development of this environmental assessment, the Forest Service consulted the following individuals; federal, state, and local agencies; tribes; and non-Forest Service persons. Consultation was in the format of the scoping letter, which described the project area and proposed action, and the letter requesting public comment on the proposed action and an alternative to the proposed action. Consultation also occurred during an on-site review of the project with federal and state fish and wildlife representatives.

FEDERAL, STATE, AND LOCAL AGENCIES:

Oregon Department of Fish and Wildlife
US Fish and Wildlife Service

TRIBES:

Burns Paiute Tribe
Confederated Tribes of Warm Springs, and
The Klamath Tribe

OTHERS:

American Forest Resource Council
Bend Clean Air Committee
Bruce Berryhill
Blue Mountains Biodiversity Project
Blue Ribbon Coalition
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Appendix 1 – Alternative 2 and 3 Treatment List

Treatment Abbreviations

Harvest (HRVST)

HFR	Final Removal Cut. Removal of overstory trees within a stand with an immature understory that was the result of a prescribed regeneration cut.
None	No commercial harvest.

Treatment (TRTMNT)

Girdle/Prune/Fell	Girdle, prune, or fall and retain mistletoe infected lodgepole or ponderosa pine overstory trees greater than or equal to 4 inches dbh.
LP_All	Remove all live lodgepole pine overstory trees greater than or equal to 4 inches dbh and less than 21 inches dbh.
LP_DMT	Remove live lodgepole pine overstory trees greater than or equal to 4 inches dbh and less than 21 inches dbh infected with dwarf mistletoe.
LP_Excess	Remove live lodgepole pine overstory trees greater than or equal to 4 inches dbh and less than 21 inches dbh excess to green tree replacement strategy.
LP_PP_DMT	Remove live lodgepole and ponderosa pine overstory trees greater than or equal to 4 inches dbh and less than 21 inches dbh infected with dwarf mistletoe.
LP_PP_Excess	Remove live lodgepole and ponderosa pine overstory trees greater than or equal to 4 inches dbh and less than 21 inches dbh excess to green tree replacement strategy.
PP_DMT	Remove live ponderosa pine overstory trees greater than or equal to 4 inches dbh and less than 21 inches dbh infected with dwarf mistletoe.
PP_Excess	Remove live ponderosa pine overstory trees greater than or equal to 4 inches dbh and less than 21 inches dbh excess to green tree replacement strategy.

Green Tree Replacement Strategy (GTR)

3 TPA	Retain 3 trees per acre greater than or equal to 8 inches dbh or the largest tree available.
Clump inside	Within proposed treatment unit, retain clumps of overstory trees that have no dwarf mistletoe infection.
Clump outside	Outside proposed treatment unit, designate areas for retention to provide green tree replacements.
LP GTR	Retain lodgepole pine overstory trees, with or without dwarf mistletoe, to serve as green tree replacements.
PP/WF GTR	Retain ponderosa pine or white fir overstory trees, with or without dwarf mistletoe, to serve as green tree replacements.
Tree w/o dmt	Retain overstory trees that have no dwarf mistletoe to provide tree replacements.

	Alternative 2 (Proposed Action)				Alternative 3			
Unit	**HRVST**	**TRTMNT**	**GTR**	**Acres**	**HRVST**	**TRTMNT**	**GTR**	**Acres**
1					None	Girdle/Prune/Fell	Trees w/o dmt	59
2					None	Girdle/Prune/Fell	Trees w/o dmt	45
3					None	Girdle/Prune/Fell	Trees w/o dmt	85
4					None	Girdle/Prune/Fell	Trees w/o dmt	14
5	HFR	LP_Excess	3 TPA	10	None	Girdle/Prune/Fell	Trees w/o dmt	10
6	HFR	LP_Excess	3 TPA	5	HFR	LP_DMT	Trees w/o dmt	5
7	HFR	LP_Excess	3 TPA	33	HFR	LP_All	PP/WF GTR	33
8					None	Girdle/Prune/Fell	Trees w/o dmt	19
9					None	Girdle/Prune/Fell	Trees w/o dmt	13
10	HFR	LP_PP_Excess	3 TPA	46	None	Girdle/Prune/Fell	Trees w/o dmt	46
11	HFR	LP_Excess	3 TPA	11	HFR	LP_All	PP/WF GTR	11
12	HFR	LP_Excess	3 TPA	90	None	Girdle/Prune/Fell	Trees w/o dmt	90
13	HFR	LP_Excess	3 TPA	72	HFR	LP_Excess	3 TPA	72
14	HFR	LP_Excess	3 TPA	48	None	Girdle/Prune/Fell	Trees w/o dmt	48
15	HFR	LP_Excess	3 TPA	19	HFR	LP_DMT	Trees w/o dmt	19
16					HFR	LP_PP_Excess	3 TPA	25
17	HFR	LP_Excess	3 TPA	32	None	Girdle/Prune/Fell	Trees w/o dmt	32
18					HFR	LP_DMT	Trees w/o dmt	58
19					HFR	LP_All	Clump inside[3]	53
20	HFR	LP_Excess	3 TPA	32	HFR	LP_Excess	3 TPA	32
21	HFR	LP_Excess	3 TPA	35	None	Girdle/Prune/Fell	Trees w/o dmt	35
22					None	Girdle/Prune/Fell	Trees w/o dmt	27
23					None	Girdle/Prune/Fell	Trees w/o dmt	18
24					HFR	LP_PP_Excess	3 TPA	18
25	HFR	LP_Excess	3 TPA	49	HFR	LP_DMT	Trees w/o dmt	49
26	HFR	LP_Excess	3 TPA	48	None	Girdle/Prune/Fell	Trees w/o dmt	48
27					None	Girdle/Prune/Fell	Trees w/o dmt	51
28					None	Girdle/Prune/Fell	Trees w/o dmt	97
29					None	Girdle/Prune/Fell	Trees w/o dmt	4
30	HFR	LP_Excess	3 TPA	84	None	Girdle/Prune/Fell	Trees w/o dmt	84
31	HFR	LP_Excess	3 TPA	21	None	Girdle/Prune/Fell	Trees w/o dmt	21
32	HFR	LP_Excess	3 TPA	75	HFR	LP_All	Clump inside	75
33	HFR	LP_Excess	3 TPA	32	HFR	LP_Excess	3 TPA	32
34					None	Girdle/Prune/Fell	Trees w/o dmt	26
35					None	Girdle/Prune/Fell	Trees w/o dmt	28
36	HFR	LP_Excess	3 TPA	72	HFR	LP_Excess	3 TPA	72
37	HFR	LP_PP_Excess	3 TPA	43	None	Girdle/Prune/Fell	Trees w/o dmt	
38					HFR	LP_PP_DMT	Trees w/o dmt	20
39	HFR	LP_Excess	3 TPA	22	HFR	LP_Excess	3 TPA	22
40					None	Girdle/Prune/Fell	Trees w/o dmt	38

[3] Clumps not mapped. Retain clumps of mistletoe-free overstory (approximately 50% of unit).

	Alternative 2 (Proposed Action)				Alternative 3			
Unit	**HRVST**	**TRTMNT**	**GTR**	**Acres**	**HRVST**	**TRTMNT**	**GTR**	**Acres**
41	HFR	LP_Excess	3 TPA	44	HFR	LP_All	Clump inside	44
42					None	Girdle/Prune/Fell	Trees w/o dmt	18
43	HFR	LP_Excess	3 TPA	41	HFR	LP_All	PP/WF GTR	41
44					None	Girdle/Prune/Fell	Trees w/o dmt	19
45	HFR	LP_Excess	3 TPA	38	HFR	LP_Excess	3 TPA	38
46					HFR	LP_All	PP/WF GTR	44
47	HFR	LP_Excess	3 TPA	28	HFR	LP_Excess	3 TPA	28
48	HFR	LP_Excess	3 TPA	217	HFR	LP_Excess	3 TPA	217
49					HFR	LP_All	Clump inside	52
50					None	Girdle/Prune/Fell	Trees w/o dmt	27
51	HFR	LP_Excess	3 TPA	37	HFR	LP_All	PP/WF GTR	37
52	HFR	LP_Excess	3 TPA	48	HFR	LP_Excess	3 TPA	48
53					None	Girdle/Prune/Fell	Trees w/o dmt	38
54					HFR	LP_PP_Excess	3 TPA	83
55	HFR	LP_Excess	3 TPA	67	HFR	LP_Excess	3 TPA	67
56	HFR	LP_Excess	3 TPA	15	HFR	LP_Excess	3 TPA	15
57	HFR	LP_Excess	3 TPA	12	HFR	LP_Excess	3 TPA	12
58					HFR	LP_All	PP/WF GTR	71
59					HFR	LP_PP_Excess	3 TPA	34
60	HFR	LP_Excess	3 TPA	26	HFR	LP_Excess	3 TPA	26
61	HFR	LP_Excess	3 TPA	43	HFR	LP_All	PP/WF GTR	45
62	HFR	LP_Excess	3 TPA	56	HFR	LP_Excess	3 TPA	56
63	HFR	LP_Excess	3 TPA	7	HFR	LP_All	Clump outside	7
64					None	Girdle/Prune/Fell	Trees w/o dmt	15
65	HFR	LP_Excess	3 TPA	190	HFR	LP_Excess	3 TPA	190
66	HFR	LP_Excess	3 TPA	39	HFR	LP_Excess	3 TPA	39
67	HFR	LP_PP_Excess	3 TPA	9	HFR	LP_PP_Excess	3 TPA	9
69					None	Girdle/Prune/Fell	Trees w/o dmt	32
70	HFR	LP_PP_Excess	3 TPA	16	HFR	LP_PP_Excess	3 TPA	16
71					HFR	LP_Excess	3 TPA	17
72					HFR	LP_Excess	3 TPA	47
73	HFR	LP_Excess	3 TPA	7	HFR	LP_All	Clump outside	7
74					None	Girdle/Prune/Fell	Trees w/o dmt	65
75	HFR	LP_Excess	3 TPA	53	None	Girdle/Prune/Fell	Trees w/o dmt	53
76	HFR	LP_Excess	3 TPA	25	HFR	LP_Excess	3 TPA	25
77					None	Girdle/Prune/Fell	Trees w/o dmt	37
78	HFR	LP_Excess	3 TPA	55	HFR	LP_All	Clump inside	55
79	HFR	LP_Excess	3 TPA	48	HFR	LP_Excess	3 TPA	48
80	HFR	LP_Excess	3 TPA	48	HFR	LP_Excess	3 TPA	48
81	HFR	LP_Excess	3 TPA	76	HFR	LP_Excess	3 TPA	76
82	HFR	LP_Excess	3 TPA	32	HFR	LP_Excess	3 TPA	32
83	HFR	LP_Excess	3 TPA	56	HFR	LP_Excess	3 TPA	56
84	HFR	LP_Excess	3 TPA	171	HFR	LP_Excess	3 TPA	171

	Alternative 2 (Proposed Action)				Alternative 3			
Unit	**HRVST**	**TRTMNT**	**GTR**	**Acres**	**HRVST**	**TRTMNT**	**GTR**	**Acres**
85					None	Girdle/Prune/Fell	Trees w/o dmt	29
86	HFR	LP_Excess	3 TPA	106	HFR	LP_All	Clump inside	106
87	HFR	LP_Excess	3 TPA	20	HFR	LP_Excess	3 TPA	20
88					HFR	LP_Excess	3 TPA	30
89	HFR	LP_Excess	3 TPA	96	None	Girdle/Prune/Fell	Trees w/o dmt	96
90	HFR	LP_Excess	3 TPA	80	None	Girdle/Prune/Fell	Trees w/o dmt	80
91	HFR	LP_Excess	3 TPA	30	HFR	LP_Excess	3 TPA	30
92					HFR	LP_Excess	3 TPA	41
93	HFR	LP_Excess	3 TPA	18	HFR	LP_Excess	3 TPA	18
94	HFR	LP_Excess	3 TPA	46	HFR	LP_Excess	3 TPA	46
95	HFR	LP_Excess	3 TPA	38	HFR	LP_Excess	3 TPA	38
96	HFR	LP_PP_Excess	3 TPA	45	HFR	LP_PP_Excess	3 TPA	45
97	HFR	LP_Excess	3 TPA	11	HFR	LP_All	PP/WF GTR	11
98	HFR	LP_Excess	3 TPA	26	HFR	LP_Excess	3 TPA	26
99					HFR	LP_PP_Excess	3 TPA	38
100	HFR	LP_PP_Excess	3 TPA	182	None	Girdle/Prune/Fell	Trees w/o dmt	182
101					HFR	LP_PP_Excess	3 TPA	21
102	HFR	LP_Excess	3 TPA	17	HFR	LP_All	PP/WF GTR	17
103	HFR	LP_PP_Excess	3 TPA	60	HFR	LP_PP_Excess	3 TPA	60
104	HFR	LP_PP_Excess	3 TPA	16	HFR	LP_PP_Excess	3 TPA	16
105	HFR	LP_Excess	3 TPA	80	None	Girdle/Prune/Fell	Trees w/o dmt	80
106	HFR	LP_Excess	3 TPA	193	HFR	LP_All	Clump inside	193
107	HFR	LP_PP_Excess	3 TPA	74	None	Girdle/Prune/Fell	Trees w/o dmt	74
108					HFR	PP_DMT	LP GTR	24
109					HFR	LP_PP_Excess	3 TPA	6
110	HFR	LP_PP_Excess	3 TPA	33	None	Girdle/Prune/Fell	Trees w/o dmt	33
111					HFR	LP_PP_Excess	3 TPA	23
112					None	Girdle/Prune/Fell	Trees w/o dmt	19
113	HFR	LP_Excess	3 TPA	68	HFR	LP_Excess	3 TPA	68
114					HFR	LP_PP_Excess	3 TPA	12
115					None	Girdle/Prune/Fell	Trees w/o dmt	9
116	HFR	LP_Excess	3 TPA	16	HFR	LP_Excess	3 TPA	16
117					None	Girdle/Prune/Fell	Trees w/o dmt	27
118	HFR	LP_Excess	3 TPA	48	HFR	LP_Excess	3 TPA	48
119	HFR	LP_Excess	3 TPA	5	HFR	LP_Excess	3 TPA	5
120	HFR	LP_Excess	3 TPA	8	HFR	LP_Excess	3 TPA	8
121	HFR	LP_PP_Excess	3 TPA	87	HFR	LP_PP_Excess	3 TPA	87
122	HFR	LP_PP_Excess	3 TPA	50	HFR	LP_PP_Excess	3 TPA	50
123	HFR	LP_Excess	3 TPA	15	HFR	LP_All	PP/WF GTR	15
125	HFR	LP_Excess	3 TPA	31	HFR	LP_Excess	3 TPA	31
126	HFR	LP_Excess	3 TPA	39	HFR	LP_Excess	3 TPA	39
127					None	Girdle/Prune/Fell	Trees w/o dmt	14
128	HFR	LP_Excess	3 TPA	46	HFR	LP_Excess	3 TPA	46

	Alternative 2 (Proposed Action)				Alternative 3			
Unit	**HRVST**	**TRTMNT**	**GTR**	**Acres**	**HRVST**	**TRTMNT**	**GTR**	**Acres**
129	HFR	LP_PP_Excess	3 TPA	105	HFR	LP_PP_Excess	3 TPA	105
130	HFR	LP_Excess	3 TPA	17	HFR	LP_All	Clump outside	17
131	HFR	LP_Excess	3 TPA	10	HFR	LP_Excess	3 TPA	10
132	HFR	LP_Excess	3 TPA	20	HFR	LP_All	Clump inside	20
133	HFR	LP_Excess	3 TPA	31	HFR	LP_Excess	3 TPA	31
134					None	Girdle/Prune/Fell	Trees w/o dmt	26
135	HFR	LP_Excess	3 TPA	55	HFR	LP_Excess	3 TPA	55
136	HFR	LP_Excess	3 TPA	31	None	Girdle/Prune/Fell	Trees w/o dmt	31
137	HFR	LP_Excess	3 TPA	23	HFR	LP_All	PP/WF GTR	23
138	HFR	LP_Excess	3 TPA	35	HFR	LP_Excess	3 TPA	35
139	HFR	LP_Excess	3 TPA	53	HFR	LP_Excess	3 TPA	53
141					HFR	LP_All	Clump inside	36
142	HFR	LP_Excess	3 TPA	52	HFR	LP_Excess	3 TPA	52
143	HFR	LP_Excess	3 TPA	19	HFR	LP_Excess	3 TPA	19
144	HFR	LP_Excess	3 TPA	95	HFR	LP_Excess	3 TPA	95
145	HFR	LP_Excess	3 TPA	38	HFR	LP_All	PP/WF GTR	38
146	HFR	LP_Excess	3 TPA	44	HFR	LP_Excess	3 TPA	44
147	HFR	LP_Excess	3 TPA	29	HFR	LP_DMT	Trees w/o dmt	29
148	HFR	LP_Excess	3 TPA	39	HFR	LP_Excess	3 TPA	39
149					HFR	LP_DMT	Trees w/o dmt	31
150					HFR	LP_PP_Excess	3 TPA	47
151	HFR	LP_Excess	3 TPA	39	HFR	LP_Excess	3 TPA	39
152	HFR	LP_Excess	3 TPA	8	HFR	LP_Excess	3 TPA	8
153	HFR	LP_Excess	3 TPA	13	HFR	LP_All	PP/WF GTR	13
154					HFR	LP_All	Clump inside	77
155					HFR	LP_Excess	3 TPA	10
156	HFR	LP_Excess	3 TPA	36	HFR	LP_Excess	3 TPA	36
157					None	Girdle/Prune/Fell	Trees w/o dmt	25
158	HFR	PP_Excess	3 TPA	18	None	Girdle/Prune/Fell	Trees w/o dmt	18
159	HFR	LP_Excess	3 TPA	122	HFR	LP_All	Clump inside	122
160	HFR	LP_Excess	3 TPA	50	None	Girdle/Prune/Fell	Trees w/o dmt	50
161	HFR	LP_Excess	3 TPA	17	None	Girdle/Prune/Fell	Trees w/o dmt	17
162	HFR	LP_Excess	3 TPA	44	HFR	LP_Excess	3 TPA	44
163	HFR	LP_PP_Excess	3 TPA	64	HFR	LP_PP_Excess	3 TPA	64
164					HFR	LP_PP_Excess	3 TPA	84
165	HFR	LP_Excess	3 TPA	19	HFR	LP_All	Clump inside	19
166	HFR	LP_Excess	3 TPA	55	HFR	LP_Excess	3 TPA	55
167	HFR	LP_Excess	3 TPA	33	HFR	LP_All	Clump inside	31
168	HFR	LP_Excess	3 TPA	24	HFR	LP_All	PP/WF GTR	26
169					None	Girdle/Prune/Fell	Trees w/o dmt	10
170	HFR	LP_Excess	3 TPA	13	HFR	LP_All	PP/WF GTR	13
171	HFR	LP_Excess	3 TPA	34	HFR	LP_All	Clump inside	34
172					None	Girdle/Prune/Fell	Trees w/o dmt	18

	Alternative 2 (Proposed Action)				Alternative 3			
Unit	**HRVST**	**TRTMNT**	**GTR**	**Acres**	**HRVST**	**TRTMNT**	**GTR**	**Acres**
173	HFR	LP_Excess	3 TPA	15	None	Girdle/Prune/Fell	Trees w/o dmt	15
174	HFR	LP_Excess	3 TPA	14	None	Girdle/Prune/Fell	Trees w/o dmt	14
175					HFR	LP_All	Clump outside	10
176	HFR	LP_Excess	3 TPA	16	None	Girdle/Prune/Fell	Trees w/o dmt	16
177	HFR	LP_Excess	3 TPA	60	HFR	LP_Excess	3 TPA	60
178	HFR	LP_Excess	3 TPA	38	HFR	LP_Excess	3 TPA	38
179	HFR	LP_Excess	3 TPA	17	HFR	LP_Excess	3 TPA	17
180	HFR	LP_Excess	3 TPA	14	None	Girdle/Prune/Fell	Trees w/o dmt	14
181	HFR	LP_Excess	3 TPA	39	HFR	LP_Excess	3 TPA	39
182	HFR	LP_Excess	3 TPA	23	HFR	LP_Excess	3 TPA	23
183	HFR	LP_Excess	3 TPA	53	HFR	LP_All	Clump inside	53
184					None	Girdle/Prune/Fell	Trees w/o dmt	16
185	HFR	LP_Excess	3 TPA	35	HFR	LP_All	Clump inside	35
186	HFR	LP_Excess	3 TPA	12	HFR	LP_Excess	3 TPA	12
187	HFR	LP_Excess	3 TPA	27	None	Girdle/Prune/Fell	Trees w/o dmt	
188	HFR	LP_Excess	3 TPA	134	HFR	LP_Excess	3 TPA	134
189	HFR	LP_Excess	3 TPA	31	None	Girdle/Prune/Fell	Trees w/o dmt	31
190	HFR	LP_Excess	3 TPA	42	HFR	LP_Excess	3 TPA	42
191	HFR	LP_PP_Excess	3 TPA	36	HFR	LP_PP_Excess	3 TPA	36
192					None	Girdle/Prune/Fell	Trees w/o dmt	14
193	HFR	LP_Excess	3 TPA	26	HFR	LP_All	Clump inside[4]	26
194	HFR	LP_Excess	3 TPA	13	HFR	LP_Excess	3 TPA	13
195	HFR	LP_Excess	3 TPA	48	HFR	LP_Excess	3 TPA	48
196	HFR	LP_Excess	3 TPA	14	HFR	LP_Excess	3 TPA	14
197	HFR	LP_Excess	3 TPA	36	HFR	LP_All	Clump inside	36
198	HFR	LP_Excess	3 TPA	34	None	Girdle/Prune/Fell	Trees w/o dmt	34
199					None	Girdle/Prune/Fell	Trees w/o dmt	39
200	HFR	LP_Excess	3 TPA	23	HFR	LP_Excess	3 TPA	23
201					HFR	LP_Excess	3 TPA	15
202	HFR	LP_Excess	3 TPA	45	HFR	LP_All	PP/WF GTR	45
203	HFR	LP_Excess	3 TPA	3	HFR	LP_Excess	3 TPA	3
204	HFR	LP_Excess	3 TPA	32	HFR	LP_Excess	3 TPA	32
205	HFR	LP_Excess	3 TPA	7	HFR	LP_Excess	3 TPA	7
206	HFR	LP_Excess	3 TPA	242	HFR	LP_DMT	Trees w/o dmt	242
207					None	Girdle/Prune/Fell	Trees w/o dmt	44
208	HFR	LP_Excess	3 TPA	22	HFR	LP_DMT	Trees w/o dmt	22
209	HFR	LP_Excess	3 TPA	40	None	Girdle/Prune/Fell	Trees w/o dmt	40
210	HFR	LP_Excess	3 TPA	48	HFR	LP_All	PP/WF GTR	48
211					None	Girdle/Prune/Fell	Trees w/o dmt	5
212					None	Girdle/Prune/Fell	Trees w/o dmt	36
213	HFR	LP_Excess	3 TPA	15	HFR	LP_Excess	3 TPA	15

[4] Clumps not mapped. Retain clumps of mistletoe-free overstory (approximately 30% of unit).

	Alternative 2 (Proposed Action)				Alternative 3			
Unit	**HRVST**	**TRTMNT**	**GTR**	**Acres**	**HRVST**	**TRTMNT**	**GTR**	**Acres**
214	HFR	LP_Excess	3 TPA	10	HFR	LP_Excess	3 TPA	10
215	HFR	LP_Excess	3 TPA	26	None	Girdle/Prune/Fell	Trees w/o dmt	26
216	HFR	LP_Excess	3 TPA	14	None	Girdle/Prune/Fell	Trees w/o dmt	14
217	HFR	LP_PP_Excess	3 TPA	48	HFR	LP_PP_Excess	3 TPA	48
218	HFR	LP_Excess	3 TPA	51	HFR	LP_DMT	Trees w/o dmt	51
219	HFR	LP_Excess	3 TPA	19	None	Girdle/Prune/Fell	Trees w/o dmt	19
220	HFR	LP_Excess	3 TPA	38	None	Girdle/Prune/Fell	Trees w/o dmt	38
221	HFR	LP_Excess	3 TPA	32	HFR	LP_Excess	3 TPA	32
222	HFR	LP_Excess	3 TPA	24	None	Girdle/Prune/Fell	Trees w/o dmt	24
223	HFR	LP_Excess	3 TPA	38	None	Girdle/Prune/Fell	Trees w/o dmt	
224					None	Girdle/Prune/Fell	Trees w/o dmt	57
225	HFR	LP_Excess	3 TPA	12	HFR	LP_DMT	Trees w/o dmt	12
226	HFR	LP_Excess	3 TPA	39	None	Girdle/Prune/Fell	Trees w/o dmt	39
227	HFR	LP_Excess	3 TPA	15	HFR	LP_Excess	3 TPA	15
228	HFR	LP_Excess	3 TPA	13	HFR	LP_Excess	3 TPA	13
229	HFR	LP_Excess	3 TPA	19	HFR	LP_Excess	3 TPA	19
230	HFR	LP_Excess	3 TPA	24	HFR	LP_Excess	3 TPA	24
231	HFR	LP_Excess	3 TPA	45	HFR	LP_Excess	3 TPA	45
232	HFR	LP_Excess	3 TPA	40	HFR	LP_Excess	3 TPA	40
233					None	Girdle/Prune/Fell	Trees w/o dmt	22
234	HFR	LP_Excess	3 TPA	10	HFR	LP_Excess	3 TPA	10
235					None	Girdle/Prune/Fell	Trees w/o dmt	104
236					None	Girdle/Prune/Fell	Trees w/o dmt	47
237					HFR	LP_PP_Excess	3 TPA	119
238	HFR	LP_Excess	3 TPA	10	None	Girdle/Prune/Fell	Trees w/o dmt	10
239	HFR	LP_Excess	3 TPA	14	None	Girdle/Prune/Fell	Trees w/o dmt	14
240	HFR	LP_Excess	3 TPA	34	HFR	LP_All	Clump inside	34
241	HFR	LP_Excess	3 TPA	21	HFR	LP_Excess	3 TPA	21
242	HFR	LP_Excess	3 TPA	41	HFR	LP_Excess	3 TPA	41
243	HFR	LP_Excess	3 TPA	28	HFR	LP_DMT	Trees w/o dmt	28
244					None	Girdle/Prune/Fell	Trees w/o dmt	64
245	HFR	LP_Excess	3 TPA	39	HFR	LP_Excess	3 TPA	39
246					None	Girdle/Prune/Fell	Trees w/o dmt	130
247	HFR	LP_Excess	3 TPA	28	HFR	LP_Excess	3 TPA	28
248	HFR	LP_Excess	3 TPA	25	HFR	LP_Excess	3 TPA	25
249	HFR	LP_Excess	3 TPA	44	HFR	LP_All	Clump outside	44
250	HFR	LP_Excess	3 TPA	27	HFR	LP_All	Clump inside	27
252					None	Girdle/Prune/Fell	Trees w/o dmt	26
253					None	Girdle/Prune/Fell	Trees w/o dmt	34
254	HFR	LP_Excess	3 TPA	44	HFR	LP_Excess	3 TPA	44
255	HFR	LP_Excess	3 TPA	9	HFR	LP_All	Clump inside	9
256	HFR	LP_Excess	3 TPA	6	HFR	LP_Excess	3 TPA	6
257					HFR	LP_PP_Excess	3 TPA	56

	Alternative 2 (Proposed Action)				Alternative 3			
Unit	**HRVST**	**TRTMNT**	**GTR**	**Acres**	**HRVST**	**TRTMNT**	**GTR**	**Acres**
258					HFR	LP_Excess	3 TPA	127
259	HFR	LP_Excess	3 TPA	34	None	Girdle/Prune/Fell	Trees w/o dmt	34
260					HFR	LP_PP_Excess	3 TPA	93
261	HFR	LP_Excess	3 TPA	11	HFR	LP_Excess	3 TPA	11
262	HFR	LP_Excess	3 TPA	10	HFR	LP_All	Clump inside	10
263					None	Girdle/Prune/Fell	Trees w/o dmt	15
264	HFR	LP_Excess	3 TPA	64	HFR	LP_All	PP/WF GTR	64
265	HFR	LP_Excess	3 TPA	86	HFR	LP_Excess	3 TPA	86
266	HFR	LP_Excess	3 TPA	14	HFR	LP_Excess	3 TPA	14
267	HFR	LP_Excess	3 TPA	21	HFR	LP_All	Clump inside	21
269					None	Girdle/Prune/Fell	Trees w/o dmt	33
270					HFR	LP_Excess	3 TPA	35
271	HFR	LP_Excess	3 TPA	22	HFR	LP_All	PP/WF GTR	22
272					None	Girdle/Prune/Fell	Trees w/o dmt	40
273					None	Girdle/Prune/Fell	Trees w/o dmt	70
274					HFR	LP_DMT	Trees w/o dmt	15
275	HFR	LP_Excess	3 TPA	6	None	Girdle/Prune/Fell	Trees w/o dmt	6
276	HFR	LP_Excess	3 TPA	28	HFR	LP_All	Clump outside	28
277	HFR	LP_Excess	3 TPA	24	None	Girdle/Prune/Fell	Trees w/o dmt	24
278					HFR	LP_All	Clump outside	16
279					HFR	LP_PP_Excess	3 TPA	10
280	HFR	LP_Excess	3 TPA	5	None	Girdle/Prune/Fell	Trees w/o dmt	5
281					None	Girdle/Prune/Fell	Trees w/o dmt	31
282	HFR	LP_Excess	3 TPA	32	HFR	LP_All	PP/WF GTR	32
283	HFR	LP_PP_Excess	3 TPA	31	HFR	LP_PP_Excess	3 TPA	39
284					HFR	LP_Excess	3 TPA	9
285	HFR	LP_Excess	3 TPA	3	HFR	LP_Excess	3 TPA	3
286	HFR	LP_PP_Excess	3 TPA	74	HFR	LP_PP_Excess	3 TPA	74
287					None	Girdle/Prune/Fell	Trees w/o dmt	37
288	HFR	LP_Excess	3 TPA	15	HFR	LP_Excess	3 TPA	15
290	HFR	LP_Excess	3 TPA	30	HFR	LP_Excess	3 TPA	30
291	HFR	LP_Excess	3 TPA	14	HFR	LP_Excess	3 TPA	14
292	HFR	LP_Excess	3 TPA	29	HFR	LP_Excess	3 TPA	29
293	HFR	LP_Excess	3 TPA	27	HFR	LP_Excess	3 TPA	27
294	HFR	LP_Excess	3 TPA	24	HFR	LP_Excess	3 TPA	24
295	HFR	LP_Excess	3 TPA	108	None	Girdle/Prune/Fell	Trees w/o dmt	108
296	HFR	LP_PP_Excess	3 TPA	71	None	Girdle/Prune/Fell	Trees w/o dmt	71
297					None	Girdle/Prune/Fell	Trees w/o dmt	50
298	HFR	LP_Excess	3 TPA	9	HFR	LP_All	Clump outside	9

Appendix 2 - Estimates of Detrimental Soil Disturbance from Mechanical Treatments by Activity Areas (Units) and Action Alternatives.

EA Unit/Stand Number	Proposed Activity HFR = Final Removal Cut		Treated Acres	Unit Acres	Percent Treated	Existing Detrimental Soil Conditions (%)	Estimated Detrimental Soil Conditions After Treatment (%)		Estimated Detrimental Soil Conditions After Restoration (%/Acres)			
	Alt 2	Alt 3					Alt 2	Alt 3	Alt 2		Alt 3	
5	HFR		10	10	100%	17%	24%	17%	17%	0.7	17%	0.0
6	HFR	HFR	5	5	100%	23%	30%	30%	20%	0.5	20%	0.5
7	HFR	HFR	33	33	100%	14%	21%	21%	20%	0.3	20%	0.3
10	HFR		46	46	100%	24%	31%	24%	24%	5.1	24%	0.0
11	HFR	HFR	11	11	100%	17%	24%	24%	17%	0.7	17%	0.7
12	HFR		90	90	100%	29%	36%	29%	27%	14.4	29%	0.0
13	HFR	HFR	72	72	100%	29%	36%	36%	27%	6.0	27%	6.0
14	HFR		48	48	100%	16%	23%	16%	16%	3.3	16%	0.0
15	HFR	HFR	19	19	100%	8%	15%	15%	15%	0.0	15%	0.0
16		HFR	27	27	100%	30%	30%	37%	30%	0.0	28%	2.4
17	HFR		32	32	100%	13%	20%	13%	20%	0.0	13%	0.0
18		HFR	58	58	100%	24%	24%	31%	24%	0.0	22%	5.2
19		HFR	27	53	50%	23%	23%	26%	23%	0.0	20%	3.2
20	HFR	HFR	32	32	100%	13%	20%	20%	20%	0.0	20%	0.0
21	HFR		35	35	100%	15%	22%	15%	20%	0.7	15%	0.0
24		HFR	18	18	100%	30%	30%	37%	30%	0.0	25%	2.2
25	HFR	HFR	49	49	100%	25%	32%	32%	23%	4.4	23%	4.4
26	HFR		48	48	100%	29%	36%	29%	27%	4.3	29%	0.0
30	HFR		84	84	100%	8%	15%	8%	15%	0.0	8%	0.0
31	HFR		21	21	100%	13%	20%	13%	20%	0.0	13%	0.0
32	HFR	HFR	75	75	100%	13%	14%	14%	14%	0.0	14%	0.0
33	HFR	HFR	32	32	100%	13%	20%	20%	20%	0.0	20%	0.0
36	HFR	HFR	71	71	100%	13%	20%	20%	20%	0.0	20%	0.0
37	HFR		43	43	100%	24%	31%	24%	22%	3.8	24%	0.0
38		HFR	20	20	100%	30%	30%	37%	30%	0.0	28%	1.8
39	HFR	HFR	22	22	100%	29%	36%	36%	27%	2.0	27%	2.0
41	HFR	HFR	15	44	34%	29%	31%	31%	29%	0.8	29%	0.8
43	HFR	HFR	41	41	100%	14%	21%	21%	20%	0.4	20%	0.4
45	HFR	HFR	38	38	100%	29%	36%	36%	27%	3.4	27%	3.4
46		HFR	44	44	100%	23%	23%	30%	23%	0.0	23%	3.1
47	HFR	HFR	28	28	100%	25%	32%	32%	23%	2.6	23%	2.6
48	HFR	HFR	217	217	100%	17%	24%	24%	20%	8.7	20%	8.7
49		HFR	29	52	56%	30%	30%	34%	30%	0.0	28%	3.1
51	HFR	HFR	37	37	100%	14%	21%	21%	17%	1.5	17%	1.5
52	HFR	HFR	48	48	100%	30%	37%	37%	28%	4.4	28%	4.4
54		HFR	83	83	100%	24%	24%	31%	24%	0.0	24%	5.8
55	HFR	HFR	67	67	100%	30%	37%	37%	28%	6.0	28%	6.0
56	HFR	HFR	15	15	100%	16%	23%	23%	16%	1.1	16%	1.1
57	HFR	HFR	12	12	100%	21%	28%	28%	20%	1.0	20%	1.0
58		HFR	71	71	100%	17%	17%	24%	17%	0.0	20%	2.8
59		HFR	34	34	100%	30%	30%	37%	30%	0.0	28%	3.1

EA Unit/Stand Number	Proposed Activity HFR = Final Removal Cut		Treated Acres	Unit Acres	Percent Treated	Existing Detrimental Soil Conditions (%)	Estimated Detrimental Soil Conditions After Treatment (%)		Estimated Detrimental Soil Conditions After Restoration (%/Acres)			
	Alt 2	Alt 3					Alt 2	Alt 3	Alt 2		Alt 3	
60	HFR	HFR	26	26	100%	23%	30%	30%	20%	2.6	20%	2.6
61	HFR	HFR	45	45	100%	19%	26%	26%	19%	3.1	19%	3.1
62	HFR	HFR	56	56	100%	30%	37%	37%	28%	5.0	28%	5.0
63	HFR	HFR	7	7	100%	30%	37%	37%	28%	0.6	28%	0.6
65	HFR	HFR	190	190	100%	17%	24%	24%	20%	7.6	20%	7.6
66	HFR	HFR	39	39	100%	30%	37%	37%	28%	3.5	28%	3.5
67	HFR	HFR	9	9	100%	26%	33%	33%	24%	0.8	24%	0.8
70	HFR	HFR	16	16	100%	13%	20%	20%	20%	0.0	20%	0.0
71		HFR	17	17	100%	31%	31%	38%	31%	0.0	30%	1.4
72		HFR	47	47	100%	23%	23%	30%	23%	0.0	23%	3.3
73	HFR	HFR	7	7	100%	8%	15%	15%	15%	0.0	15%	0.0
75	HFR		53	53	100%	30%	37%	30%	28%	4.8	30%	0.0
76	HFR	HFR	25	25	100%	13%	20%	20%	20%	0.0	20%	0.0
78	HFR	HFR	47	55	85%	19%	25%	25%	19%	3.3	19%	3.3
79	HFR	HFR	48	48	100%	19%	26%	26%	19%	3.4	19%	3.4
80	HFR	HFR	48	48	100%	18%	25%	25%	18%	3.4	18%	3.4
81	HFR	HFR	76	76	100%	14%	21%	21%	19%	1.6	19%	1.6
82	HFR	HFR	32	32	100%	24%	31%	31%	22%	2.9	22%	2.9
83	HFR	HFR	56	56	100%	25%	32%	32%	23%	5.0	23%	5.0
84	HFR	HFR	171	171	100%	30%	37%	37%	30%	12.0	30%	12.0
86	HFR	HFR	77	106	73%	8%	13%	13%	13%	0.0	13%	0.0
87	HFR	HFR	20	20	100%	20%	27%	27%	20%	1.4	20%	1.4
88		HFR	30	30	100%	24%	24%	31%	24%	0.0	22%	2.7
89	HFR		96	96	100%	13%	20%	13%	20%	0.0	13%	0.0
90	HFR		80	80	100%	13%	20%	13%	20%	0.0	13%	0.0
91	HFR	HFR	30	30	100%	24%	31%	31%	22%	2.7	22%	2.7
92		HFR	41	41	100%	31%	31%	38%	31%	0.0	30%	3.3
93	HFR	HFR	18	18	100%	20%	27%	27%	19%	1.5	19%	1.5
94	HFR	HFR	46	46	100%	15%	22%	22%	15%	3.2	15%	3.2
95	HFR	HFR	38	38	100%	30%	37%	37%	28%	3.5	28%	3.5
96	HFR	HFR	45	45	100%	18%	25%	25%	20%	2.3	20%	2.3
97	HFR	HFR	11	11	100%	27%	34%	34%	20%	1.5	20%	1.5
98	HFR	HFR	26	26	100%	20%	27%	27%	20%	1.8	20%	1.8
99		HFR	38	38	100%	24%	24%	31%	24%	0.0	22%	3.4
100	HFR		182	182	100%	13%	20%	13%	20%	0.0	13%	0.0
101		HFR	21	21	100%	32%	32%	39%	32%	0.0	32%	1.5
102	HFR	HFR	17	17	100%	24%	31%	31%	20%	1.9	20%	1.9
103	HFR	HFR	60	60	100%	25%	32%	32%	23%	5.4	23%	5.4
104	HFR	HFR	16	16	100%	9%	16%	16%	16%	0.0	16%	0.0
105	HFR		80	80	100%	14%	21%	14%	19%	1.6	14%	0.0
106	HFR	HFR	171	193	89%	9%	15%	15%	15%	0.0	15%	0.0
107	HFR		74	74	100%	24%	31%	24%	22%	6.6	24%	0.0
108		HFR	24	24	100%	29%	29%	36%	29%	0.0	27%	2.1
109		HFR	6	6	100%	29%	29%	36%	29%	0.0	20%	1.0
110	HFR		33	33	100%	13%	20%	13%	20%	0.0	13%	0.0

EA Unit/Stand Number	Proposed Activity HFR = Final Removal Cut		Treated Acres	Unit Acres	Percent Treated	Existing Detrimental Soil Conditions (%)	Estimated Detrimental Soil Conditions After Treatment (%)		Estimated Detrimental Soil Conditions After Restoration (%/Acres)			
	Alt 2	Alt 3					Alt 2	Alt 3	Alt 2		Alt 3	
111		HFR	23	23	100%	31%	31%	38%	31%	0.0	30%	1.8
113	HFR	HFR	68	68	100%	30%	37%	37%	29%	5.5	29%	5.5
114		HFR	12	12	100%	30%	30%	37%	30%	0.0	25%	1.4
116	HFR	HFR	16	16	100%	23%	30%	30%	20%	1.6	20%	1.6
118	HFR	HFR	48	48	100%	26%	33%	33%	24%	4.3	24%	4.3
119	HFR	HFR	5	5	100%	35%	42%	42%	20%	1.1	20%	1.1
120	HFR	HFR	8	8	100%	23%	30%	30%	20%	0.8	20%	0.8
121	HFR	HFR	87	87	100%	25%	32%	32%	25%	6.0	25%	6.0
122	HFR	HFR	50	50	100%	25%	32%	32%	23%	4.5	23%	4.5
123	HFR	HFR	15	15	100%	25%	32%	32%	20%	1.8	20%	1.8
125	HFR	HFR	31	31	100%	8%	15%	15%	15%	0.0	15%	0.0
126	HFR	HFR	39	39	100%	14%	21%	21%	15%	2.3	15%	2.3
128	HFR	HFR	46	46	100%	15%	22%	22%	17%	2.3	17%	2.3
129	HFR	HFR	105	105	100%	13%	20%	20%	20%	0.0	20%	0.0
130	HFR	HFR	17	17	100%	27%	34%	34%	25%	1.5	25%	1.5
131	HFR	HFR	10	10	100%	29%	36%	36%	25%	1.1	25%	1.1
132	HFR	HFR	15	20	75%	9%	14%	14%	14%	0.0	14%	0.0
133	HFR	HFR	31	31	100%	29%	36%	36%	27%	2.8	27%	2.8
135	HFR	HFR	55	55	100%	15%	22%	22%	20%	1.0	20%	1.0
136	HFR		31	31	100%	29%	36%	29%	27%	2.8	29%	0.0
137	HFR	HFR	23	23	100%	25%	32%	32%	23%	2.1	23%	2.1
138	HFR	HFR	35	35	100%	24%	31%	31%	22%	3.2	22%	3.2
139	HFR	HFR	53	53	100%	15%	22%	22%	20%	1.1	20%	1.1
141		HFR	15	36	42%	25%	25%	28%	25%	0.0	23%	1.8
142	HFR	HFR	52	52	100%	25%	32%	32%	23%	4.6	23%	4.6
143	HFR	HFR	19	19	100%	14%	21%	21%	18%	0.6	18%	0.6
144	HFR	HFR	95	95	100%	14%	21%	21%	20%	1.0	20%	1.0
145	HFR	HFR	38	38	100%	15%	22%	22%	18%	1.6	18%	1.6
146	HFR	HFR	44	44	100%	14%	21%	21%	18%	1.3	18%	1.3
147	HFR	HFR	29	29	100%	30%	37%	37%	28%	2.6	28%	2.6
148	HFR	HFR	39	39	100%	29%	36%	36%	28%	3.1	28%	3.1
149		HFR	33	33	100%	31%	31%	38%	31%	0.0	30%	2.6
150		HFR	47	47	100%	24%	24%	31%	24%	0.0	23%	3.8
151	HFR	HFR	39	39	100%	13%	20%	20%	20%	0.0	20%	0.0
152	HFR	HFR	8	8	100%	13%	20%	20%	20%	0.0	20%	0.0
153	HFR	HFR	13	13	100%	13%	20%	20%	20%	0.0	20%	0.0
154		HFR	73	77	95%	23%	23%	30%	23%	0.0	23%	5.4
155		HFR	10	10	100%	31%	31%	38%	31%	0.0	25%	1.3
156	HFR	HFR	36	36	100%	15%	22%	22%	18%	1.4	18%	1.4
158	HFR		18	18	100%	13%	20%	13%	20%	0.0	13%	0.0
159	HFR	HFR	17	122	14%	14%	15%	15%	15%	0.0	15%	0.0
160	HFR		50	50	100%	32%	39%	32%	30%	4.5	32%	0.0
161	HFR		17	17	100%	14%	21%	14%	14%	1.2	14%	0.0
162	HFR	HFR	44	44	100%	29%	36%	36%	27%	3.9	27%	3.9
163	HFR	HFR	64	64	100%	30%	37%	37%	28%	5.8	28%	5.8

EA Unit/Stand Number	Proposed Activity HFR = Final Removal Cut		Treated Acres	Unit Acres	Percent Treated	Existing Detrimental Soil Conditions (%)	Estimated Detrimental Soil Conditions After Treatment (%)		Estimated Detrimental Soil Conditions After Restoration (%/Acres)			
	Alt 2	Alt 3					Alt 2	Alt 3	Alt 2		Alt 3	
164		HFR	84	84	100%	23%	23%	30%	23%	0.0	23%	5.9
165	HFR	HFR	13	19	68%	30%	35%	35%	28%	1.4	28%	1.4
166	HFR	HFR	55	55	100%	14%	21%	21%	19%	1.1	19%	1.1
167	HFR	HFR	21	33	64%	13%	17%	17%	17%	0.0	17%	0.0
168	HFR	HFR	26	26	100%	14%	21%	21%	15%	1.6	15%	1.6
170	HFR	HFR	13	13	100%	16%	23%	23%	16%	0.9	16%	0.9
171	HFR		1	34	3%	14%	14%	14%	14%	0.0	14%	0.0
173	HFR		15	15	100%	30%	37%	30%	25%	1.8	30%	0.0
174	HFR		28	28	100%	14%	21%	14%	18%	0.9	14%	0.0
175		HFR	10	10	100%	26%	26%	33%	26%	0.0	23%	1.0
176	HFR		16	16	100%	24%	31%	24%	22%	1.5	24%	0.0
177	HFR	HFR	60	60	100%	16%	23%	23%	18%	3.0	18%	3.0
178	HFR	HFR	38	38	100%	25%	32%	32%	23%	3.5	23%	3.5
179	HFR	HFR	17	17	100%	29%	36%	36%	25%	1.8	25%	1.8
180	HFR		14	14	100%	24%	31%	24%	22%	1.2	24%	0.0
181	HFR	HFR	39	39	100%	13%	20%	20%	20%	0.0	20%	0.0
182	HFR	HFR	23	23	100%	32%	39%	39%	30%	2.1	30%	2.1
183	HFR	HFR	26	53	49%	14%	17%	17%	17%	0.0	17%	0.0
185	HFR	HFR	6	35	17%	24%	25%	25%	23%	0.7	23%	0.7
186	HFR	HFR	12	12	100%	13%	20%	20%	20%	0.0	20%	0.0
187	HFR		27	27	100%	13%	20%	13%	20%	0.0	13%	0.0
188	HFR	HFR	134	134	100%	14%	21%	21%	20%	1.3	20%	1.3
189	HFR		31	31	100%	14%	21%	14%	18%	0.9	14%	0.0
190	HFR	HFR	42	42	100%	25%	32%	32%	23%	3.7	23%	3.7
191	HFR	HFR	36	36	100%	14%	21%	21%	18%	1.1	18%	1.1
193	HFR	HFR	18	26	69%	13%	18%	18%	18%	0.0	18%	0.0
194	HFR	HFR	13	13	100%	30%	37%	37%	25%	1.5	25%	1.5
195	HFR	HFR	48	48	100%	29%	36%	36%	27%	4.3	27%	4.3
196	HFR	HFR	14	14	100%	31%	38%	38%	25%	1.8	25%	1.8
197	HFR	HFR	9	36	25%	14%	16%	16%	16%	0.0	16%	0.0
198	HFR		34	34	100%	13%	20%	13%	20%	0.0	13%	0.0
200	HFR	HFR	23	23	100%	30%	37%	37%	28%	2.1	28%	2.1
201		HFR	15	15	100%	30%	30%	37%	30%	0.0	25%	1.8
202	HFR	HFR	45	45	100%	9%	16%	16%	16%	0.0	16%	0.0
203	HFR	HFR	3	3	100%	23%	30%	30%	15%	0.4	15%	0.4
204	HFR	HFR	32	32	100%	29%	36%	36%	27%	2.9	27%	2.9
205	HFR	HFR	7	7	100%	26%	33%	33%	24%	0.6	24%	0.6
206	HFR	HFR	242	242	100%	25%	32%	32%	25%	16.9	25%	16.9
208	HFR	HFR	22	22	100%	13%	20%	20%	20%	0.0	20%	0.0
209	HFR		40	40	100%	14%	21%	14%	18%	1.2	14%	0.0
210	HFR	HFR	48	48	100%	29%	36%	36%	27%	4.3	27%	4.3
213	HFR	HFR	15	15	100%	13%	20%	20%	20%	0.0	20%	0.0
214	HFR	HFR	10	10	100%	29%	36%	36%	25%	1.1	25%	1.1
215	HFR		26	26	100%	15%	22%	15%	18%	1.0	15%	0.0
216	HFR		14	14	100%	17%	24%	17%	17%	1.0	17%	0.0

EA Unit/Stand Number	Proposed Activity HFR = Final Removal Cut		Treated Acres	Unit Acres	Percent Treated	Existing Detrimental Soil Conditions (%)	Estimated Detrimental Soil Conditions After Treatment (%)		Estimated Detrimental Soil Conditions After Restoration (%/Acres)			
	Alt 2	Alt 3					Alt 2	Alt 3	Alt 2		Alt 3	
217	HFR	HFR	48	48	100%	30%	37%	37%	28%	4.4	28%	4.4
218	HFR	HFR	51	51	100%	29%	36%	36%	27%	4.6	27%	4.6
219	HFR		19	19	100%	22%	29%	22%	20%	1.7	22%	0.0
220	HFR		38	38	100%	15%	22%	15%	18%	1.6	15%	0.0
221	HFR	HFR	32	32	100%	14%	21%	21%	18%	0.9	18%	0.9
222	HFR		24	24	100%	15%	22%	15%	20%	0.5	15%	0.0
223	HFR		38	38	100%	14%	21%	14%	18%	1.2	14%	0.0
225	HFR	HFR	12	12	100%	13%	20%	20%	20%	0.0	20%	0.0
226	HFR		39	39	100%	15%	22%	15%	18%	1.6	15%	0.0
227	HFR	HFR	15	15	100%	29%	36%	36%	27%	1.4	27%	1.4
228	HFR	HFR	13	13	100%	17%	24%	24%	17%	0.9	17%	0.9
229	HFR	HFR	19	19	100%	15%	22%	22%	15%	1.3	15%	1.3
230	HFR	HFR	24	24	100%	29%	36%	36%	27%	2.1	27%	2.1
231	HFR	HFR	45	45	100%	13%	20%	20%	20%	0.0	20%	0.0
232	HFR	HFR	40	40	100%	30%	37%	37%	28%	3.6	28%	3.6
234	HFR	HFR	10	10	100%	19%	26%	26%	19%	0.7	19%	0.7
237		HFR	119	119	100%	23%	23%	30%	23%	0.0	23%	8.3
238	HFR		10	10	100%	9%	16%	9%	16%	0.0	9%	0.0
239	HFR		14	14	100%	10%	17%	10%	17%	0.0	10%	0.0
240	HFR	HFR	28	34	82%	9%	16%	16%	16%	0.0	16%	0.0
241	HFR	HFR	21	21	100%	8%	15%	15%	15%	0.0	15%	0.0
242	HFR	HFR	41	41	100%	29%	36%	36%	28%	3.3	28%	3.3
243	HFR	HFR	28	28	100%	29%	36%	36%	27%	2.5	27%	2.5
245	HFR	HFR	39	39	100%	33%	40%	40%	31%	3.5	31%	3.5
247	HFR	HFR	28	28	100%	14%	21%	21%	18%	0.9	18%	0.9
248	HFR	HFR	25	25	100%	29%	36%	36%	27%	2.2	27%	2.2
249	HFR	HFR	44	44	100%	17%	24%	24%	19%	2.2	19%	2.2
250	HFR	HFR	8	27	30%	17%	19%	19%	19%	0.0	19%	0.0
254	HFR	HFR	44	44	100%	14%	21%	21%	17%	1.7	17%	1.7
255	HFR	HFR	6	9	67%	29%	34%	34%	25%	0.8	25%	0.8
256	HFR	HFR	6	6	100%	29%	36%	36%	25%	0.7	25%	0.7
257		HFR	56	56	100%	23%	23%	30%	23%	0.0	23%	3.9
258		HFR	127	127	100%	29%	29%	36%	29%	0.0	29%	8.9
259	HFR	HFR	34	34	100%	25%	32%	32%	23%	3.1	23%	3.1
260		HFR	93	93	100%	23%	23%	30%	23%	0.0	23%	6.5
261	HFR	HFR	11	11	100%	9%	16%	16%	16%	0.0	16%	0.0
262	HFR	HFR	10	10	100%	15%	22%	22%	15%	0.7	15%	0.7
264	HFR	HFR	64	64	100%	14%	21%	21%	17%	2.5	17%	2.5
265	HFR	HFR	86	86	100%	14%	21%	21%	20%	0.9	20%	0.9
266	HFR	HFR	14	14	100%	24%	31%	31%	22%	1.2	22%	1.2
267	HFR	HFR	8	21	38%	8%	11%	11%	11%	0.0	11%	0.0
270		HFR	35	35	100%	29%	29%	36%	29%	0.0	29%	2.4
271	HFR	HFR	22	22	100%	9%	16%	16%	16%	0.0	16%	0.0
274		HFR	15	15	100%	29%	29%	36%	29%	0.0	26%	1.5
275	HFR		6	6	100%	19%	26%	19%	19%	0.5	19%	0.0

EA Unit/Stand Number	Proposed Activity HFR = Final Removal Cut		Treated Acres	Unit Acres	Percent Treated	Existing Detrimental Soil Conditions (%)	Estimated Detrimental Soil Conditions After Treatment (%)		Estimated Detrimental Soil Conditions After Restoration (%/Acres)			
	Alt 2	Alt 3					Alt 2	Alt 3	Alt 2		Alt 3	
276	HFR	HFR	28	28	100%	16%	23%	23%	19%	1.1	19%	1.1
277	HFR		24	24	100%	23%	30%	23%	21%	2.2	23%	0.0
278		HFR	16	16	100%	29%	29%	36%	29%	0.0	27%	1.5
279		HFR	10	10	100%	23%	23%	30%	23%	0.0	20%	1.0
280	HFR		5	5	100%	19%	26%	19%	19%	0.3	19%	0.0
282	HFR	HFR	32	32	100%	10%	17%	17%	17%	0.0	17%	0.0
283	HFR	HFR	39	39	100%	31%	38%	38%	30%	3.1	30%	3.1
284		HFR	9	9	100%	17%	17%	24%	17%	0.0	17%	0.7
285	HFR	HFR	3	3	100%	13%	20%	20%	20%	0.0	20%	0.0
286	HFR	HFR	74	74	100%	26%	33%	33%	26%	3.0	26%	3.0
288	HFR	HFR	15	15	100%	29%	36%	36%	25%	1.6	25%	1.6
290	HFR	HFR	30	30	100%	13%	20%	20%	20%	0.0	20%	0.0
291	HFR	HFR	14	14	100%	13%	20%	20%	20%	0.0	20%	0.0
292	HFR	HFR	29	29	100%	13%	20%	20%	20%	0.0	20%	0.0
293	HFR	HFR	27	27	100%	13%	20%	20%	20%	0.0	20%	0.0
294	HFR	HFR	24	24	100%	14%	21%	21%	18%	0.7	18%	0.7
295	HFR		108	108	100%	8%	15%	8%	15%	0.0	8%	0.0
296	HFR		71	71	100%	30%	37%	30%	30%	5.0	30%	0.0
298	HFR	HFR	9	9	100%	26%	33%	33%	23%	0.9	23%	0.9

Appendix 3 – Current and Foreseeable Projects

The effects of the following projects were considered in the analysis of cumulative effects.

Miscellaneous Post-Sale Project (Current Project). Hand-felling of small diameter trees. Includes some use of ground based equipment to accomplish vegetation management objectives. Approximately 794 acres of treatment within the Long Prairie project area (1% of project area). Approximately half of treatment area (416 acres) will be precommercially thinned. Treatment on remaining acres includes whipcutting and some treatments to reduce mistletoe.

Ponderosa pine release Project (Current Project). Precommercial thinning of ponderosa and lodgepole pine plantations. Trees to be cut range in size from 1 to 6 inches diameter at breast height (dbh), with most trees being less than 2 inches dbh. Approximately 1,610 acres of treatment within the Long Prairie project area (3% of project area).

Rim Personal Use Woodcutting Area (Current Activity). In the northeastern portion of the project area. Of the 7,300 acre woodcutting area, approximately 3,900 are within the Long Prairie project area (7% of project area).

Road Closures (Current Activity). Approximately 45.3 miles of road closures associated with Decisions supported by the following Environmental Assessments: Topso (1991), Woof (1994), Emerald (1996), Prairie Dog (1996), and Central (1999).

Edge Timber Sale (Current Activity). No overlap with Long Prairie units. NEPA analysis documented in the Central EA. Old "Troll Firewood Units." Treatment consists of removing down (dead) trees. Approximately 87 acres in Long Prairie project area (<1% of project area).

Gem Timber Sale (Current Activity). No overlap with Long Prairie units. NEPA analysis documented in the Emerald EA. Treatment consists of removing overstory trees on 5 treatment areas totaling 213 acres (<1% of project area) and ranging in size from 22 to 77 acres. Treatment includes weeding and cleaning submerchantable trees (<3 inches dbh) following removal of overstory. Damaged, defective, and diseased (mainly dwarf mistletoe and western gall rust) trees will be cut. Additionally, lodgepole pine will be cut that are competing with manageable ponderosa pine.

Howlet Fuels CE for Natural Fuels Treatment (Foreseeable Project). No overlap with Long Prairie units. NEPA analysis ongoing. Proposed treatments, used separately or in combination, may include the following: thinning from below (cutting trees predominantly less than 8 inches dbh while retaining at least 60 trees per acre), removal of lodgepole pine, underburning and/or mowing of shrubs. 1,000 acres of underburn/mow, with 800 of this including thinning. (2% of project area).

Precommercial Thinning Project (Unnamed Foreseeable Project). Precommercial thinning of ponderosa and lodgepole pine in plantations. NEPA analysis has not yet started. Areas would likely include same areas being evaluated for treatment with the Long Prairie Mistletoe Reduction Project. Trees to be cut would likely range in size from 1 to 6 inches diameter at breast height (dbh), with most trees being less than 2 inches dbh. Estimate 8,000 to 11,000 of treatment. (14 to 20% of project area).

Appendix 4 – Comment Period and Issues Identified as Non-Significant

A 30-day comment period for the Long Prairie proposed action was provided for interested and affected publics, including appropriate local, state, and federal government agencies and Tribes. The Forest Service received 5 separate pieces of mail during the comment period, from 3 sources. The following table lists the comment letters received.

Table 4-1. Comments received during 30-day comment period

Letter	Author	Organization
1	John Morgan	Ochoco Lumber Co
2	Asante Riverwind	Blue Mtn. Biodiversity
3	Chandra LeGue	Oregon Natural Resources Council
4	Asante Riverwind	Blue Mtn. Biodiversity
5	Chandra LeGue	Oregon Natural Resources Council

An issue was defined as a discussion, debate, or dispute regarding the environmental effects directly or indirectly related to the implementation of the proposed action. Issues are considered non-significant if they are: 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)…".

All comments were reviewed and substantive comments were used to develop significant issues. The following lists those comments considered to be non-significant issues and reasons for non-significance. Each comment is followed by a number in parentheses. The first number corresponds to the letter number in Table 4-1. The second number corresponds to an assigned comment number. The complete comment record is available in the project record.

Comment: *"Given the … extent of adverse logging management impacts across the area, it is clear that improved management actions are truly necessary here. Among these would be reassessing the management allocations for the area and amending these to incorporate current scientific research regarding wildlife habitat, forest ecology, connective corridors, healthy soils and aquatic systems needs. That only 3% of this extensive (55,867 acres) area is designated as old growth is shameful." (2-3)*

Consideration: Reassessing Forest Plan allocations is outside scope of proposed action.

Comment: *"Proposing that "Management emphasis in lodgepole pine foregrounds will be on managing healthier, fuller crowned, younger trees" fails to incorporate abundant scientific research and essential biodiversity needs to protect all remaining old growth trees and restore forests to within their historical ranges for late and old structure stands. This cannot be accomplished by managing for "younger trees." This management direction violates credible science, and failure to disclose this violates the requirements of the NEPA. (2-6)*

Consideration: Changing Forest Plan management direction is outside the scope of proposed action. The Long Prairie Proposed Action implements the Deschutes Forest Plan as amended June 1995 by the Decision Notice for the Continuation of Interim Management Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales. Interim Management Direction makes provisions for protecting existing Late or Old Structure stands. According to Forest Plan Standard and Guideline M9-51, in lodgepole pine foregrounds, "…Because their crowns are relatively small, and the older trees tend to have a deteriorating appearance, management emphasis in lodgepole pine foregrounds will not be to produce large diameter, older trees. Instead, the emphasis will be on managing healthier, fuller crowned, younger trees". The environmental assessment addresses consistency with this management direction.

Comment: *"Accept Mistletoe as a Part of the Forest Landscape ... mistletoe is not a problem for a forest. In a natural forest, mistletoe is normal, a thinning strategy the forest uses much like fire or bugs to maintain space between trees. Trees live for a very long time with mistletoe infection. ... mistletoe is fine, a part of forest function. ... mistletoe is beneficial and important to many species of birds and wildlife." (3-7) (See cited references)*

Consideration: References cited by the respondent identify effects dwarf mistletoe has on infected trees. These references support the effects briefly summarized in the detailed information provided during the 30-day comment period. As articulated in one of the references cited by the respondent, depending on management objectives and priorities, effects of dwarf mistletoe are interpreted as positive, negative, or usually of mixed consequences (Geils et al 2002). The Deschutes LRMP provides these management objectives. The following sections in the Deschutes LRMP address Forest Health and provide guidelines for addressing dwarf mistletoe infection: (1) the desired future condition of the Forest (page 4-5), (2) the Forest Health goal and associated standards and guidelines (pages 4-36 through 4-37), and (3) the goals and objectives and associated standards and guidelines for the general forest (pages 4-117 and 4-120) and scenic views (pages 4-121 through 4-131) management allocations. A summary of management direction was included in the detailed information prepared for the 30-day comment period (pages 1, 5, and 6). This document also described or made reference to wildlife use of dwarf mistletoe (pages 4 and 6). Redefining Forest Plan goals and objectives and direction are outside the scope of the proposed action. The Environmental Assessment addresses how removal of mistletoe-infected trees will affect wildlife.

Comment: *"...any proposed mistletoe treatment will not be effective. The only way to effectively treat mistletoe is to remove the infected hosts over large areas so that the regeneration grows up faster than the mistletoe can invade from the edges." (3-8) (See cited references)*

Consideration: This issue is considered conjectural and not supported by scientific or factual evidence. References cited by the respondent indicate proposed mistletoe treatments can be effective in reducing spread of mistletoe from overstory trees to understory trees (purpose and need for action). Hawksworth and Wiens (1996) indicate removing infected overstory trees before regeneration is 1 meter tall or 10 years old is a strategy that reduces the likelihood of dwarf mistletoe spreading into the understory. Geils et al (2002) also present this as a strategy for

preventing spread of mistletoe into cut blocks. To be effective in minimizing re-invasion of mistletoe from infected trees along the edges, treatment areas should have as large an area-to-perimeter area as allowable (Hawksworth and Wiens, 1996 and Geils et al, 2002). These sources indicate narrow strips should be avoided and units should be no smaller than 8 hectare (approximately 20 acres).

Comment: *"The agency should not be managing for peak growth rates of commercial tree species. The agency should be managing for a complex forest and a wide range of forest values. Newer research and a more enlightened view of the ecological function of former pests has shown us the value of mistletoe, and … the crucial nature of mistletoe to a functioning forest." (3-9) (See cited references.)*

Consideration: The setting of goals and objectives for management allocations is outside scope of proposed action. The Deschutes LRMP identifies the goals and objectives for each management allocation. The LRMP recognizes that wildlife considerations are one factor that can be used to establish priorities for treating stands affected by "pests" (Standard and Guideline FH-5). The Deschutes Wildlife Tree and Long Implementation Strategy recognizes the wildlife value associated with dwarf mistletoe as well as the undesirable effects mistletoe can have on the landscape (pages 38 to 39).

Cited References by Respondent (Comment 3-7 and 3-8)

Pollock, Michael M., Ph.D. Kieran Suckling. 1995. **An Ecologically Integrated Approach to Management of Dwarf Mistletoe (Arceuthobium) in Southwestern Forests.** Southwest Forest Alliance May 5, 1995.
http://www.sw-center.org/swcbd/Programs/science/mistltoe.html

Review: This paper includes information on the ecology of dwarf mistletoes which infect ponderosa pine and Douglas fir. According to the author, it "primarily focused on applying this information to management of Southwest ponderosa pine forests." Topics covered in the section on ecology include: (1) consumers of dwarf mistletoe, (2) witches brooms as wildlife habitat, (3) dwarf mistletoe and snag creation, (4) fire and dwarf mistletoe. Also included is a discussion on the biology of dwarf mistletoe. Topics discussed include: (1) the life cycle of dwarf mistletoe and short distance seed dispersal, 2) long distance seed dispersal, (3) pollination, and 4) tree host selection. This paper includes a section on the "effect of land-use practices on the ecology of dwarf mistletoe". The authors suggest "fire suppression, livestock grazing and logging are the primary land use practices that have altered the ecology of mistletoe in the Southwest". The paper also includes the authors' suggestion on integrated management strategies for controlling dwarf mistletoe. The authors indicate an integrated strategy would include: (1) No cutting of large diameter trees and snags, (2) thinning understory trees, (3) reestablishing regular ground fires, and (4) reducing livestock densities to a level that will allow a relatively continuous ground cover of herbs and grasses to develop.

Consideration: Information contained in this reference has been considered, but is not included as a cited reference in the Long Prairie Environmental Assessment (EA). This reference does not provide new or contradictory information on the ecology and biology of dwarf mistletoe. Similar information is available from other references cited by the EA. The integrated strategies suggested in this paper depend on the assumption that "an integrated management strategy that restores some of the fundamental components and processes that historically existed … would largely eliminate the mistletoe problem". This paper provides no literature citations or research to support the suggested integrated management strategies

for controlling dwarf mistletoe. Suggested strategies would not be applicable to lodgepole pine, which is the dominant vegetation type in the Long Prairie project area. To use the language of the authors, the "fundamental components and processes that historically existed" in lodgepole pine stands would be different from those assumed in the paper for ponderosa pine.

Conklin, David A., **Dwarf Mistletoe Management and Forest Health in the Southwest**
USDA Forest Service, Southwest Region.
http://www.forestpests.org/diseases/pdfs/dwarfmistletoe.pdf

Review: The introduction of this paper indicates the "report considers past approaches and more recent ideas for managing dwarf mistletoes in the Southwest". The report is divided into four chapters. Chapter 1 provides a brief overview of the general nature of dwarf mistletoe infection. Chapter 2 provides a historical background on dwarf mistletoe control in the Southwest (Arizona and New Mexico). Chapter 3 discusses the effects of past control efforts and considers "various ecological factors which are relevant for management of dwarf mistletoes". The author states, "a century of experience has demonstrated that is virtually impossible to eliminate dwarf mistletoes through partial cutting." Chapter 4 presents management suggestions for dwarf mistletoes and forest health. The author indicates the management suggestions "…are often a compromise between generality and precision. Every stand/area is different. Management decisions should be based on the specific needs and objectives for each area, but within a framework that considers the overall landscape and forest condition."

Consideration: Information contained in this reference has been considered, but this publication is not a cited reference in the Long Prairie Environmental Assessment. This paper does not provide new or contradictory information on the ecology and biology of dwarf mistletoe. In at least a couple of places, the author refers readers to another publication titled "Dwarf Mistletoes: Biology, Pathology, and Systematics" (Hawksworth and Wiens 1996) for more detailed information. This is the same publication cited below as Bennetts et al (1996). This publication was cited in the detailed information describing the Long Prairie proposed action and is cited in the Long Prairie EA. In the chapter on management suggestions, there is a section titled "newly regenerated areas". The suggestions presented in this section would be most applicable to the stands proposed for treatment in the Long Prairie project. The author writes "some of the best opportunities to protect regeneration occur in previously logged or burned areas that were either planted or have regenerated naturally. Often these areas contain infected, 'residual' trees….Removal of infected residual trees, especially the smaller, low-value one, should be a high priority in newly regenerated areas." This recommendation is similar to the guidance found in the Deschutes LRMP and in other publications cited in the Long Prairie Environmental Assessment.

Pennings, Steven C., and Ragan M. Callaway. 2002. **Parasitic plants: parallels and contrasts with herbivores.** Oecologia.
http://biology.umt.edu/Callaway%20Lab/Full%20text%20papers%20and%20abstracts/oecologia2002%20parasitic%20plants.htm

Review: This paper compares the interactions between parasites and their hosts and herbivores and their hosts. Topics discussed in the paper include: (1) host choice, (2) impacts on hosts, and (3) impacts on communities. Brief reference is made in the paper to dwarf mistletoe.

Consideration: This citation does not provide new or contradictory information on dwarf mistletoe. It is not referenced in the Long Prairie Environmental Assessment. The general nature of the paper limits it's usefulness in assessing the effects of proposed treatments.

Geils, Brian W.; Cibrián Tovar, Jose; Moody, Benjamin, tech. coords. 2002. **Mistletoes of North American Conifers**. Gen. Tech. Rep. RMRS–GTR–98. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 123 p. http://extension.usu.edu/forestry/Reading/Assets/PDFDocs/RMRS_GTR_098.pdf

Review: This publication provides a recent summary of mistletoes of North American conifers. Topics addressed include: (1) life history (2) spread and intensification, (3) physiology of dwarf mistletoe parasitism, (4) ecological an evolutionary effects, (5) consequences to resources and other values, and (6) management strategies for dwarf mistletoe.

Consideration: This citation is a comprehensive review of the literature on mistletoe. It is cited as a reference in the Long Prairie Environmental Assessment.

Bennetts, Robert E., Gary C. White, Frank G. Hawksworth, and Scott E. Severs. 1996. **Dwarf Mistletoes: Biology, Pathology, and Systematics The Influence of Dwarf Mistletoe on Bird Communities in Colorado Ponderosa Pine Forests.** Agriculture Handbook 709. USDA Forest Service, Washington, DC. Mar 1996.

Note: This reference is cited in the Long Prairie Literature Cited section as:
Hawksworth, F. G. and D. Wiens. 1996. Dwarf mistletoes: biology, pathology, and systematics. Ag. Hndbk 709. USDA Forest Service. 410 p.

Review: This publication provides a summary of dwarf mistletoe. Topics addressed include: (1) Generalized life cycle, (2) sexual reproductive biology, (3) mechanism and trends of evolution, (4) host relationships, (5) ecological relationships, (6) biotic associates, including birds, mammals, and insects, (7) pathogenic effects, and (8) control.

Consideration: This citation is a comprehensive review of the literature on mistletoe. This publication is cited in the Long Prairie environmental assessment.

Maloney, P.E.; Rizzo, D.M. 2002. **Dwarf mistletoe-host interactions in mixed-conifer forest in the Sierra Nevada**. Phytopathology. 92(6):597-602.

Review: This publication addresses the dwarf mistletoe-host interactions of white fir (*Abies concolor*) and Jeffrey pine (*Pinus jeffreyi*). The paper describes the results of a study to understand dwarf mistletoe patterns of spread, host effects, and bark beetle interactions in the Sierra Nevada. In the discussion section of the paper, incidence and severity in the Jeffrey pine-*Arceuthobium* interaction was strongly correlated to host density. The authors' study found no strong positive relationship between dwarf mistletoe-infected hosts and bark beetle incidence. The author states "..in the case of Arceuthodium campylopodum infection on Jeffrey pine, logging appears to play a role in increased infection and intensity."

Consideration: Information contained in this reference has been considered, but is not included as a cited reference in the Long Prairie Environmental Assessment. The Long Prairie project does not identify dwarf mistletoe in white fir to be of concern. The white fir mistletoe information presented in this publication is not applicable to the stands being

considered for treatment in the Long Prairie project. Insufficient information is presented on the type of logging done in the study site to determine how applicable the results would be to stands proposed for harvest in the Long Prairie project.

Hawksworth, F. G. 1985. **Insect-Dwarf Mistletoe Associations**. P. 49-50, In, Proceedings Of The 36th Annual Western Forest Insect Work Conference, Boulder, Colorado. March 4-7, 1985. Northern Forestry Centre, Canadian For. Service, Edmonton, 54p.

Review: This article presents a short discussion on the associations between insects and dwarf mistletoe infected trees. The author notes many of the publications that deal with the subject are observational with little or no quantitative data. The following general associations noted include: 1) heavily infected ponderosa pine trees were more susceptible to mountain pine beetle than non-mistletoed trees, and 2) mistletoe-infected Rocky mountain lodgepole pine may be less susceptible than non-mistletoed trees. The paper also included, however, a different observation for lodgepole pine in the Sierra's. It was suggested that lodgepole pine in the Sierra's is more susceptible to the mountain pine beetle than mistletoe-free trees. The paper concluded that much more research is needed to quantify the interactions of bark beetles and dwarf mistletoes in tree killing.

Consideration: Information contained in this reference has been considered, but is not included as a cited reference in the Long Prairie Environmental Assessment. Hawksworth and Wiens (1996), which is cited in the Long Prairie Environmental Assessment, address these interactions.

Johnson, D. W.; Yarger, L. C.; Minnemeyer, C. D.; Pace, V. E. 1976. **Dwarf Mistletoe As A Predisposing Factor For Mountain Pine Beetle Attack Of Ponderosa Pine In The Colorado Front Range**. U.S. For. Serv., Rocky Mountain Region, Forest Insect And Disease Manage. Tech. Rept. R2-4, 7 P.

Review: We were able to locate an abstract of this publication. According to the abstract, 4 stands of mistletoe infected ponderosa pine were surveyed. In areas where mistletoe infection was low, there was no relationship between bark beetle attack and dwarf mistletoe infection. Preliminary results suggest that there may be a positive relationship between mountain pine beetle attraction to mistletoe infected trees in stands where the dwarf mistletoe infection is high.

Consideration: Information contained in the abstract of this reference has been considered. Interactions between dwarf mistletoe and mountain pine beetles are summarized in Hawksworth and Wiens (1996), which is cited in the Long Prairie Environmental Assessment.