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Environmental Assessment

Lower Fly Creek Project

Flymon Stewardship

Sisters Ranger District, Deschutes National Forest
Jefferson County, Oregon

T.12S. R.10&11 E.W. M., sections 1, 2, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 17, and 18.

Lower Fly Creek Wildlife Primitive Area

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SUMMARY

The Deschutes National Forest proposes to restore wildlife habitat within mule deer winter range by conducting restoration work through ecologically driven tree thinning, shrub mowing, and prescribed fire in second growth ponderosa pine forests. In addition, the project proposes to remove encroaching western juniper, close roads that hydrologically affect Lower Fly Creek, and remove invasive plants. Activities will occur over 4,412 acres in the in the Lower Fly Creek Project area

In 2006 the National Wild Turkey Federation (NWTF) approached the Sisters Ranger District with interest in a watershed level wildlife habitat enhancement project for the Fly Creek watershed. Due to the history of wildfire in the area and the recent number of landscape scale stand replacing wildfires across the Ranger District, there was concern with the long term viability of wildlife habitat within the Fly Creek area and specifically the Fly Creek Wildlife Primitive Area. There were also concerns about road densities and invasive plants.

In 2007 and 2008 two Decision Memos were approved to implement stewardship restoration activities on about 550 acres. Given that previous analysis efforts involved in the preparation of two categorical exclusions, it was felt that an environmental assessment was necessary to document the cumulative effects of this third phase of the project, the Lower Fly Creek Project.

The Forest Service evaluated two alternatives:

Alternative 1 - No Action. No change would occur in the management of the area.

Alternative 2 - Proposed Action. The action proposed by the Forest Service to meet the purpose and need would implement mosaic thinning from below to conifer stands, reintroduce prescribed fire, and remove encroaching Western juniper on approximately 1,883 acres in the Lower Fly Creek watershed. Special care would be taken to thin around existing old growth ponderosa pine trees and to protect them during prescribed fire. Existing large snags would also be protected from prescribed fire and thinning operations. It is estimated that trees up to 21” diameter of which 99% are less than 16” diameter would be removed.

Forest Service roads 1100-980, 1129-874, 1129-975, and 1129-876 would be closed due to the poor quality of existing wildlife cover and to limit disturbance to wintering mule deer, as well as restore hydrologic function.

Lastly, treatments for invasive plant sites are limited to hand pulling only. Sites have been identified adjacent to vegetation restoration treatment units associated with Forest Road 1170-400, 1170-900, 960 and in the vicinity of the 2055-014/017; these sites will be treated by hand.

Based upon the effects of the alternatives, the Responsible Official will decide:

1. whether the Proposed Action would proceed as described, as modified, or not at all; and
2. what mitigation measures and monitoring requirements would be applied to the project.

For this decision, the Sisters District Ranger is the Responsible Official.

CHAPTER 1. 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: Hydrology, Fisheries, Botany, Heritage Resources, Wildlife, Soils, and Forest Vegetation. Within each section, the affected environment 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 Sisters Ranger District Office in Sisters, Oregon.

Background

In 2006, the National Wild Turkey Federation (NWTF) approached the Sisters Ranger District with interest in a watershed level wildlife habitat enhancement project for the Fly Creek watershed. Due to the history of wildfire in the area and the recent number of landscape scale stand replacing wildfires across the Ranger District, there was concern with the long term viability of wildlife habitat within the Fly Creek area. There were also concerns about road densities and invasive plants. Due to the lack of funding and availability of time to complete an environmental assessment at a watershed scale, a much smaller project was initiated. Given the stewardship work the NWTF had completed on the neighboring Crooked River National Grassland (CRNG) and both

projects are located within the Metolius Mule Deer Winter Range, it was determined that the Fly Creek area could serve as a stewardship project. By creating this adjacent stewardship area, the CRNG and Sister Ranger District could accomplish management objectives for the Metolius Mule Deer Winter Range at the landscape level. Thus, the NWTF signed a Challenge Cost Share agreement for stewardship with both the Ochoco and Deschutes National Forest expiring September 30, 2013.

To extend the work capacity of the Stewardship process Regional Forester Linda Goodman signed a Stewardship Agreement with the NWTF extending the stewardship project to September 30, 2018. In 2007 and 2008, two Decision Memos were approved to implement stewardship restoration activities on about 550 acres. Given that previous analysis efforts involved the preparation of two categorical exclusions, it was felt that an environmental assessment was necessary to document the cumulative effects of this third phase of the project.

Purpose and Need for Action

The purpose of the project is to meet the objectives for mule deer winter range, bald eagle as well as other species as defined for Management Area 7 and Management Area 8 in the Deschutes National Forest Land and Resource Management Plan (LRMP). The project would promote the growth of younger trees and move the area to Old Growth Forest/Late Old Structure to meet the objectives for ponderosa pine forest as defined in Forest Plan Amendment #2, the East Side Screens. Additionally, the project would reintroduce prescribed natural fire, reduce open road densities to maximize the effectiveness of the wildlife primitive area associated with Lower Fly Creek, minimizing disturbance to wintering mule deer and other species, while reducing the spread of invasive plants to restore native vegetation.

There is a need to thin stands from below to reduce stand densities, promoting the desired stand condition. Stands are currently overstocked and need silvicultural treatment. Treatment would allow the growth of grasses and shrubs, as well as aiding in the development of Late and Old Structure (LOS).

Desired Future Condition

The Deschutes National Forest LRMP provides direction for the desired future condition. The desired future condition for Management Area -7 states that “Important Deer winter and transition ranges are managed to achieve a desirable arrangement of cover and forage. Cover, usually not exceeding 40 percent, is provided by stands which vary in size. These stands have intermingled openings with a variety of grasses, forbs, and shrubs available for forage. This forage is maintained by prescribed burning.”

Stand structure would reflect the Historic Range of Variability (HRV) for ponderosa pine forests, including LOS, where low intensity fires can burn without risk of a stand replacement event. Shrubs and grasses are generally young and vigorous reflecting the influence of frequent low intensity fire. Understories would be composed of native plants with little to no non-native plants and/or invasive plants. Shrubs are present but not dominant; patches of shrubs would provide browse for deer and elk and nesting habitat for birds.

The desired future condition is an open mosaic of ponderosa pine dominated forest, dominated by one or two storied stands of large trees, with smaller patches of younger trees in even age clumps about 1/2 acre in size. Stand density would be variable, in a "gappy, patchy, clumpy" configuration. Stand basal area would be from 60 to 80 square feet per acre on sites which can support these densities over time. Single snags, patches of snags and down woody debris would be abundant.

In the eastern portion of the project area, where juniper is the dominant overstory tree, junipers that do not exhibit old growth characteristics would be removed from the stand. This area would be managed for individual occurrences of ponderosa pine.

Additional objectives for desired future condition would focus on developing late and old structure ponderosa pine for obligates such as the white-headed woodpecker and pygmy nuthatch.

Although 99% of the project occurs within Management Area 7, Unit 13 falls within Management Area 8, "General Forest". Unit 13 is still considered biological winter range, regardless of the allocation. Management Area 8 emphasizes timber production and tends to be less restrictive with its management direction, therefore the project will manage Unit 13 with the same objectives for mule deer and the variety of other wildlife as the rest of the project. This direction will be a much more conservative approach and will be consistent with the entire project area.

Proposed Action

The action proposed by the Forest Service to meet the purpose and need would thin conifer stands from below, reintroduce prescribed fire, and remove western juniper on approximately 1,884 acres in the Lower Fly Creek watershed. Special care would be taken to thin around existing old growth ponderosa pine trees and to protect them during prescribed fire. Existing large snags would also be protected from prescribed fire and thinning operations to the extent possible.

The upper diameter limit of trees to be thinned is 21" diameter at breast height as established by the East-Side Screens. However, estimates from timber stand examinations indicate that the majority of trees (approximately 99%) which need to be removed for density management are smaller than 16"dbh. In fact, estimates show that approximately 80% of the trees to be removed are less than 8"dbh. Ground-based logging systems would be used to remove timber. The project does not require any new road construction. Activity fuels would be treated by prescribed burning or by burning fuel concentrations or through utilization.

During the analysis process for the Flymon Stewardship Demo project the transportation report identified Forest Road 1170-900 to be closed as outlined in the Eyerly Fire Roads Analysis. The road would be closed following vegetation restoration treatments. In addition, due to the poor quality of existing wildlife cover and to limit disturbance to wintering mule deer, Forest Service roads 1100-980, 1129-874, 1129-975, and 1129-876 would be closed.

Currently treatments for invasive plant sites are limited to hand pulling only. Invasive plant sites have been identified adjacent to vegetation restoration treatment units associated with Forest Road 1170-400, 1170-900, 960 and in the vicinity of the 2055-014/017; these sites will be treated by hand. Upon completion of the Ochoco/Deschutes Invasive Plant Environmental Impact Statement, if treatments have not been implemented or it has been determined those sites need additional treatment; Best Management Practices would be implemented.

Decision Framework

Given the purpose and need, the Responsible Official reviews the proposed action and the other alternatives in order to make the following decisions:

whether the Proposed Action would proceed as described, as modified, or not at all; and

what mitigation measures and monitoring requirements would be applied to the project.

The decision would be made by the District Ranger who is the Responsible Official.

Public Involvement

The proposal was provided to the public and other agencies for comment during scoping in May 2009. In addition, as part of the public involvement process, a collaborative working group was formed from parties associated with the Westside Stewardship project and members of the public interested in wildlife management on the Sisters Ranger District. The collaborative working group consists of private contractors and adjacent landowners, Portland General Electric, Oregon Department of Fish and Wildlife, CRNG, NWTF, and the Confederated Tribes of Warm Spring, Oregon. The collaborative working group would define and recommend the out-year work to be accomplished within the project area.

The collaboration efforts for this project meet the intent of Forest Service Handbook 2409.19(61.12). The project provided a 30 day scoping period beginning on May 18, 2009. The scoping letter was mailed to 353 individuals, businesses, organizations and other interested parties, including the Confederated Tribes of the Warm Springs on May 14, 2009. As a result of this scoping process, comments were received from two respondents. Although public scoping period for the project ended June 16, all comments received were taken into consideration. No significant issues were identified in the comments provided by the public, or other agencies.

Issues

The Forest Service separates the issues into two groups: significant and non-significant issues. Significant issues were defined as those directly or indirectly caused by implementing the proposed action. Non-significant issues were identified as those:

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)…".

Significant/Key Issues: Since no significant issues were identified through scoping, none were used to design an alternative to the proposed action. Significant issues were identified by the interdisciplinary team during project planning and were resolved by incorporation through project design.

Analysis Issues: The following are Analysis Issues, which are used to determine the effects of the alternatives on specific resource areas within the project. These include Hydrology, Fish Habitat Protection, Sensitive and Invasive Plants, Heritage Site Protection, Wildlife, Soils, and Forest Vegetation.

Hydrology- Fly Creek is not a 303(d) listed stream under the Clean Water Act. The creek contains a population of redband trout, a Forest Service Region 6 Sensitive Species. Sedimentation is not a significant issue because project design criteria and mitigation measures would be taken to avoid any potential sedimentation.

> *Indicator: Minimize sedimentation into Fly Creek from runoff by complying with Riparian Habitat Conservation Areas as defined by in INFISH.*

Fish Habitat Protection- Fly Creek is an intermittent stream within the project area, but contains perennial sections upstream of the project area near the mouth of Six Creek and downstream from the project area on private property where it enters Lake Billy Chinook. These perennial sections contain populations of redband trout. Through project design, all Riparian Habitat Conservation Areas (RHCA) within the project will be buffered. Sediment would not be expected to reach fish bearing streams due to the high infiltration rates of the soils, RHCA buffers, and the long distances from fish bearing sections.

> *Indicator: Minimize fine sedimentation into Fly Creek to mitigate effects to redband trout spawning and rearing complying with Riparian Habitat Conservation Areas as defined by in INFISH.*

> *Indicator: Minimize impacts to red-band trout populations in Fly Creek.*

Sensitive and Invasive Plants- Peck's penstemon is rare endemic plant in the project area. Mitigation measures provide for avoidance and reduced disturbance would protect plants. Mitigation for the protection of the plant will be to exclude any known populations from vegetation management units or ground disturbing activities.
There are populations of invasive non-native plants along several roads in the project area. These include Spotted and Diffuse Knapweed, St. Johns Wort, Dalmation Toadflax, Field Bindweed, Bull Thistle, and Medusa Head. Project design should ensure that this invasive is not spread. Mitigations would reduce the spread of invasive non-native plants and monitoring will be used to detect any new populations and physical removal will be attempted.

> *Indicator: Number of sites with protection measures implemented for Peck's penstemon.*

Indicator: Number of sites with prevention measures to prevent the spread of invasive plants.

Heritage Site Protection- Many cultural resource sites are located within the Lower Fly Creek project area. Sites would be avoided or monitored during project implementation. Mitigation at sites would include limiting treatments to hand thinning only, and hand piling activity generated slash rather than broad cast burning.

Indicator: Protection of known sites and with monitoring of project activity in the vicinity of these sites.

Wildlife Protection- Thinning, mowing and burning can remove forage, hiding cover, thermal cover and nest sites for wildlife. Connectivity of habitat provided by large old trees, dead trees and downed wood or coarse woody debris can be affected by thinning and prescribed fire. The proposed action was designed to protect and minimize short-term impacts to habitat and meet the requirements of the Eastside Screens for wildlife habitat. Actions would maintain nesting and foraging habitat, and hiding and thermal cover for wildlife needs. Thinning prescriptions are based on the inherent soil quality, therefore variable mosaic thinning patterns and untreated patches will provide habitat diversity and leave a variety of habitats on the landscape. A variety of specific design criteria and mitigation measures are outlined to protect snags and restrict disturbance around nests if they are discovered.

Indicator: Several habitat features are examined; large old trees, habitat connectivity for various, snag and coarse down wood habitats, changes to nesting and foraging habitats, and changes to cover and forage.

Soils- The use of ground based equipment for thinning or mowing can increase the amount and distribution of detrimental soil conditions, including compaction. Removing trees or prescribed burning can potentially cause adverse changes to soil organic matter levels. Use of equipment on soils with seasonal water tables can cause resource damage. Soils within sensitive riparian areas and adjacent to streams can increase the potential for sediment delivery following soil disturbance. The proposed action was designed to avoid or minimize potentially adverse impacts to soils by restricting equipment operations to locations and conditions that are less susceptible to resource damage. Project design criteria include minimizing the extent of new soil disturbance from mechanical treatments by implementing appropriate design features for avoiding or minimizing detrimental soil impacts from project activities. Detrimental soil conditions would not exceed Forest Plan standards.

Indicator: Change in extent of detrimental soil disturbance.
Indicator: Amount of coarse woody debris (CWD) and surface organic matter retained.
Indicator: Project design applied to minimize adverse impacts that would alter the soils ability to function in a desirable manner.

Forest Vegetation- The project area is on the edge of National Forest system lands, where the inherent soil quality and productivity varies in large degrees. In areas where the inherent soil quality is highly productive, altered successional patterns from past harvest and fire exclusion are working against the long-term survival of remnant old-growth trees. Second growth forests are uniform in tree size, structure, and densities and

unlikely to grow to resemble the patterns and structure found in historic old growth forests without the re-creation of a mosaic of tree sizes and densities based on the inherent soil quality and the reintroduction of fire. The action alternative was designed to restore the structure, density, species composition, and fuel profile of the ponderosa pine forests to within the historic range of variability found within this forest and soil type.

Indicator: Improvements to Forest Health Sustainability and Resiliency
Indicator: Size of Tree Removed.
Indicator: Economic viability, lack of commercial product associated with the project area, and cost per acre to complete restoration activities.

Fire Hazard- The project area has missed 6 to 11 natural fire cycles and this has led to a buildup of forest fuels that would support moderate to high intensity fire behavior if an unplanned wildfire was to occur. Most of the area is in a Fire Regime (FR) 1 and 2 but contains a small portion of Fire Regime 3. Condition Classes (CC) in the project area consist of CC 2 and CC 3, indicating a moderate to high risk of losing key ecosystem components in the case of a wildfire. The forests, plants, and much of the wildlife in the area are fire dependent and would benefit from low intensity fire playing its natural role. The action alternative would move the trend in condition class from moderate to high, to moderate to low, reducing the risk of losing key ecosystem components in the event of a wildfire.

Indicator: Acres of the project area moved from high intensity wildfire fuels conditions to moderate or low intensity wildfire fuels conditions.
Indicator: Acres of the project reducing western juniper encroachment through mowing, thinning, and burning.

Analysis Issues Not Considered:

Recreation - No developed recreation occurs within the project area; therefore it was not addressed as an analysis issue.

Scenic Values - Although there are short-term visual impacts from thinning, mowing, and burning there are no land allocation identifying scenic values in the project area; therefore it was not addressed as an analysis issue.

CHAPTER 2. ALTERNATIVES, INCLUDING THE PROPOSED ACTION

This chapter describes and compares the alternatives considered for the Lower Fly Creek Project. It includes a description and map of each alternative considered. This section also presents the alternatives in comparative form, 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., helicopter logging versus the use of skid trails) and some of the information is based upon the environmental, social and economic effects of implementing each alternative (i.e., the amount of erosion or cost of helicopter logging versus skidding).

Alternatives Considered but not in Detail

The proposed action was developed in cooperation with a collaborative working group made up of special interest groups, private and public agencies, as well as the general public. Therefore, during the scoping process no issues were raised that would warrant developing another action alternative. Also, through project design no internal issues were raised to consider other action alternatives.

Alternatives

Alternative 1. No Action

Under the No Action alternative, current management plans would continue to guide management of the project area. No thinning of conifer stands from below, removal of western juniper, mowing, and prescribed natural fire, pulling of invasive plants, or closing roads would be implemented to accomplish project goals.

Stand structure and density under the no action alternative would continue to deviate from historical conditions. Stand structure of most stands would consist of dense, multi-storied canopies, resulting in large areas of contiguous ladder fuels. Dead fuel on the surface would continue to accumulate in the form of decadent brush, dead material from insect and disease mortality, limbs, and needles, adding to the fuels that have accumulated since the last burn cycle. The shift in species composition towards fire intolerant species (western juniper and white fir) would continue. There would be less fire-resistant species on the landscape, and there would be more ladder fuels from the fire tolerant trees in the understory. Wildlife habitat would diminish overtime for ponderosa pine obligates as well as species that utilize ground vegetation for both nesting and foraging. Densification of forest stands would greatly limit the diversity of grasses, shrubs, and forbs within the project area.

Roads identified for closure due to hydrologic function would continue to provide sediment inputs to Lower Fly Creek, cumulatively causing issues to redband trout habitat.

In addition, those roads in excess of Forest Plan Standards and Guides for mule deer winter range, wound continue to create a disturbance and displace wintering mule deer.

Invasive plants associated with the major routes, would annually be on a schedule for treatment through our invasive plant program. However, within the interior of the project area, populations associate with secondary road systems would rank out as a lower priority. Populations would increase, out competing native plants for resources, diminishing wildlife habitat in the project area.

Figure 1. Project Vicinity and Land Allocations

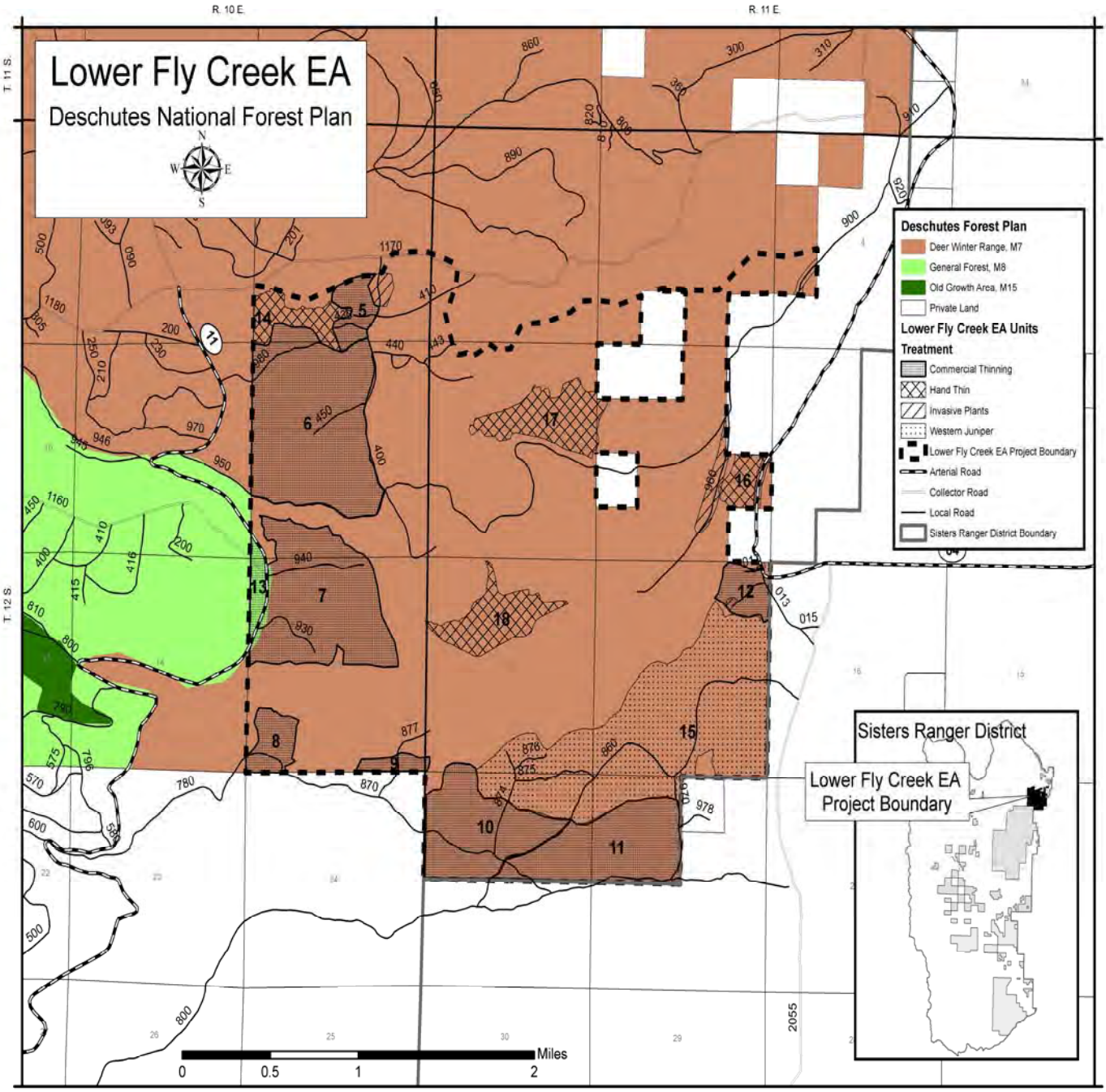


Figure 2. Project Proposed Action

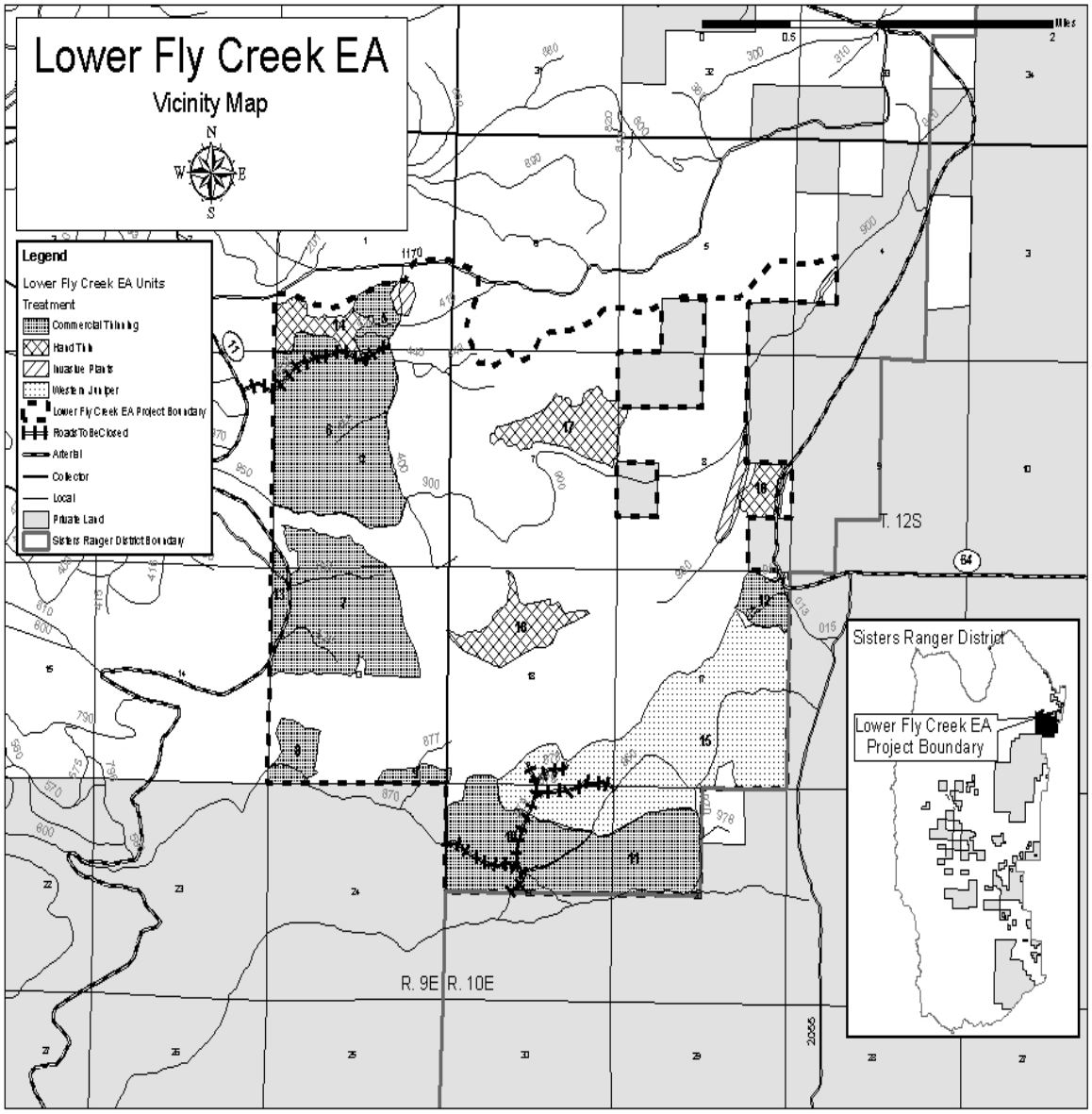


Table 2-1: Proposed Action Treatment Units by Prescription

Unit Number	Prescription	Acres
5	Variable thinning from below, full utilization of biomass	38
6	Variable thinning from below, full utilization of biomass	306
7	Variable thinning from below, full utilization of biomass	262
8	Variable thinning from below, full utilization of biomass	42
9	Variable thinning from below, full utilization of biomass	17
10	Variable thinning from below, full utilization of biomass	163
11	Variable thinning from below, full utilization of biomass	178
12	Variable thinning from below, full utilization of biomass	39
13	Variable thinning from below, full utilization of biomass	22
14	Variable non-commercial thinning from below, full utilization of biomass	85
15	Western Juniper removal, utilization of biomass with available juniper markets	530
16	Variable non-commercial thinning from below, full utilization of biomass	28
17	Variable non-commercial thinning from below, full utilization of biomass	94
18	Variable non-commercial thinning from below, full utilization of biomass	80

Note: Within all ponderosa pine stands, prescribed natural fire would be utilized to maintain fuel level in the future.

Alternative 2. Proposed Action

The proposed action to meet the purpose and need would thin conifer stands from below, reintroduce prescribed fire, and remove western juniper on approximately 1,884 acres in the Lower Fly Creek watershed. Special care would be taken to thin around existing old growth ponderosa pine trees and to protect them during prescribed fire. Existing large snags would also be protected from prescribed fire and thinning operations.

The upper diameter limit of trees to be thinned is 21" diameter at breast height as established by the East-Side Screens. However, estimates from timber stand examinations indicate that the majority of trees (approximately 99%) which need to be removed for density management are smaller than 16"dbh. In fact, estimates show that approximately 80% of the trees to be removed are less than 8"dbh. Ground-based logging systems would be used to remove timber. The project does not require any new road construction. Activity fuels would be treated by prescribed burning or by burning fuel concentrations or through utilization.

During the analysis process for the Flymon Stewardship Demo project the transportation report identified Forest Road 1170-900 to be closed as outlined in the Eyerly Fire Roads Analysis. The road would be closed following vegetation restoration treatments. In addition, due to the poor quality of existing wildlife cover and to limit disturbance to wintering mule deer, Forest Service roads 1100-980, 1129-874, 1129-975, and 1129-876 would be closed.

Currently treatments for invasive plant sites are limited to hand pulling only. Site have been identified adjacent to vegetation restoration treatment units associated with Forest Road 1170-400, 1170-900, 960 and in the vicinity of the 2055-014/017; these sites will be treated by hand. Upon completion of the Ochoco/Deschutes Invasive Plant Environmental Impact Statement, if treatments have not been implemented or it has been determined those sites need additional treatment; Best Management Practices would be implemented.

HABITAT ENHANCEMENT ACTIVITIES AND TECHNIQUES

Variable Thinning from Below

The following vegetation management would occur on approximately 1067 acres in units 5, 6, 7, 8, 9, 10, 11, 12, and 13.

Thinning:

- Retain all "old growth" trees that appear to have been part of the original, pre-settlement/pre-fire suppression forest, regardless of size. These trees have the following characteristics: yellow bark with wider plates, well developed, rounded or flat crowns, and bigger, long, or droopy branches.
- Concentrate thinning in the young post-settlement (i.e., <120 years old) black bark pine component.
- Densities and Spatial Arrangement:

- Residual densities would be variable in a "gappy, patchy, clumpy" pattern to emulate historical stand conditions.
- Residual basal area would be based on the **inherent soil quality** and the productivity of the site as defined by the soil scientist and silviculturist, with prescriptions recommending optimum tree production.
- Densities would vary from 40 sq. ft. to 80 sq. ft. of basal area.
- Unthinned clumps will be retained in each unit in areas where the inherent soil quality will support denser stands. Clumps will be distributed to provide to provide connectivity throughout thinning units. Clump size should be 1/10th to 1 acre in size.
- In addition, to maintain unique habitat characteristics within the project area, approximately 57% of the area will remain untreated providing a variety of wildlife habitat and connectivity.

o Species Composition:
- Ponderosa pine would be the desired species in all cases
- Remove the majority of species other than ponderosa pine if they appear to have been established in the last 100 years. Some post-settlement species, other than ponderosa pine (incense cedar), may be left occasionally as scattered individuals or very small clumps.
- 0-3 pre-settlement/pre-fire suppression ponderosa pine trees occur per acre.
- Douglas-fir would be the second most desired species.
- Cedar also existed within the stand and should remain a component in the understory.

o Snags and Down Wood:
- Retain all snags and down wood.
- No new snags would be created. Recruitment would come from decadent trees and/or diseased and stressed trees.

o Hand Thinning
- Non-commercial hand thinning would occur within these units as a follow up treatment to commercial removal. Tree densities are low and therefore will be lopped and scattered so there are no concentrations of thinning slash.

Fuels Treatment Associated with Variable Thinning

o Thinning Slash:
- Feller Buncher Operation:

  Whole tree logging, slash concentrated at landings.

  Utilization would be the preferred method of fuels treatment. Utilize as much of the thinned trees as possible (e.g., utilize small trees, limbs and tops if there is a market for that material).

  Pile slash at landings and burn the piles in the fall or winter.

For unutilized material/slash, lop and scatter for jackpot burn if remaining, unused slash is minimal

Hand pile where concentrations of slash remaining in the woods are high and would risk the health of leave trees.

- Cut to Length Operation:

  Material is processed on the trails.

  Utilization would be the preferred method of fuels treatment. Utilize as much of the thinned trees as possible (e.g., utilize small trees, limbs and tops if there is a market for that material).

  For unutilized material/slash, lop and scatter for jackpot burn if remaining, unused slash is minimal.

  Grapple pile when large concentrations of slash remain from thinning treatments.

  Hand pile where concentrations of slash remaining in the woods are high and would risk the health of leave trees.

- Ground Fuels:
  - Jack pot burn remaining slash concentration
  - Mow to reduce fuel continuity in the shrubs; mowing would reduce the amount of mortality that could be caused by prescribed fire.
  - To the extent possible, protect snags and appropriate quantities of down wood.

Non-commercial Thinning from Below

The following vegetation management would occur on approximately 287 acres in units 14, 16, 17, and 18.

- Densities and Spatial Arrangement:

  Variable spacing of small diameter trees (under 12 inches dbh), leaving 20-30 feet between remaining trees, averaging around 25 feet between trees.

  Space off of trees over 8 inches dbh where possible.

  Leave the best, largest trees regardless of spacing.

- Species Composition:

  Ponderosa pine would be the desired species in all cases.

  Douglas-fir would be the second most desired species.

  Remove all incense cedar and western juniper under 8 inches.

Unit 14 contains thermal cover habitat for wintering mule deer. In this unit thinning of trees less than 6 inches dbh would occur to maintain thermal cover.

- Thinning Slash:

  Hand pile and burn to remove slash concentrations.

  Where appropriate jackpot burn to remove concentrations.

Western Juniper Removal

The following vegetation management would occur on approximately 530 acres in unit 15.

- Thinning:

  Cut all junipers that do not exhibit old growth characteristics. Remove bowl wood where possible to minimize fuel concentrations.

  Where densities of pine and conifers other than western juniper exist require variable spacing of small diameter trees (under 8 inches dbh), leave 20-30 feet between remaining trees, averaging around 25 feet between trees.

  Space off of trees over 8 inches dbh where possible.
- Thinning Slash:

  Hand pile and burn to remove slash concentrations.

  Due to the amount of limbs and slash associated with thinning, masticate piles if necessary.
- Ground Fuels:

  Antelope bitterbrush is associated with these units and provides critical winter forage and security cover. To reduce continuity in the ground fuels and enhance early seral browse in the area, mow approximately 25% -35% of the unit associated with the juniper removal areas.

Road Closures

- Prior to closing any roads, install sufficient drainage to provide hydrologic function and reduce sedimentation until the site is fully occupied with vegetation. Re-close any road closures that have been breached within the project area.
- The following Forest Service roads have been identified for decommissioning: 1100-980, 1129-874, 1129-876, and 1129-875 totaling approximately 2 miles. Roads will be decommissioned upon the completion of the prescribed vegetation management identified above.

Prescribed Natural Fire

- Post treatment within all ponderosa pine units; prescribed natural fire would be utilized to maintain fuels levels in the future.

Weed Treatments

- Approximately 45 acres of invasive plant sites occur within the project area. Treat invasive plants with best management practices as identified by the Deschutes National Forest noxious invasive plants program. Minimally the sites would receive hand pulling.

Project Design Features

The following features are incorporated into the design of all activities included in the Lower Fly Creek Project. These are features that are considered routine, have been used on similar projects, and are either incorporated into contract provisions or accomplished between appropriate resource specialists, and have proven to be effective. Project Design Features are used as a basis for determining and disclosing effects in the Environmental Consequences (Chapter 3) discussions.

Rating. The rating criteria for effectiveness of mitigations measures are listed below:

Poor: The action would have benefit, but would have a major conflict with other project objectives and goals.

Low: The action would have benefit, but the benefit is difficult or expensive to achieve and of minor value, and may have conflicts with other objectives or goals.

Medium: The action would have minor or major benefit, and conflicts with other objectives or goals are minor or none.

High: The action would have major benefit, conflicts with other objectives or goals are minor or none. The action also helps meet other objectives or goals.

The following are incorporated into this project:

Hydrology

1. Water quality objectives are established prior to preparation of the burn plan to provide for water quality protection while achieving the management objectives through the use of prescribed fire (LRMP RP-35; Fuels Management BMP F-2 and F-3).
    a. Water diversions on fire lines will be constructed to drain water into areas with sufficient ground cover to avoid sediment transport to stream channels. *High effectiveness*
    b. A protective strip of undisturbed ground surface will be provided between prescribed burn areas and riparian transitional areas if sediment movement to stream channels is likely. *High effectiveness*
2. Road maintenance shall be performed on a frequency necessary to maintain drainage efficiency at all runoff control and drainage structures, e.g., dips and culverts. Road management objectives shall include direction to minimize soil erosion. Dispersal of runoff can reduce peak downstream flows and keep water in its natural drainage area (LRMP RP-22 and RP-23; Road Systems BMP R-7 and R-18 thru R-20; Timber Management BMP T-7 and T-8).
    a. Forest Service road 1170-400 crosses an unnamed intermittent stream and will require immediate maintenance to minimize the erosive effects of water, disperse runoff from or through this road, and to minimize the sediment generated from this road. A number of measures can be used, alone or in combination, to minimize possible detrimental effects of surface drainage. Dispersal of runoff from roads can be accomplished by rolling the grade, insloping with cross drains, outsloping, crowning, installation of water spreading ditches, contour trenching, etc. *High effectiveness*
3. Opportunities to relocate, close, or obliterate existing roads in riparian areas shall be pursued (LRMP RP-24; Road Systems BMP R-23).
    a. Forest Service roads 1170-900, 1100-980, 1129-874, 1129-875, and 1129-876 have been identified for decommissioning and/or closure. Any road being closed and/or decommissioned shall have sufficient drainage to

provide for hydrologic function and reduce sedimentation. *High effectiveness*

4. There will be no scheduled timber harvest in the Riparian Habitat Conservation Areas (RHCA). (LRMP RP-11; Timber Management BMP T-7, T-8, T-10, T-11, T-13, T-15, T-21).
    a. Determination of RHCA size and/or width is in accordance with RHCA standards and guidelines. *High effectiveness*
5. Use sale area maps for designating water quality protection needs (Timber Management BMP T-4). *High effectiveness*

Fisheries

6. Haul of equipment and wood products on the 1170-400 road shall occur during the dry season after the intermittent channel has stopped flowing. If haul is needed when water is flowing monitoring of turbidity and fine sediments downstream of the crossing will be done. Perennial redband trout fish bearing sections are located 5.1 downstream of the 400 road haul crossing. The crossing was hardened with angular rock in 2008 and may need more rock added to the approach on the north side of the crossing if sediment in road runoff becomes an issue. *High effectiveness*
7. If the intermittent channel is flowing and haul is permitted it will be restricted to three log truck loads per day and crossing at speeds of 5 mph or less.
8. No crossings or machinery allowed within 50 feet of the intermittent channel that runs though the northern part of the project area. The only designated crossing is at the 1170-400 road ford. *High effectiveness*
9. Where possible, use existing roads and old skid trails within the project area for thinning operations. Ensure non-system road and skid trails are sufficiently closed to motorized access and proper drainage features are installed. *High effectiveness*
10. Closure of the 1170-900 road shall include water barring and associated restoration to correct erosion problems associated with this road and the intermittent stream channel that parallels the 900 road to the North. This may also require additional barriers at closure points on both ends to prohibit breaches of the closures with ATV's and motor vehicles. *High effectiveness*

Sensitive Plants

11. Excludes sensitive plant populations entirely from ground disturbing activities by unit design. *High effectiveness*
12. Use existing roads and skid trails. *High effectiveness*

Invasive Plants

13. Require clean vehicles and equipment to reduce introduction of invasive plant seed. Wash tires and undercarriages to remove mud, dirt and seeds. *High effectiveness*

14. Work to increase public (including contractors) awareness of invasive plants and their potential negative impact on the environment. Include educational emphasis in prework and other contract meetings. *High effectiveness*
15. Remove invasive plants from project area by hand and monitor each summer until Forest- wide direction changes. *High effectiveness*

Heritage Resources

16. Within the vicinity of eligible or unevaluated historic properties (historic and prehistoric sites); treatments should only include hand treatment, mowing, or no treatment at all. Under-burning could be used at sites with only prehistoric components. *High effectiveness*

Wildlife

17. No existing snags are targeted to be cut or removed unless they pose a hazard to mechanical operations under OSHA regulations (Deschutes National Forest LRMP WL-38). No coarse woody debris would be intentionally removed or lost with the exception of what may occur through prescribed fire; however project design will minimize the potential for snag loss. (Deschutes National Forest LRMP WL-72). *High effectiveness*
18. During prescribed fire operations consider lining large snags and large down logs (i.e. 21 inches diameter or larger) that are at a high risk of consumption. Criteria to apply include: 1) is the snag likely to burn?, 2) Is it a large snag > 21" diameter?, 3) Can duff be raked away around the snag to reduce the probability it will burn? If so, line the snag if possible. *High effectiveness*
19. During prescribed fire operation, consumption of down wood is restricted to the following criteria. Consumption of down wood at least 12 inches in diameter at the small end and at least 6 feet in length (at rate of 40 lineal feet per acre in ponderosa pine) will not exceed 3 inches total (1 ½ inches per side). This complies with Forest Plan Amendment #2 (USDA 1995). *High effectiveness*
20. Consider spring burning (when 1,000 hour fuel moistures are higher) to decrease the chances of large snag and down wood consumption by fire. *High effectiveness*
21. There are no known raptor nest sites within the project area. Restrict disturbance activities within ¼ mile of any known or newly discovered nests. This condition may be waived in a particular year if nesting or reproductive success surveys reveal that the species indicated is non-nesting or that no young are present that year. The following are a list of raptors and nest their nest restriction dates:
    - Golden Eagle: February 1 to July 31
    - Red-tailed Hawk: March 1 to August 31
    - Northern Goshawk: March 1 to August 31

If a new goshawk territory is discovered, a 30 acre not treatment area around the nest will be identified and a 400 acre Post Fledging Area will be delineated as outlined in the Eastside Screens.

- Cooper's and Sharp-shinned Hawks: April 15 to August 31

High effectiveness

Soils

22. The following implementation guidelines are designed to avoid or minimize potentially adverse impacts to soils by controlling equipment operations to locations and conditions that are less susceptible to resource damage. Project design criteria include minimizing the extent of new soil disturbance form mechanical treatments by implementing appropriate design features for avoiding or minimizing detrimental soil impacts from project activities. Options include using some or all of the following:

    a. Use existing log landing and trail networks (whenever possible) or designate locations for new trails and landings. *High effectiveness*

    b. Designated locations for new trails and landings need to best fit the terrain and minimize the extent of soil disturbance. *High effectiveness*

    c. To minimize detrimental soil impacts attempt to match specialized equipment such as harvester forwarder or all season's vehicles to the types of material being removed. *High effectiveness*

    d. If mechanical slash piling is used machine operations will be limited to working off of existing trails. *High effectiveness*

    e. If traditional harvester skidder equipment is used maintain spacing of 100 to 150 feet for all primary (main) skid trail routes, except where converging at landings. Closer spacing due to complex terrain must be approved in advance by the Timber Sale Administrator and Soil Scientist. Main skid trails have typically been spaced 100 feet apart (11% of the unit area). For the larger activity areas (greater than 40 acres) that can accommodate wider spacing distances, it is recommended that distance between main skid trails be increased to 150 feet to reduce the amount of detrimentally disturbed soil to 7 % 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. *High effectiveness*

    f. Restricting skidders and tractors to designated areas (i.e., roads, landings, designated skid trails), and limit the amount of traffic from other equipment off designated areas. Harvester shears will be authorized to operate off designated skid trails at 30 foot intervals and make no more than two equipment passes on any site specific area to accumulate materials. *High effectiveness*

g. Use of directional felling techniques from pre-approved skid trails, and suspending the leading end of logs during skidding operations. *High effectiveness*

h. Past soil monitoring of ground based harvest operations have shown that ground based harvest equipment can operate on soil types found in the planning area when soil moistures are dry to moist without causing excessive soil disturbance. Ground based harvest may also be preformed over frozen ground and or sufficient compacted snow again with minimal soil disturbance. To avoid excessive soil disturbance harvest equipment operations should not occur when soils are wet (i.e. excessive soil moisture present in the soil profile). These conditions are evident by equipment operations resulting in soil ruts in excess of that produced under dry, moist, or frozen soil conditions. *High effectiveness*

23. Apply appropriate Best Management Practices (BMPs) to all ground disturbing management activities, as described in General Water Quality Best Management Practices (Pacific Northwest Region, 1988). These BMPs are tiered to the Soil and Water Conservation Practices (SWCP) Handbook (FSH 2509.22), which contains conservation practices that have proven effective in protecting and maintaining soil and water resource values. The Deschutes Forest Plan states that BMPs will be selected and incorporated into project plans in accordance with the Clean Water Act for protection of waters of the State of Oregon (Forest Plan 4-69). The following specific BMPs commonly used to minimize the effects of road systems, fuels and timber management activities on the soil resource are briefly described for this project proposal.

a. Use old landings and skidding networks whenever possible. 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 (LRMP SL-1; Timber Management BMP T-16, T-18). *High effectiveness*

b. 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. (LRMP SL-1 & SL-3; Timber Management BMP T-11, T-14 & T-16). *Moderate effectiveness*

c. Surface drainage on temporary roads – minimize the erosive effects of concentrated water through the proper design and construction of temporary roads (Road BMP R-7). *Moderate effectiveness*

d. Road maintenance – conduct regular preventive maintenance to avoid deterioration of the road surface and minimize the effects of erosion and sedimentation (Road BMP R-18, R-19). *Moderate effectiveness*

e. Protect soils and water during prescribed burn operations – a burn plan addressing compliance with all applicable LRMP standards and guidelines and Best Management Practices will be completed before the initiation of

prescribed fire treatments in planned activity areas. Prescribed burn plans need to include soil moisture guidelines to minimize the risk of intense fire and adverse impacts to soil and water resources (LRMP SL-1 & SL-3; Timber BMP T-2, T-3 & T-13; Fuels Management BMP F-2, F-3). *Moderate to High effectiveness*

f. Coarse woody debris/down wood – assure that on Ponderosa Pine sites, a minimum of 5 to 10 tons per acres of large woody debris (greater than 3 inches in diameter) is retained within activity areas to provide organic matter reservoirs for nutrient cycling that helps maintain long-term site productivity (LRMP SL-1). Assure that on Mixed Conifer sites, a minimum of 10 to 15 tons per acres (greater than 3 inches in diameter) is retained for long-term nutrient cycling. *Moderate effectiveness*

g. Maintain duff layer – strive to maintain fine organic matter (organic materials less than 3 inches in diameter; commonly referred to as the duff layer) over at least 65 percent of an activity area (pertains to both harvesting and post harvest operations). If the potential natural plant community (i.e., site) is not capable of producing fine organic matter over 65 percent of the area, adjust minimum amounts to reflect potential vegetation site capabilities (LRMP SL-6; Fuels Management BMP F-2; Timber Management BMP T-13). *Moderate effectiveness*

h. Use sale area maps for designating soil and water protection needs (Timber Management BMP T-4). *Moderate effectiveness*

Roads

24. National Forest System (NFS) roads with native surfaces will only be used as a haul route under dry or frozen conditions. This is in order to protect the road surface and keep the road from becoming incised. *High effectiveness*

25. NFS roads that were opened providing access to complete vegetation management activities will be reclosed by contractors upon completion of work in that unit. *High effectiveness*

26. Non-system roads used for haul would be closed following vegetation management activities or allowed to re-vegetate naturally or be subsoiled. *High effectiveness*

Fire Hazard

27. Conduct prescribed fire in compliance with National Ambient Air Quality Standards, Oregon Department of Environmental Quality regulations and restrictions, and under the Oregon Smoke Management Plan regulations and restrictions. *High effectiveness*

Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in the table is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

Table 2-2. Comparison of Alternatives

Analysis Issue	Alternative 1 No Action	Alternative 2 Proposed Action
Hydrology Impacts to Fly Creek from sedimentation inputs, due to surface runoff from project operations	**No Impact**	**No Impact** ➢ RHCA's are buffered through project design, and implementation units are on slopes significantly less than 30%.
Fish Habitat Protection ➢ Impacts to redband trout spawning and rearing habitat ➢ Impacts to redband trout populations	**No Impact**	**No Impact** ➢ RHCA's are buffered through project design. ➢ RHCA's are buffered through project design. No fine sedimentation would impact red-band trout populations.
Sensitive Plants Probability of detrimental impact to rare plant populations	**No Effect**	**No Effect** ➢ Populations are avoided through project design
Invasive Plants Acres of detrimental soil disturbance created that will encourage or facilitate invasive plant establishment	**No Effect**	➢ Increased risk of invasive plant introduction and spread on 1,883 treated acres. Mitigation measures will minimize risk.
Heritage Site Protection Number of heritage sites protected	**No Changes or Effects**	**No Changes or Effects** ➢ Through project design and mitigation, all sites are protected.
Wildlife ➢ Residual large pine habitat to provide potential nest sites for new bald eagle territories. ➢ Changes to the amounts and distribution of snags and down woody material as it result to dependent wildlife species. ➢ Changes to the amounts and distribution of nesting and foraging habitat of species not dependent on dead wood including raptors. ➢ Changes to the amount of foraging and hiding cover	➢ No Direct effects to eagle but a long term trend towards a loss of large trees for perching and nesting. ➢ No Direct effects to snags and down wood, except long term trend towards increased smaller snags and loss of existing large snags from fire and lack of new recruitment due to shortage of developing large trees. ➢ No effects to raptors, but long term trend towards loss of large trees for perching and nesting. ➢ 965 acres are classified as hiding cover and 643 acres	➢ Reduced the Risk of loss of large perch and nest trees, and enhanced conditions favorable to development of future large trees on 1,353 acres. ➢ Minimal loss of large snags felled as hazard trees or during prescribed fire. Increased development on of large pine on 1,884 acres results in long-term recruitment of large snags and down wood. ➢ Reduced risk of loss of large perch and nest trees, and enhanced conditions favorable to development of large trees on 1,884 acres. ➢ No thermal cover will be removed as a result of the proposed action. The

Analysis Issue	Alternative 1 No Action	Alternative 2 Proposed Action
for mule deer ➢ Landbird Conservation Strategy and Birds of Conservation Concern, changes to amounts and distribution of habitats for flammulated owl, Lewis's woodpecker, white-headed woodpecker, Williamson's sapsucker, chipping sparrow, olive-side fly catcher, green-tailed towhee, northern flicker, and pinyon jay.	are classified as thermal cover. Hiding cover increases in the short term, but would be at risk from fire. ➢ No changes direct effects to large pines or snags and down wood habitats, except long term trend towards increased smaller snags and loss existing large trees from fire and lack of new recruitment from a shortage of developing large trees.	hiding cover will be maintained at 16% on 643 acres. Meeting the objective of 10%. ➢ Minimal loss of large snags felled as hazard trees or during prescribed fire. Increased development of large pine on 1,884 acres results in long-term recruitment of large snags and down wood 1,884 acres. Thinned stands increase nest security of white-headed woodpeckers by increasing sight distances for detecting predators. Thinning mowing burning may result in short term loss of shrub habitats, but will result in long term improvement of habitat diversity and resiliency.
Soils ➢ Change in extent of detrimental soil disturbance. ➢ Amount of coarse woody debris and surface organic material retained. ➢ Project Design to minimize impacts that would alter the soils ability to function in a desirable manner.	➢ Approximately 4% of the project area has detrimental soil conditions from previous treatments. ➢ Adequate amounts of woody debris and organic material currently exist over the project area, and would increase over time, unless completely removed in a high intensity fire. ➢ No cumulative increase in detrimental soil conditions.	➢ Approximately 12% acres of detrimental soil conditions exist post treatment. ➢ Proposed Action would comply with the recommended management guidelines of coarse woody, fine organic matter. ➢ Project design elements built into the Proposed Action are all designed to avoid, minimize, or rectify potentially adverse impacts to the soil resource from ground-disturbing management activities.
Forest Vegetation ➢ Improvements to Forest Health Sustainability and Resiliency, percent of area above the Upper Management Zone(UMZ) and at risk of insects and disease. ➢ and Acres where treatments create	➢ Long term risk of loss to wildfire, insects and disease. Pine stands are above Upper Management Zone (UMZ). ➢ No thinning would occur within the project area.	➢ 56% of the treated stand acres would be thinned to densities that are below the Upper Management Zone (UMZ). ➢ 1,354 acres of small pine would be removed and 529 acres of western juniper,

Analysis Issue	Alternative 1 No Action	Alternative 2 Proposed Action
conditions more favorable to the development of stand structure and composition similar to historic conditions.		moving 64% of the project area toward historic conditions.
➢ Size of Tree Removed**.**	➢ No trees removed.	➢ Estimates from stand exams indicate that the majority of trees (approximately 95%) which need to be removed for ecological based density management are smaller than 16"dbh. Estimates show that approximately 75% of the trees that would be removed are <8" dbh.
➢ Economic Viability	➢ No short term costs or products removed.	➢ Project is a restoration based, there is very little monetary value associated with the commercial product. Commercial product will be traded for service work and appropriated fund and partnership/grant dollars will cover deficits.
Fire Hazard ➢ The number of acres moved from high intensity wildfire fuels conditions to moderate or low intensity wildfire fuels conditions.	➢ 1,408 acres High Intensity Fuel Conditions.	➢ 1,884 acres of Low Intensity Fuels Conditions.
➢ The number of acres of the project reducing western juniper encroachment through mowing, thinning, and burning.	➢ 530 acres of high to levels of juniper encroachment.	➢ 530 acres of low levels of juniper encroachment reduced through, mowing thinning and burning.

CHAPTER 3. ENVIRONMENTAL CONSEQUENCES

Introduction

This section summarizes the physical, biological, social and economic environments of the project area and the anticipated effects of implementing each alternative on that environment.

"Affected Environment" refers to the existing biological, physical and social conditions of an area that are subject to change directly, indirectly, or cumulatively as a result of a proposed human action. Information on the affected environment is found in each resource section under "Existing Condition".

The following discussion of effects follows CEQ (Council on Environmental Quality) guidance for scope (40 CFR 1508.25(c)) by categorizing them as direct, indirect, and cumulative. The focus is on cause and consequences. Effects exist in a chain of consequences and thus may be labeled "indirect" (occurring later in time or farther in distance, (40 CFR 1508.8(b)), rather than cumulative. For this analysis, in general, direct and indirect effects have been discussed in the context that most readers are accustomed to: those consequences which are caused by the action and either occur at the same time and place, or are later in time or farther removed in distance but are still reasonably foreseeable (40 CFR 1508.8). Cumulative effects are discussed where there is an effect to the environment which results from the incremental effect of the action when added to other past, present, or reasonably foreseeable future actions (40 CFR 1508.7).

Cumulative Effects of Past, Present and Reasonably Foreseeable Future Actions

The following is a list of past, present, or reasonably foreseeable future action. These are Forest Service actions which have either occurred within the recent past, where effects are still measurable, are ongoing actions, or actions that will occur in the foreseeable future. These actions are listed due to the possibility that they may contribute to incremental cumulative effects and utilized to assess impacts to resource areas within the Lower Fly Creek Environmental Assessment.

Table 3–1. Past, Present, and Reasonably Foreseeable Future Actions

Project / Event Name	General Description of Act ivies	Status
Glaze Forest Restoration Project	Thinning of understory trees and fuels treatments in the Whychus Creek Watershed.	2008 to Present
Flymon Stewardship Demo	Thinning of understory trees and fuels treatments in the Lower Metolius Watershed.	2007 to Present
Flymon II	Thinning of understory trees and fuels	2008 to Present

Project / Event Name	General Description of Act ivies	Status
Stewardship Project	treatments in the Lower Metolius Watershed.	
Sisters Area Fuels Reduction	Thinning of understory trees and fuels treatments in Whychus Creek watershed, associated with the designated wildland urban interface surrounding the city of Sisters.	2009 to Present
Metolius Basin Forest Management	Thinning of Understory Trees Near Camp Sherman.	2004 to Present
Jack Canyon Timber Sale and Jack Canyon Salvage	Thinning/Salvage within the Metolius Basin.	2000 to 2004
Hwy 20 Thinning	Understory thinning/mowing/prescribed fire with Whychus Creek watershed, occurring along hwy 20 and adjacent to urban communities northwest of Sisters.	1998 to Present
Santiam Restoration and related timber sales	Coil Fiber, Springtail and Leftover TS.	1997 to 2007
Big Bear Vegetation Management Project	Bear Garden and Cab TS	1995-2005
Canal and Underline Fuels Treatments	Thinning and prescribed burning of within the urban interface of the Sisters Community within the Whychus Creek watershed.	1995 to 2000
B&B Fire Recovery	Salvage of Dead Trees on 6,000 acres	2005 to Present
Eyerly Fire Salvage	Salvage of Dead Trees on 2,000 acres	2004-2007
Black Crater Fire Salvage	Salvage on Dead trees on <30 acres	2007
GW Fire Salvage	Salvage of dead trees on 250 acres	2008

The following is a list of wildfires that have occurred during the last 8 years within the Metolius and Whychus Watersheds. Although these are not Forest Service actions, they do contribute to impacts associated with resources analyzed within the Lower Fly Creek Environmental Assessment. Fires can be utilized to define the “Existing Condition” of individual resources assessed under this document.

Table 3-2 Large Fire History

Fire	Year	Acres
GW Fire	2008	7,300
Black Crater Fire	2006	6,000
Lake George	2006	6,000
B&B Fire	2003	76,000
Link Fire	2003	3,000
Cache Mountain Fire	2002	4,000
Eyerly Fire	2002	24,000

Hydrology

The section below summarizes the affected environment information, along with the direct, indirect and cumulative effects as analyzed in the Hydrology Report for this project (Wells, B. 2009). Additional information is contained in the full specialist report available in the project file at the Sisters Ranger District.

Indicator: Minimize sedimentation into Fly Creek from runoff, by complying with interim Riparian Habitat Conservation Areas as defined by in INFISH.

Affected Environment

The project area lies primarily within the Lower Fly Creek 6th code (HUC6) watershed, which is part of the larger Lower Metolius River 5th code (HUC5) watershed. A very small portion of the project area also lies within the Juniper Creek HUC6 watershed that will not be considered in this analysis due to the limited nature of any possible effects. (Figure 3).

Road densities in the Lower Fly Creek subwatershed, were reported in 2004 (USDA Forest Service 2004) to have 4.3 miles of road per square mile and 11.7 miles of road in the Riparian Habitat Conservation Areas (RHCAs). Road densities exceed the 2.5 miles of road per square mile recommended as desired the future condition in the Deschutes Forest Plan (USDA 1990). In the recent past road closures, road obliterations and invasive plant treatments have been the main restoration focus within this subwatershed. Ongoing and historical activities include timber harvest, firewood collection, fuels reduction, grazing, hunting and other recreational activities.

Elevation within the Lower Fly Creek watershed ranges between 2,400 feet along Fly Creek in the NE portion of the watershed to 4,600 feet in the western portion of the watershed. Within the project area, the elevation ranges between 2,600 feet to 3,400 feet.

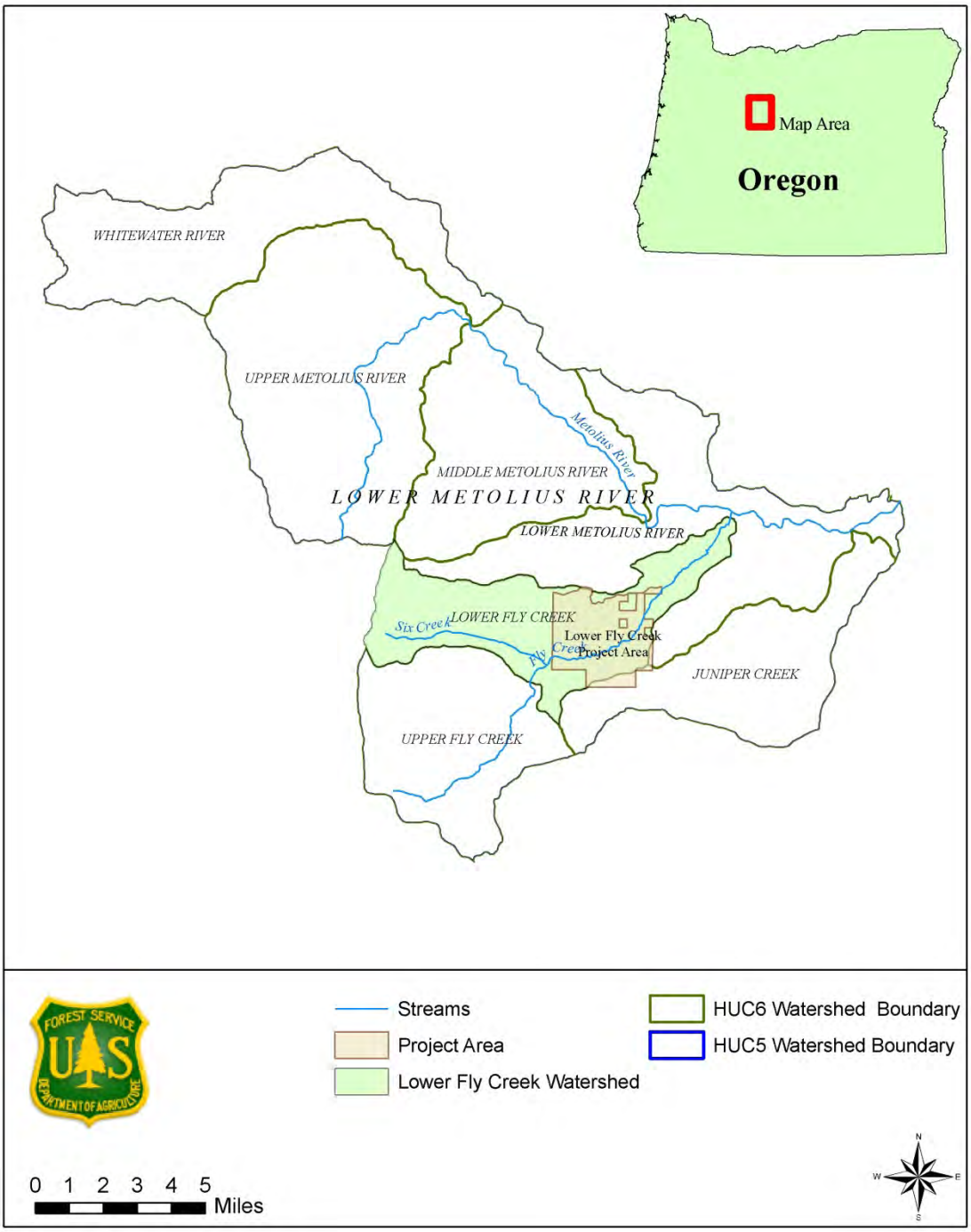


Figure 3. Lower Fly Creek Watershed

The Lower Fly Creek 6th Field Watershed is 16,226 acres, of which the project would impact approximately 1,883 acres. The Juniper Creek and Lower Metolius River 6th field watersheds are each affected less than 2 and 1 percent, respectively (Table 3-3) with no hydrologic effects occurring as a result of this project and will not be analyzed for that reason.

Table 3-3: 5th and 6th field watersheds within the project area and the portion of each watershed affected by the project area.

5th FieldWatershed (Name & HUC #)	6th Field Watershed (Name & HUC #)	Watershed (Acres)	Project (Acres)	Affected Watershed (%)
Lower Metolius River 1707030110		145,497	4,413	3
	Lower Fly Creek 170703011004	16,226	4,049	25
	Juniper Creek 170703011006	15,088	301	2
	Lower Metolius River 170703011007	24,301	63	< 1
	Middle Metolius River 170703011003	21,208	-	-
	Upper Fly Creek 170703011004	16,406	-	-
	Upper Metolius River 170703011002	31,553	-	-
	Whitewater River 170703011001	20,715	-	-

The Lower Fly Creek Project is located on the lower eastern flank of a shield volcano known as Green Ridge in the north east corner of the Sisters Ranger District in Central Oregon. Essentially all landforms, rocks and soil materials in this area are derived from volcanism.

The Deschutes Soil Resource Inventory (SRI) identifies several different soil mapping units within the planning area (Table 4). Soil mapping units are identified based on similarities in soils, landforms, geology, and climatic conditions that influence defined patterns of soil and vegetation (Soil Resource Inventory, Larsen, 1996). The planning area consists primarily of two soil mapping units, which are identified as SRI soil code units 53 and 61 (Table 3-4). Hydrologically, these soil codes, because of their ash or loam surface component are typically well drained and absorb moisture rapidly. Field investigations of soils and existing vegetation within the Lower Fly Creek project area resulted in the identification of four ecotypes which repeat across the landscape. The biophysical characteristics of these ecotypes can be interpreted to identify productivity potential and suitability for natural resource planning and management.

Table 3-4. Lower Fly Creek planning area soil codes, eco-types, and amount of affected area.

EA Unit	SRI Soil Code	Eco-types	Acres
5	61	3	38
6	61	3	306
7	53	5,6	262
8	61/51	3	42
9	61	3	17
10	61	3	163
11	61	3	178
12	53	5,6,7	39
13	53	3	22
14	61	3	85
15	53	5,6,7	530
16	51	3	28
17	50/TB	3	94
18	53	3,4	80
Total			**1884**

Source: Craigg, T. 2009. Soil Resource Specialist Report, Flymon (Phase 3) Stewardship Demonstration Project Environmental Assessment.

Criteria for identifying soils that are sensitive to management are described in the Deschutes NF Land Resource Management Plan (USDA Forest Service 1990). Based on these criteria none of the soils within the Lower Fly Creek planning area were identified as sensitive soil types (Craigg 2009).

Water Quality

Water quality is the physical, chemical, and biological characteristic of water relative to a particular use. Land management activities can affect water quality characteristics through the changes that the activity causes in the hydrologic cycle and streamflow regimes.

To help implement the objectives of the Clean Water Act, Oregon has developed and adopted water quality standards. Water quality standards include beneficial uses, narrative and numeric criteria, and antidegradation policies. Standards are designed to protect the most sensitive beneficial use within a water body. A determination that water quality is impaired can be based on: evidence of a numeric criterion exceedance; evidence of a narrative criterion exceedence; evidence of a beneficial use impairment; or evidence of a declining trend in water quality such that it would exceed a standard prior to the next listing period (ODEQ 2006a).

Every two years the Oregon Department of Environmental Quality (DEQ) assesses water quality and prepares an integrated report for the U.S. Environmental Protection Agency (USEPA) reporting on the condition of the states waters that meets the requirements of

the federal Clean Water Act (CWA) for Section 305(b) and Section 303(d). CWA Section 305(b) reports on the overall condition of the states waters and CWA Section 303(d) identifies waters that do not meet water quality standards. All of Oregon's waters are placed into one of five categories representing varying levels of water quality attainment, ranging from Category 1, where all of a water's designated uses are met, to Category 5, where a pollutant impairs a water and a TMDL is required (ODEQ 2006a).

There are no water quality limited or impaired streams within the Lower Fly Creek watershed with only Six Creek being reported in the 2004/2006 Integrated Report. Six Creek has been placed into Category 2, which in general terms means that some of the designated uses are met but there is insufficient data to determine if remaining designated uses are being met.

The Lower Fly Creek watershed is drained to the northeast via Fly Creek, which is mostly intermittent except near its headwater springs and from Prairie Farm Creek to just above Six Creek. Fly Creek is a tributary to Lake Billy Chinook (Metolius Arm) where it enters at an elevation of 1,945 feet. The headwaters of Fly Creek are located on land owned by Willamette Industries at an elevation of approximately 4,400 feet.
Using the Pacific Northwest Region (R6) Level II stream inventory methods, a stream survey was conducted on Fly Creek from river mile 3.4 to river mile 7.0 by personnel from the Sisters Ranger District, Deschutes National Forest in 1998 with a summary of results shown in Table 3-5.

Table 3-5. Summary of Fly Creek Stream Survey (Dachtler 1998).

	Reach 2 River Mile 3.4 to 4.4	**Reach 3 River Mile 4.4 to 5.4**	**Reach 4 River Mile 5.4 to 7.0**
Pool Frequency	49	60	59
Water Temperature (°F)	66.4 (daily max)	No Data	56.0 (daily max)
Large Woody Debris	10	12	25
Bank Stability	97	99	87
Width/Depth Ratio	25	23	17

To help in assessing channel condition, impact-use effects, and alternate management scenarios, the surveyed stream was divided into three reaches and classified according to the Rosgen classification of natural rivers.

Classification was determined from field measurements listed in Table 3-6. Entrenchment is the vertical containment of the stream and the degree to which it is incised in the valley floor. The entrenchment ratio is the ratio of the flood-prone area to the bankfull surface width of the stream. The width/depth ratio describes the dimension and shape factor as the ratio of bankfull channel width to bankfull mean depth. Sinuosity is the ratio of stream length to valley length or as the ratio of valley slope to channel slope. Water surface slope is of major importance to the morphological character of the

channel and its sediment, hydraulic, and biological functions. Channel material is critical for sediment transport, hydraulic influences, and the form, plan and profile of the stream (Rosgen 1994).

Table 3-6. Fly Creek Stream Classification Data by Reach.

	Reach 2 River Mile 3.4 to 4.4	Reach 3 River Mile 4.4 to 5.4	Reach 4 River Mile 5.4 to 7.0
Rosgen Stream Type	C3	B3	C3
Entrenchment Ratio	2.3	2.4	1.5
Width / Depth Ratio	25	23	17
Sinuosity	1.3	1.1	1.4
Slope	1.0	3.0	0.9
Channel Material (D_{50})	Cobble	Cobble	Cobble

Water Quantity

Water quantity is represented by stormflow, baseflow, or some combination of the two dependent on the specified time interval. When vegetation and organic matter on the soil surface are destroyed, interception and evapotranspiration and infiltration decrease, and overland flow and subsurface flow can increase.

During the stream inventory survey on Fly Creek in 1998 discharge of 1.1 cfs was measured at the bottom end of reach two and was observed remaining constant throughout except near the top end of the reach where it may have been a few cfs higher. During the summer months flows become very low in reach 4 and dry out in the lower reaches with some perennial exceptions in reach 1.

Precipitation is mainly in the form of snow with annual averages for the Lower Fly Creek watershed of 10 to 15 inches at the lower elevations to the east and 30 to 40 inches at the higher elevations to the west. Within the project area, precipitation ranges between 10 to 20 inches. The majority of snowfall fall occurs during the winter months of December through February, while the majority of rainfall occurs between the months of October and March. Annual average maximum and minimum air temperature is 60 °F and 31 °F, respectively. January is normally the coldest month and July is the warmest month (Western Regional Climate Center 2009).

On average, more than 80 percent of the total runoff occurs during the months of February, March, April, and May. Seventy percent of the annual precipitation occurs during the months of October through March and most of this falls as snow. Above 5,000 feet most of this snow accumulates as snowpack, which is the most significant contributor to streamflow during the spring snowmelt period.

At elevations between 3,000 and 5,000 feet snow accumulation is more transient and may melt out during several periods of warmer weather throughout the winter. This phenomenon is more pronounced on south and southwest aspects. Occasionally a large mass of warm moist air will move into the region during the winter months resulting in a rain on snow event. Large amounts of moisture stored in the snowpack may be released producing record stream flow events. Rain-on-snow events can occur in the upper portion of the Lower Fly Creek watershed, as a result of its elevation and higher precipitation. A second type of runoff event common in this area is associated with summer thunderstorms. Summer thunderstorms are characterized as being locally intense, short duration and are capable of generating large magnitude, short duration surface runoff. However, the greatest influences on overland flow in the analysis area are roads (USDA Forest Service 2004).

Environmental Consequences

Methodology

Each alternative was assessed in terms of direct, indirect and cumulative effects. Direct effects are those effects that occur as part of an action and directly affect the water resource. For example, if a road crossing were constructed, a direct effect could be delivery of sediment to a creek. Indirect effects are those effects that occur later in time and may occur in a location away from the actual activity. An example of an indirect effect could be an increase in water yield. For example, if a large opening were created in an area with a high risk for rain-on-snow, then water yield could increase from the site in a time and location well away from the actual activity. Each direct/indirect effect will be addressed in terms of timber harvesting, burning, and road activities.
In conducting the cumulative effects analysis, the first step was to determine existing conditions by reviewing past, present and foreseeable activities. Once the existing conditions were assessed, the next step was to evaluate how implementing any of the alternatives could affect the water resource. Cumulative effects looked at the larger picture and assessed whether or not implementation of any alternative would affect positively or negatively the current condition of the watershed. Field review and data along with pertinent literature was used to determine possible impacts of the proposed activities upon the water resource. The direct, indirect, and cumulative effects of each of the alternatives on water quality, water quantity, and riparian condition are discussed below.

The project-related disturbances to the watershed and hydrologic function include prescribed burning, road decommissioning/closures, and thinning. Fire, which has the potential to significantly alter vegetation and soil properties, can cause a wide variability in watershed hydrologic responses. Effects of fire on the hydrologic cycle are determined largely by the size and severity of the fire, soils, watershed slope, vegetation, decisions made relative to any suppression activities, and the immediate postfire precipitation regime. Precipitation inputs are affected little by burning. However, interception, infiltration, evapotranspiration, soil moisture storage, and the overland flow of water can be significantly affected by fire (DeBano et al. 1998, Neary et al. 2005, Zwolinski 2000). Roads can be a primary source of erosion (and a direct source of sediment) as well as hydraulic modification if they are located in the active floodplain. Roads can lead to

water temperature changes and alter streamflow regimes. Roads have three primary effects on hydrologic processes: a) they intercept rainfall directly on the road surface and road cutbanks and affect subsurface water moving down the hillslope; b) they concentrate flow, either on the surface or in an adjacent ditch or channel; and c) they divert or reroute water from paths it otherwise would take were the road no present (Gucinski et al. 2001). Thinning can modify local runoff and these changes, primarily to peak flows from snowmelt, can affect channel conditions similar to wildfires. Riparian harvest can reduce long-term supply and replacement of large woody debris, and increase stream temperature.

Alternative 1 (No Action)

Ecological Trends

This alternative would have no direct or indirect effects because no actions (thinning, prescribed fire and road decommission/closures) would be taken. In the short-term, water quality, water quantity, or riparian condition would continue at the present level. In the long-term, overstocked stands and ladder fuels could increase the risk of uncharacteristic large scale stand replacement wildfires.

A wildfire can potentially consume all of the organic material across the landscape, including the amount of woody debris within the streams. The loss of riparian vegetation would expose the streams to greater solar radiation for 0-15 years, causing increased water temperatures. Channel conditions can be affected, although the extent of the damage depends on the area burned. There is a high probability of increased sediment delivery resulting in adverse effects to aquatic habitats. It is difficult to predict the time or the scale and intensity at which such an event might occur, but it is highly probable that it would be larger and more intense than what has happened historically due to increased ladder fuels and higher fuel loadings. Roads in the stream influence zone would not be closed or decommissioned.

This alternative would be consistent with the Forest Plan, Riparian Management Goals and Riparian Management Objectives outlined in INFISH. This alternative would protect designated beneficial uses and would be consistent with the Clean Water Act and Executive Orders 11988, 11990, and 12088.

Alternative 2 (Proposed Action)

Direct and Indirect Effects

This alternative includes maintaining vegetative buffer strips that conform to interim Riparian Habitat Conservation Areas (RHCAs) as defined by INFISH. After examining the location, timing, and design of the proposed project, it was determined that any effects would likely be localized and would not have any direct and indirect effects to water quality, water quantity, and riparian areas as a result of this alternative.

This alternative would be consistent with the Forest Plan, Riparian Management Goals and Riparian Management Objectives outlined in INFISH. This alternative would protect designated beneficial uses and would be consistent with the Clean Water Act and Executive Orders 11988, 11990, and 12088.

A combination of treatments including thinning trees from below, mechanical treatment of small trees and brush, and prescribed burning would be used to reduce the fuel loading in the planning area. Most of the slash generated from commercial harvest would be hand piled or machine piled and burned on log landings and/or main harvester trails. Under this alternative, disturbances from timber harvest, road closure, and prescribed fire would occur. All treatment units are relatively flat and slopes are far less than 30%. Therefore, there is little to no risk of sediment movement as a result of these activities.

Maintaining vegetative buffer strips will prevent any negative effects in stream water quality or quantity, sediment yield and runoff and provide woody debris and detritus that serve as nutrient and habitat sources for aquatic organisms (Brown and Krygier 1970, Cristea and Janisch 2007, DeBano et al. 1998, Dwire et al. n.d., McGurk 1989, Neary et al. 2005, Stednick n.d.).

All streams are well buffered, so any sediment generated from harvest would be filtered before reaching channels. Water yield and rain-on-snow potential may increase in the localized area around harvest units; however, there would be no changes to peak streamflows in the main fish-bearing streams, primarily due to the high infiltration capabilities of the soils in the project area. Stream buffers ensure that no riparian trees would be removed.

Fire affects water quality characteristics through the changes that the burning causes in the hydrologic cycle and streamflow regimes. The effects to water quality and quantity are largely dependent on the size, intensity, and severity of the fire, the condition of the watershed when rainfall starts, and the intensity, duration, and total amount of rainfall. When fire destroys vegetation and organic matter on the soil surface, interception and evapotranspiration and infiltration decrease, and overland flow and subsurface flow can increase (DeBano et al. 1998, Neary et al. 2005, Zwolinski 2000). Prescribed fire with low to moderate burn severity such as the type proposed rarely produce adverse hydrologic effects on watershed condition, especially if best management practices are utilized. Prescribed burning would reduce the risk of a lethal wildfire and would simulate the beneficial effects of fire on the landscape and avoid detrimental effects. Accelerated erosion is a possible effect when using fire in conjunction with logging, however any road system built for timber harvesting far overshadows logging or fire as a cause of increased erosion (Rice et al. 1972). Regulating slash disposal fires will control the amount of litter consumed and any resulting erosion. Thinning will remove smaller trees outside of the RHCAs while leaving larger trees and snags. This will retain the shade component along the stream channels. Combined with buffers and the retention of large trees, there would be little to no risk on stream temperatures in Fly Creek.

Surface soil erosion results primarily from the exposure of mineral soil by yarding operations, fire, and the disruption of natural drainage patterns by skid trails and road construction. Sediment production from road construction is often highly variable with rapid declines upon completion of road construction. No new road construction proposed for this project that would result in an increase in sediment production and resulting

negative effect on water quality. Erosion occurring from logging operations is usually minor when compared to road construction. Thinning will be with ground-based equipment with surface erosion being limited to the extent and continuity of bare areas that are typically small and localized (Rice et al. 1972). The terrain in the project area is also fairly flat and any soil disturbance created by the project would be filtered by on the ground organics and vegetation prior to reaching any stream channels. Road-related improvements include reducing sediment sources and restoring hydrologic function to those road sites that have been identified for decommissioning upon completion of this project and to re-close any road closures that have been breached within the project area.

Water quantity is represented by stormflow, baseflow, or some combination of the two dependent on the specified time interval. On stream peakflows a low severity, prescribed fire would have little or no effect because it does not substantially alter watershed condition. Water quantity, or streamflow, responses to prescribed fire are generally smaller in magnitude, or almost nonexistent in instances of low severity fire, as compared to a wildfire since it is not the purpose of prescribed burning to completely consume extensive areas of litter and other decomposed organic matter on the soil surface. Within the analysis area, overland flow does not generally occur from a reduction in evapotranspiration when trees are harvested because infiltration rates often exceed precipitation rates. The timing, duration or magnitude of overland flow or runoff is not expected to change as a result of this project because of the soil types and existing soil characteristics. These properties will not be altered as a result of this project. Leaving larger trees and thinning smaller crowded trees will provide sufficient tree structure and basal area to maintain the current amounts and timing of runoff during precipitation events.

Closing excess roads would decrease the risk of future road failures while simultaneously improving slope hydrology. Where applicable, roads closed under this project will have all culverts removed, unstable fill slopes recontoured, road prisms scarified, and entrances recontoured. The closed roads would be left in a condition where they would no longer adversely impact water resources. There may be short-term effects related to closing of these roads. The potential for surface erosion may increase due to the possibility of the exposed soil related to ripping the roads, slope recontouring, waterbarring, and/or removing any culverts. Because these closed would be located away from any live stream and are located on gentle sloping terrain with high infiltration rates as discussed previously, the risk of sediment delivery would be low.

There are no water quality limited or impaired streams (303d listed) within the Lower Fly Creek watershed. Through project design, none of the proposed treatments will compromise water quality and incrementally move Lower Fly Creek towards a 303d listing under the Clean Water Act.

Cumulative Effects for Alternative 2

Within the Cumulative effects to water quality, water quantity, and riparian condition from the activities proposed in the Lower Fly Creek Project would not incrementally add to cumulative effects because no effects to water quality, water quantity, and riparian

condition including sedimentation, runoff, flow modification, wood recruitment, stream temperature and turbidity are predicted. The primary reason for this is because of generally good infiltration rates of soils, use of BMP (best management practices), use of existing roads, and adequate buffering of streams.

Forest Plan Consistency

Standards for riparian and water resources are listed on Page 4-61 thru 67 and 4-69 thru 70, respectively of the Deschutes Forest Plan. Both alternatives would be consistent with these standards. Proposed management activities would not impair the long-term productivity of riparian conditions. Water resources and state water quality standards would be met or exceeded.

Fisheries

The section below summarizes the existing condition information, along with the direct, indirect and cumulative effects as analyzed in the Fisheries Report and Biological Evaluation for this project (Dachtler, N. 2008). Additional information is contained in the full specialist report.

Indicator: Minimize fine sedimentation into Fly Creek to negate effects to redband trout spawning and rearing complying with interim Riparian Habitat Conservation Areas as defined by in INFISH.

Indicator: Minimize impacts to redband trout populations in Fly Creek.

Affected Environment

The project area is mostly located in the Lower Fly Creek subwatershed with a very small portion of the project located in the Lower Metolius River subwatershed. Approximately 4,049 acres of the project area is located in the 16,277 acre Lower Fly Creek subwatershed and covers 25 % of this subwatershed. The Lower Fly Creek project units cover 1,728 acres or 10.6 % of the Lower Fly Creek subwatershed. All three stewardship projects (Flymon I, Flymon II and Lower Fly Creek) cover 2,213 acres or 13.6 % of the Lower Fly Creek subwatershed (Table 3-7). The only fish bearing stream immediately downstream of the project is Fly Creek which flows into LBC (Lake Billy Chinook). Fly Creek is a small stream with a low summer flow of 1.1 cfs recorded at the lower FS boundary (Dachtler 1998). Fly Creek has a small perennial section near the mouth of Six Creek which changes in length on a yearly basis depending on local precipitation, snow pack and spring discharge. There are also two small perennial sections located downstream of the project on private land near the mouth where it enters Lake Billy Chinook. Upstream perennial flow ends at around river mile 8.4 near the upper forest service boundary. The Upper Fly Creek subwatershed is almost exclusively dominated by intermittent channels and is mostly in private ownership. Timber production and extraction has been the main use of this private land along with past sheep and cattle grazing.

Table 3-7. 5th and 6th code watersheds within the project area and the portion of each watershed affected by the project area (Wells 2009).

5th Field Watershed (Name & HUC #)	6th Field SubWatershed (Name & HUC #)	Watershed (Acres)	Project Area (Acres)	Affected Watershed (%)
Lower Metolius River 1707030110		145,497	4,413	3
	Lower Fly Creek 170703011004	16,226	4,049	25
	Juniper Creek 170703011006	15,088	301	2

5th Field Watershed (Name & HUC #)	6th Field SubWatershed (Name & HUC #)	Watershed (Acres)	Project Area (Acres)	Affected Watershed (%)
	Lower Metolius River 170703011007	24,301	63	< 1
	Middle Metolius River 170703011003	21,208	-	-
	Upper Fly Creek 170703011004	16,406	-	-
	Upper Metolius River 170703011002	31,553	-	-
	Whitewater River 170703011001	20,715	-	-

Table 3-8. Lower Metolius Watershed and Lower Fly Creek subwatershed acres, unit acres and percent of the watershed or subwatershed affected for the Lower Fly Creek project and all three Flymon projects.

5th or 6th Field Watershed or Subwatershed (Name & HUC #)	Project	Watershed or Subwatershed Acres	Project Unit Acres	Affected Watershed or Subwatershed (%)
Lower Metolius River 1707030110	Lower Fly Creek	145,497	1,884	1.3
Lower Metolius River 1707030110	Flymon I, Flymon II and Lower Fly Creek	145,497	2,376	1.6
Lower Fly Creek 170703011004	Lower Fly Creek	16,226	1,728	10.6
Lower Fly Creek 170703011004	Flymon I, Flymon II and Lower Fly Creek	16,226	2,213	13.6

A redband trout population inhabits the perennial portions of Fly Creek and they are the only fish species present. The Interior Columbia Basin redband trout are on the Region 6 Regional Foresters sensitive species list. The section of Fly Creek downstream of the project area is intermittent with some short perennial sections on private land near the mouth. Redband trout are present in the intermittent portions when they are flowing. The isolated perennial sections are fed by subsurface flows and contain redband trout year round. No current or historical use by bull trout, Chinook salmon or steelhead has been documented in Fly Creek. Currently available habitat and water quality are not suitable for bull trout or Chinook due to the small stream size and warmer water temperatures. No historical documentation of steelhead using Fly Creek is known to exist. It is possible steelhead may have been able to access Lower Fly Creek on private land but a 8-10 feet high falls at River Mile 0.9 would have made upstream passage only

possible during certain high flow conditions. Steelhead were reintroduced to the Whychus Creek drainage starting in 2007 as part of the relicensing agreement for the Pelton Round Butte Hydroelectric Complex and were first reintroduced to the Crooked River Watershed in spring of 2008.

The project is located outside the Northwest Forest Plan land allocation. The INFISH Standards (USDA and USDI 1995) and guidelines in the Joint Aquatic and Terrestrial Programmatic Biological Assessment June 2006- June 2009 (USFS 2006) Project Design Criteria (PDCs) have been used to determine the project effects to bull trout. An updated watershed analysis was completed in 2004 for the Lower and Upper Metolius Watershed after the B and B fire occurred in 2004 (USDA 2004).

Road densities in the Lower Fly Creek subwatershed, were reported in 2004 (USDA) to have 4.3 miles of road per square mile and 11.7 miles of road in the Riparian Habitat Conservation Areas (RHCA's). Road densities exceed the 2.5 miles of road per square mile recommended as desired future condition in the Deschutes Forest Plan (USDA 1990). In the recent past road closures, road obliterations and invasive plant treatments have been the management focus within this subwatershed. Ongoing and historical activities include timber harvest, firewood collection, fuels reduction, grazing, hunting and other recreational activities.

No intermittent or perennial stream channels or wetlands are present within the proposed treatment areas. There is an intermittent channel that runs water during the winter and spring that is buffered 50 plus feet on either side of the project boundaries to protect the channel and associated riparian areas. The INFISH RHCA boundary for intermittent streams within this project area is 50 feet. Prairie Farm Creek is another non fish bearing intermittent stream which is bordered by units 6, 7 and 18 in the project area.

Red-band trout habitat in Fly Creek on National Forest lands were surveyed during the 1998 stream inventory. Past timber harvest on public and private lands have caused past stream disturbance and reduced streamside shade. Riparian conditions and adjacent forests have started to recover on Forest Service lands. However, on the private lands Fly Creek and its tributaries are intermittent and growth of permanent vegetation does not occur as quickly.

The following habitat information is from the 1998 (Dachtler) stream habitat inventory. Information is presented for reaches 2, 3 and 4 which are downstream or adjacent to the project (Figure 4). Reach 1 would be located downstream of the project and was not surveyed for habitat because it is on private land.

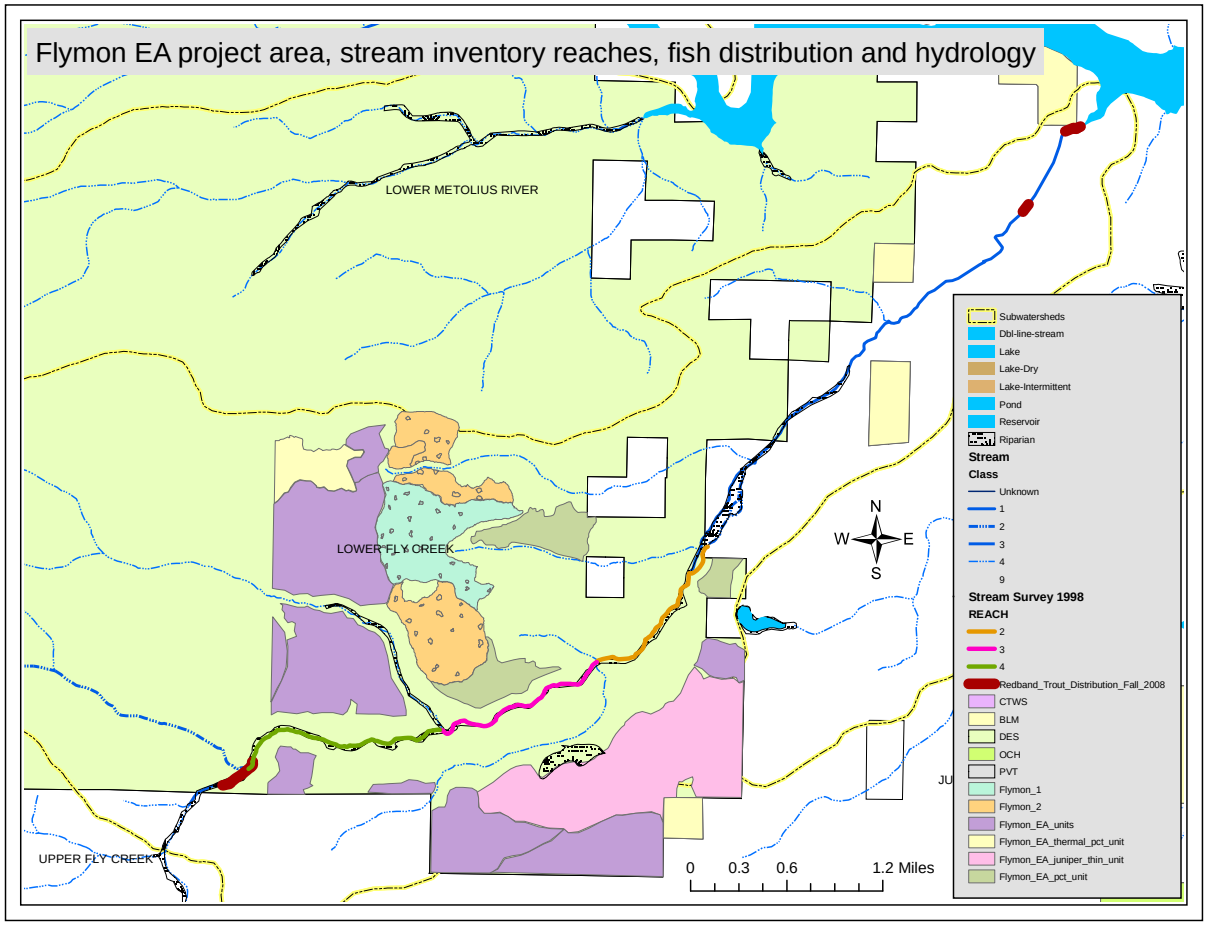


Figure 3. Fish Distribution and Reaches

The Eyerly Fire in 2002 burned a small portion of the Lower Fly Creek subwatershed and did burn through the Fly Creek riparian zone on private land well below the project area. The Eyerly Fire did not burn through the Flymon 2 project area or the associated intermittent channel. During the 1998 stream survey past fire activity, timber harvest activity, were noted. Old landslide or debris flow activity was noted during the 1998 habitat inventory in the steep canyon sections of reach 4.

Fine sediment in spawning areas is a concern and may have increased from past fires, road construction and riparian logging. Increases in fine sediment can occur from large disturbances of uplands and nearby riparian habitats which can result in deleterious effects to redband trout survival from egg to emergence. Most of Fly Creek downstream of the project area is intermittent and most likely seasonally used for rearing. Primary spawning areas most likely occur in reaches 1 and 4. Length of channel with perennial flows below Six Creek can be widely variable from year to year.

The channel in the perennial sections downstream on private land in reach 1 were not surveyed but appear to be a Rosgen B type channel with mainly boulder and cobble substrate and lesser amounts of gravel. Streambed substrate in reaches 2, 3 and 4 was

mainly gravel and cobble with lesser amounts of sand and boulder. Even with the large amount of past watershed disturbance from fires and timber harvest data from four pebble counts showed amounts of fine sediments were relatively low ranging from 12 % to 24 % of the substrate measured to be less than 5.7 mm in diameter. Highest amounts of fines (24 %) were measured in the upper end of reach 4. Mostly smaller trees and shrubs were present in reaches 2 and 3 with larger old trees located at the upper end of reach 4. The channel in Reach 2 was a Rosgen C type channel with some downcut areas that more resembled a Rosgen F type channel. The channel in reach 3 was a Rosgen B type channel that was confined by surrounding hill slopes. Reach 4 was Rosgen C type channel with one small E type channel wet meadow that was threatened by a headcut downstream.

The closure of the 1170-900 Road and water barring will help to reduce current erosion problems this road is causing which are affecting the intermittent stream and possibly Fly Creek. This will also help stop the resource damage to the area caused by vehicles and OHV's that access this area from the 900 road.

Wood plays a critical role in scour and dam pool development, sediment retention and holds organic matter essential for a proper functioning redband trout rearing habitat. Bilby and Bisson (2001) and Benda et. al (2003) discusses methods of wood recruitment to streams resulting from a variety of disturbances. Each of these disturbances is affected by climate, geomorphology and hydrology which regulate recruitment rates into a system in either chronic or large-scale episodic events. Wood densities for medium and large size classes were 9, 12 and 25 pieces per mile for reaches 2, 3 and 4 respectively. A standard of 20 pieces per mile of medium and large sizes classes are recommended in the INFISH standards and Guidelines (USDA and USDI 1995). Wood densities in reaches 2 and 3 are low most likely due to past fire and timber harvest activity. Due to the small size of Fly Creek and its tributaries measurable large wood is not transported during high flow events but must enter the channel from windthrow or channel migration.

Average annual precipitation in the project area ranges from 12-16 inches. Precipitation increases from 32 to 40 inches annually at the upper elevations of the subwatershed near the top of Green Ridge. Precipitation within the project area is primarily rain with snow at higher elevations within the subwatershed. Several intermittent channels feed into Fly Creek similar to the one that runs through the project area. Spring flows in these intermittent channels are highly influenced by annual melt off of the snowpack at higher elevations. Once these channels go dry base flow in Fly Creek comes from springs located upstream of Six Creek near the forest boundary.

The Lower Fly Creek project is located on the lower eastern flank of a shield volcano known as Green Ridge in the north east corner of the Sisters Ranger District in Central Oregon. Essentially all landforms, rocks and soil materials in this area are derived from volcanism. Elevations in the planning area are around 3300 feet and the annual precipitation is estimated to be around 18 inches.

Stream temperature data is limited to the 1998 stream survey and the thermograph placed near the lower USFS boundary the same year (reach 2 of the survey). In 1998 the stream went dry in reach 2 at the thermograph site around August 8th and a high temperature of 18.9 ºC was recorded in early July. Using a hand held thermometer during the stream survey highest recorded temperatures were: 18.9 ºC in reach 2, 16.7 ºC in reach 3 and 13.3 ºC in reach 4. The stream is not on the 2004/2006 Oregon Department of Environmental Quality (ODEQ) 303-d list of water quality limited streams. ODEQ water temperature standards and rules can be found at: http://www.deq.state.or.us/wq/standards/temperature.htm. The stream has not exceeded the ODEQ standard of 18.0 ºC (7 day average maximum) for salmonid rearing and migration but data is limited.

Environmental Consequences

Analysis Issue #1- Redband Trout Habitat Condition - Spawning and Rearing

Measure #1- Fine sediment, wood density, flow and stream temperature

Analysis Issue #2- Fish Populations

Measure #2- Current and Historic Fish Populations

Alternative 1. No Action

Ecological Trends

This alternative would have no direct or indirect effects because no actions (thinning, prescribed fire and road decommission/closures) would be taken. In the short-term water quality, fish habitat, fish populations, riparian condition would continue at the present level. In the long-term, overstocked stands and ladder fuels could increase the risk of uncharacteristic large scale stand replacement wildfires. A wildfire can potentially consume all of the organic material across the landscape, including the amount of woody debris within the streams. The loss of riparian vegetation would expose the streams to greater solar radiation for 0-15 years, causing increased water temperatures. Channel conditions can be affected, although the extent of the damage depends on the area burned. There is a high probability of increased sediment delivery resulting in adverse effects to aquatic habitats. It is difficult to predict the time or the scale and intensity at which such an event might occur, but it is highly probable that it would be larger and more intense than what has happened historically due to increased ladder fuels and higher fuel loading. Roads in the stream influence zone would not be closed or decommissioned (Wells 2009). This alternative would be consistent with the Forest Plan, Riparian Management Goals and Riparian Management Objectives outlined in INFISH.

Alternative 2. Proposed Action

Direct and Indirect Effects

This alternative includes maintaining vegetative buffer strips that conform to interim Riparian Habitat Conservation Areas (RHCAs) as defined by INFISH. After examining the location, timing, and design of the proposed project, it was determined that any effects would likely be localized and would not have any direct and indirect effects to water quality, water quantity, and riparian areas as a result of this alternative. Fish habitat and fish populations would be maintained under this project while reducing the risk of catastrophic fire which could have long lasting effects to the watershed. This alternative would be consistent with the Forest Plan, Riparian Management Goals and Riparian Management Objectives outlined in INFISH. Additional effects analysis for water quality and channel conditions can be found in the Resource Report for Hydrology by Wells (2009).

Direct and indirect effects to red-band trout spawning and rearing habitat in Fly Creek from fine sediments would be very low to non-existent as a result of thinning and underburning in the Lower Fly Creek project area. It is possible a small amount of fine sediments could be mobilized from the project area if a large rain event occurred such as thunderstorm. But this small amount of sediment is not expected to reach fish bearing streams due to the high infiltration rates of the soils, RHCA buffers, and the long distances from fish bearing sections. The terrain in the project area where mechanical treatments are proposed is also fairly flat and any soil disturbance created by the project would be filtered by organic debris and vegetation prior to reaching stream channels. Units in the project areas that have moderate to steep slopes and are closer to streams will be hand thinned.

A combination of treatments including thinning trees from below, mechanical treatment of small trees and brush, and prescribed burning would be used to reduce the fuel loading in the planning area. Most of the slash generated from commercial harvest would be ether hand piled or machine piled and burned on log landings and/or main harvester trails. Machine piling on temporary roads or main skid trails would have a minimal effect on the overall extent of detrimentally disturbed soil because equipment would operate off the same logging facilities used during yarding operations. The same designated trail systems would be used as primary travel routes. The use of specialized equipment such as tracked excavators with grapple arms and other low ground-pressure machines are capable of accumulating woody materials without moving appreciable amounts of topsoil into slash piles. Monitoring of these types of operations on similar soils on the District indicate that impacts would not exceed soil standards and guides (Craigg and Howes, 2005).

Mechanical treatment of brush and small trees (mowing and mastication) would not cause detrimental soil displacement and increases in soil bulk density are inconsequential. The primary factors that limit soil compaction are the low ground pressure of the tractor and mowing heads, the limited amount of traffic (one equipment pass), and the cushioning

effect of surface organic matter. These activities have been monitored in the past, and results show that increases in soil displacement and compaction do not meet the criteria for detrimental soil conditions (Soil Monitoring Report, 1997).

Prescribed fire would be used to reduce fuel accumulations in some of the activity areas proposed for mechanical harvest and non-commercial thinning as well as other activity areas where prescribed burning would be used exclusively to treat the shrub and grass layer and reduce natural fuels. Prescribed burning activities are conducted at times and under conditions that maximize benefits while reducing the risk of resource damage. The degree of soil heating depends upon fuel type (grass, brush, trees), fuel density, nature of the litter and duff layers (thickness, moisture content), and burn conditions at the time of ignition. For the treatment areas proposed with this project, natural fuel accumulations consist mainly of fine fuels (i.e., decadent brush, tree branches, and needle cast litter) that typically do not burn for long duration and cause excessive soil heating. Underburning does not remove all vegetation or organic debris on the ground and usually burns in a mosaic pattern. Therefore, it is expected that there would be no detrimental changes in soil properties from prescribed burning activities in timber stands because soil moisture guidelines would be included in burn plans to minimize the risk for intense ground-level heating A combination of treatments including thinning trees from below, mechanical treatment of small trees and brush, and prescribed burning would be used to reduce the fuel loading in the planning area.

Thinning will remove smaller trees 50 feet or more away from the intermittent stream while leaving larger trees and snags. This will retain the shade component along the intermittent channel. The timing at which this stream goes dry most likely varies year to year depending on local snow pack and precipitation. However, it most likely goes dry sometime in the spring previous to July which is generally the hottest time of year. Combined with buffers, retention of large trees and intermittent flow the effect on stream temperatures in Fly Creek would be negligible.

Wood recruitment will not be impacted by the treatments in the Flymon Project because all activities are outside of Riparian Habitat Conservation Areas (RHCA's). Some thinning may occur within the primary wood recruitment area (100 ft from intermittent streams) but the thinning will only remove small trees while leaving larger trees and snags that will continue to provide wood recruitment to the intermittent channel within the project area. The project treatment units are not in the primary wood recruitment zone for fish bearing streams (Fly Creek) because Fly Creek will be buffered at least 300 feet from units. Intermittent streams in the project area are too small to transport measurable pieces of large wood even during extreme high flow events.

There will be no direct effects to fish populations from implementing the proposed action of thinning small trees and underburning. No indirect effects are expected to aquatic insects, water quantity or quality that would influence the survival or growth of redband trout. No work will occur within RHCA's. No trees are proposed for removal within at least 50 feet of intermittent streams or 300 feet from Fly Creek. Units adjacent to Fly Creek will be located on the flatter terrain above the canyon that Fly Creek lies in. The

project is also located on the flatter terrain adjacent to Prairie Farm Creek, another intermittent non fish bearing stream.

There is no risk of having measurable increases in fine sediment <5.7 mm diameter in Fly Creek that would result in reduced survival rates of redband trout because of buffers, best management practices, mitigations and the location of the project in relation to fish bearing sections of Fly Creek. The redband trout population in Fly Creek is not expected to be impacted as a result of implementing the proposed action and therefore no impact to the Interior Columbia River redband trout population is expected.

Cumulative Effects

Lower Fly Creek 5th field watershed was identified as the Zone of Influence to measure cumulative effects for the redband trout. Effects to redband trout habitat from the activities proposed in the Lower Fly Creek project would not incrementally add to cumulative effects because changes in current sedimentation, runoff, flow, wood recruitment or stream temperature are not expected. Thinning smaller diameter trees and underburning outside the RHCA's would not increase sedimentation from its current condition or alter the amount of spawning or rearing habitat for redband trout. Ponderosa Land and Cattle owns a large portion of the land in the Upper Fly Creek subwatershed and it is actively managed for timber extraction. In the last year timber harvest has occurred in the upper portion of this subwatershed adjacent to Fly Creek, which is intermittent on their lands. The Upper Fly Creek watershed also has high road densities. There are two ponds located on Fly Creek at the downstream portion of the private lands at river mile 10.4 which act as settling ponds for sediments produced upstream of this. River mile 8.4 is the upstream end of the perennial fish bearing sections of Fly Creek. Substantial timber harvest on Forest Service lands has not occurred during the last ten years in the Lower or Upper Fly Creek subwatersheds. The settling ponds on private land and lack of recent timber harvests or other major disturbances on Forest Service lands would not combine to elevate levels of fine sediment in the fish bearing sections. Roads that cross or drain to streams are most likely the greatest sources of fine sediments in these two subwatersheds. The installation of proper drainage features and then closure of system and non system roads under this project will help to reduce the road densities in the project area. And, in some cases such as the 1170-900 road it will fix significant erosion and sediment issues due to a lack of road maintenance for several years.

The project would not effect current or future wood recruitment or have cumulative effects because of RHCA buffers and the project is located in low to moderate gradient uplands that do not contribute wood to fish bearing streams. Due to the nature of wood recruitment to Fly Creek windthrow or channel migration within the RHCA's will continue to provide wood. Wood densities in Fly Creek will continue at present levels from windthrow or channel migration, and would not be affected by this project. Retaining larger trees and snags in the project area will ensure wood is available for future recruitment.

The larger intermittent channels within the project area flows during the winter and spring and it will not incrementally lead to increases in stream temperatures for fish

bearing sections of Fly Creek. During the summer, water in Fly Creek comes entirely from groundwater sources.

The redband trout population in Fly Creek is unique because it has been genetically isolated from the rest of the Deschutes River population due to the streams intermittent nature before it connects to LBC. No records of fish stocking in Fly Creek are known to exist which indicates this redband trout population may be genetically unique with little to no hatchery introgression. Six Creek a tributary to Fly Creek above the project area also contains redband trout. It is unknown if steelhead historically used Fly Creek. Reach 4, the 1.6 mile section of Fly Creek from Prairie Farm Creek to Six Creek is most likely the main spawning and rearing area for this redband trout population with old redds and fry observed during the (Dachtler) 1998 survey. The amounts of spawning, timing and high use areas are unknown because no redd surveys have been conducted. Redband trout spawning probably occurs during the late winter or spring similar to other nearby populations. Increases in spawning activity in the nearby Metolius Watershed have been linked to the period when water temperatures reach 45 ºF (Houslet and Riehle 1997). Single pass electrofishing surveys of selected habitat units in Fly Creek captured 78 redband trout that ranged from 2.7 to 8.9 inches (Dachtler 1998). Water temperature data collected with a hand held thermometer in the perennial section of reach 4 reached a high of 56 ºF during the 1998 stream survey. An electronic thermograph placed in reach 2 measured a high temperature of 66.4 ºF before the stream went dry on 8/6/1998.

Effects to redband trout populations in Fly Creek from the activities proposed in the Lower Fly Creek Project would not incrementally add to cumulative effects because no effects to their population or habitat are predicted. The project will not increase fine sediment in Fly Creek or water temperature. Thinning 1,884 acres of upland stands will not affect stream flow, water quality or instream woody debris because it will only remove smaller trees while leaving larger trees, snags and woody debris. The project units make up 10.6 % of the Lower Fly Creek subwatershed. With the Addition of the Flymon and Flymon II projects within the area there would be 2,213 acres of treatments in 13.6 % of the Lower Fly Creek subwatershed. Overland flow in the project area outside of stream channels is unlikely due to low gradient, topography and high infiltration rates. The project also would not disrupt habitat that would displace or cause a decline in the redband trout population of Fly Creek. Implementation of the action alternative will have **No Impact** to redband trout populations or their habitat.

Botany/Sensitive Plants/Invasive Plants

The section below summarizes the existing condition information, along with the direct, indirect and cumulative effects as analyzed in the Botanical Resources Report and Biological Evaluation for this project (Pajutee, M. 2009). Additional information is contained in the full specialist report.

Indicator: Number of sites with protection measures implemented for Peck's penstemon.

Indicator: Number of sites with prevention measures to prevent the spread of invasive plants.

Threatened, Endangered, and Sensitive Plants

Affected Environment

There are two populations and additional potential habitat for Peck's penstemon in perennial and intermittent drainages associated with Fly Creek. Peck's penstemon is a local endemic wildflower, managed as a Regional Forest Sensitive Species. Both sites are excluded from project activities by design.

Environmental Consequences

Analysis Issue - Sensitive plant population

Measure – Probability of detrimental impacts

Alternative 1. No Action

Ecological Trends

There are no proposed activities, therfore no impacts will occur to any sensitive plants or populations under this alternative.

Alternative 2. Proposed Action

Direct and Indirect Effects

The project is not expected to disturb any sensitive species because both population sites are excluded from project activities by design.

However, potential habitat for Peck's penstemon and other native plants could be affected if weeds are spread. Thinning and burning operations can disturb and churn soil, leaving bare soil which is vulnerable to colonization by invasive plants. Since roads in the area are have invasive plant populations, equipment which works in the area can pick up weed seed in tires and on machinery parts and act as a vector to spread weeds.

Alternative 2

Cumulative Effects

Cumulatively, the number and area occupied by invasive plants has increased in the Lower Metolius watershed in the past 25 years. The largest increase occurred with the aftermath of the Eyerly wildfire in 2002, when 20,000 acres burned adjacent to the project area. Invasive plants have spread rapidly in burned habitats, despite control efforts. The adjacent Rd 1170 project which begins this year, will also disturb roadsides where invasive plants exist and contribute to a higher risk of invasive plant spread in the watershed. Required mitigation measures and continues removal of flowering plants can reduce invasive plant spread.

Invasive Plants

Affected Environment

There are populations of invasive non-native plants along several roads in the project area including:

- **Road 11:**
  - Spotted and Diffuse Knapweed,
  - Dalmation Toadflax,
  - St Johns Wort.
- **Road 1170**:
  - Spotted and Diffuse Knapweed,
  - St Johns Wort, Field Bindweed,
  - Medusa Head,
  - Bull Thistle.
- **Road 1170-400**:
  - Spotted and Diffuse Knapweed
- **Road 1170-900**:
  - Spotted Knapweed
- **Road 1170-960:**
  - Spotted Knapweed
- **Road 2055-013/014/017**:
  - Spotted Knapweed.
- **Road 2055- 970**:
  - Spotted Knapweed
- **Road 2055-970/860**:
  - Spotted Knapweed

Environmental Consequences

Alternative 1. No Action

Ecological Trend

Of the two alternative associated with this project, the No Action poses the least risk of introducing, exporting, or moving existing weeds about within the project area. However, the difference in risk between this and the action alternative appears to be relatively small. The weed populations are associated with the roads; populations would continue to spread without the treatments associated with the proposed action.

Alternative 2. Proposed Action

Direct and Indirect Effects

As noted previously, the action alternative associated with this project, relative to the No Action Alternative, pose a higher risk of the introduction and spread of invasive plants. The action alternative does not appear to differ substantially in the degree of risk that it poses. Actions to reduce, but not eliminate this risk, are included in the Mitigations section of this document.

Invasive Plant Species Risk Assessment

Forest Service Manual 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 measure that will be undertaken during project implementation (FSM 2081.03.29; November 1995).

RISK RANKING

Factors considered in determining the level of risk for the introduction or spread of invasive plants are:

__X__ HIGH

Has to be a combination of the following three factors:

1. Known invasive plants in/adjacent to project area. **YES**
2. Any of vectors #1-8 (descriptions follow) in project area. **YES**
3. Project operation in/adjacent to invasive plant population. **YES**

____ MODERATE

1. Any of vectors #1-5 present in project area.

____ LOW

1. Any of vectors #6-8 present in project area.

OR

2. Known invasive plants in/adjacent to project area without vector presence.

Vectors (if contained in project proposal) ranked in order of invasive plant introduction risk:

1. Heavy equipment (implied ground disturbance) **YES**
2. Importing soil/cinders/gravel
3. OHV's **YES**
4. Grazing (long-term disturbance)
5. Pack animals (short-term disturbance)
6. Plant restoration
7. Recreationists (hikers, mountain bikers, horses) **YES**
8. Forest Service project vehicles **YES**
9.

The project was given a **HIGH** risk ranking because there are known invasive plant populations within the project area, heavy equipment will be used, it will be used by

recreationists, horses, and off road vehicles and vehicles including Forest Service vehicles travel in the area.

Alternative 2

Cumulative Effects

The cumulative effects of the project on invasive species are defined and discussed above under Sensitive Plan cumulative effects.

Heritage Resources

The section below summarizes the existing condition information, along with the direct, indirect and cumulative effects as analyzed in the Cultural Resource Report for this project (Zettel, D. 2009). Additional information is contained in the full specialists report available at the Sisters Ranger District office project file.

Indicator: Protection of known sites and monitoring of project activity in the vicinity of these sites.

Affected Environment

Through past and present surveys, four heritage resource sites have been located and recorded that intersect some activity area of the project. Sites are defined by having 10 or more artifacts or the presence of features such as a cave, rock art, fire pit remains, structure, etc. Isolates are defined as not having any features and locating less than 10 artifacts. The sites are a lithic scatter site, historic homestead remains, and two multi-component sites with a lithic scatter and historic debris. The lithic scatter site and one of the multi-component sites are unevaluated for National Register of Historic Places eligibility. The homestead remains are not eligible. The remaining multi-component site has been evaluated as eligible. Through current survey, the previously recorded sites were confirmed to be adjacent to or inside the projects area of potential effect.

The site evaluations were completed by applying the criteria for eligibility found at 36CFR60.4. For prehistoric sites, information potential was determined by assessing research value or potential as addressed in research topics presented in the Deschutes County Prehistoric Context Statement (Houser, 1996) and Management Strategy for Treatment of Lithic Scatter Sites (Keyser et al, 1988).

No areas of specific tribal interest have been identified in the project area. The Warm Springs, Paiute, and Wasco Tribes from The Confederated Tribes of the Warm Springs Reservation of Oregon are the known tribes with historic associations to this area. The project area is within lands ceded to the Federal Government by The Confederated Tribes of the Warm Springs Reservation of Oregon under treaty in 1855 and ratified by Congress in 1859.

Environmental Consequences

Analysis Issue – Heritage sites
Measure – Avoidance through project design of known heritage sites

Alternatives 1. No Action

Ecological Trend

No impacts to heritage sites will occur under this alternative.

Alternatives 1. Proposed Action

Direct and Indirect Effects

The proposed vegetation treatment locations intersect both heritage resources that are unevaluated for the National Register and the eligible site. The treatment in the site areas of eligible or unevaluated sites will be restricted to hand treatment, mowing, under-burning (not at historic sites) or no treatment at all. (See project design features, chapter 2.)

Cumulative Effects

With the above design criteria and monitoring is implemented, there will be no direct or indirect effects from this project so no cumulative effects will occur.

Monitoring

Site locations will be inspected by an archaeologist post vegetation treatment and post slash treatment to ensure the sites were avoided and inspected to determine if additional artifacts are exposed outside the site boundaries.

Wildlife

The section below summarizes the existing condition information, along with the direct, indirect and cumulative effects as analyzed in the Wildlife Report and Biological Evaluation for this project (Gregg, M. 2009). Additional information is contained in the full specialists report.

Indicator: A variety of specific features are examined including: large old trees, connectivity, snag and coarse down wood habitats, changes to nesting and foraging habitats, and changes to hiding cover and forage.

Affected Environment

The project area is approximately 4412 acres. The project is located in the Lower Fly Creek watershed. The proposed units are located within Management Area 7, as described in the Deschutes National Forest Land and Resource Management Plan. The project would promote the growth of younger trees and move the area to Old Growth Forest/Late Old Structure to meet the objectives for ponderosa pine forest as defined in Forest Plan Amendment #2, the East Side Screens. Additionally, the project would reintroduce prescribed natural fire, reduce open road densities to minimize disturbance to wintering mule deer, and reduce invasive plants to restore native vegetation.

Stand structure would reflect the Historic Range of Variability (HRV) for ponderosa pine forests, including LOS, where low intensity fires can burn without risk of a stand replacement event. Shrubs and grasses are generally young and vigorous reflecting the influence of frequent low intensity fire. Understories would be composed of native plants with little to no non-native plants and/or invasive plants. Shrubs are present but not dominant; patches of shrubs would provide browse for deer and elk and nesting habitat for birds.

The project will create an open mosaic of ponderosa pine dominated forest, dominated by one or two storied stands of large trees, with smaller patches of younger trees in even age clumps about 1/2 acre in size. Stand density would be variable, in a “gappy, patchy, clumpy” configuration. Stand basal area would be from 60 to 80 square feet per acre on sites which can support these densities over time. Single snags, patches of snags, and down woody debris would be abundant.

In the eastern portion of the project area, where juniper is the dominant overstory tree, junipers that do not exhibit old growth characteristics would be removed from the stand. This area would be managed for individual occurrences of ponderosa pine.

The project is adjacent to Lake Billy Chinook where several bald eagle territories exist and are currently unstable due to the 2002 Eyerly Fire. The project will reduce stress to residual old growth ponderosa pine through understory thinning treatments, increasing the longevity of these old trees. Treatments will reduce density of the second growth accelerating the development of future old growth. These treatments are designed to provide alternate locations for bald eagle territories adjacent to Lake Billy Chinook.

Additional objectives would focus on developing late and old structure ponderosa pine for obligates such as the white-headed woodpecker and pygmy nuthatch.

Zone of Influence for Cumulative Effects

The following analysis examines projects that have occurred across the Sisters Ranger District over the past 15 years which implemented similar treatments as the Lower Fly Creek Project and may have had measurable effects. Direct and indirect short-term impacts are addressed looking out 20-30 years while long-term impacts are addressed looking out more than 30 years.

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. The project area proposes treatments to low elevation ponderosa pine and aspen stands within the "Eastside Screens" land allocation on the Sisters Ranger District and thus will define the "zone of influence." The discussion of wildlife effects will be focused on the units proposed for treatments and their incremental impacts in combination with the past, present and reasonably foreseeable project within the "zone of influence".

The timeframe examined for the cumulative effects analysis are projects which have occurred within the past 15 years or projects that will be implemented within the next 5 years. The zone of influence used to discuss cumulative effects are the habitats in the project areas listed below associated with treatments in lower elevation ponderosa pine, and any aspen or riparian enhancement projects. There are no other plant association groups within the project area, therefore only these habitat types will be discussed in the cumulative effects analysis.

The cumulative effect of the loss of large old trees since European settlement is not addressed in cumulative effects because no large old trees will be removed in this project. The lack of late and old structure is considered as part of the existing condition.
The following vegetation management projects (Table 3-9 and 3-10) were designed to reduce stand densities in order to maintain and develop desired structure and reduce fuel loadings. Effects to wildlife species include the reduction of dense forested habitat (reduced canopy closure), fragmentation where stands resulted in open conditions, and reduction in dead wood habitat.

This list is used to discuss cumulative impacts from Forest Service Actions to Management Indicator Species, Landbird Focal Species, and Birds of Conservation Concern. Cumulative impacts are those impacts on the environment, which results from the incremental impact of each action when added to other past, present, and reasonably foreseeable future actions that overlap in time and space.

Table 3-9. Past and Present District Projects within the Eastside Screen area.

Past Activities on the Sisters Ranger District	Acres in Lower Fly Creek Project	Acres on the Sisters Ranger District
BBR Fuels	0	390
Canal16 Thinning	0	417
Canal 16 Underburn	0	1,790
Flymon Stewardship Demo	0	250
Highway 20 Thinning	201	7,833
Private Land Activities**	0	1,460
Underline Thinning	0	1,506

Table 3-10. Future Foreseeable Projects in Eastside Screens on the Sisters Ranger District.

Future Foreseeable Projects on the District	Acres in Lower Fly Creek Project	Acres on the Sisters Ranger District
SAFR (Hazardous Fuels Reduction)	0	17,600
Flymon II Stewardship	0	300
Glaze Forest Restoration Project	0	874

BBR Fuels, Canal 16 Thinning, Canal 16 Underburn, Flymon Stewardship Demo, Highway 20 Thinning, and Underline Thinning were commercial thinning projects designed to reduce overstocked stands and treat ground vegetation to lower fuel levels. These projects were also designed to promote the growth of residual trees. Effects to wildlife species were a reduction in habitat for species requiring dense forested habitat (e.g. sharp-shinned hawk) and a reduction in ground vegetation like bitterbrush.

The SAFR and Flymon II Stewardship Projects are both projects that propose to enhance residual ponderosa pine by reducing the risk of uncharacteristically large fire while reducing stand densities to accelerate the growth of younger early/mid seral ponderosa pine. Both projects propose a thinning from below and will reintroduce prescribed natural fire to dry ponderosa pine habitat types

Threatened and Endangered Species

A Biological Evaluation has been prepared in compliance with the requirements of Forest Service Manual (FSM) 2630.3., FSM 2670-2671, FSM W.O. Amendments 2600-95-7, and the Endangered Species Act (ESA) of 1973.

Those species thought to occur presently or historically on the Deschutes National Forest and analyzed in this document include the northern spotted owl (*Strix occidentalis*) and northern spotted owl critical habitat.

Table 3 - 11. Threatened and Endangered Species Summary

Species	Status	Habitat	Presence
Northern Spotted Owl	Federal Threatened, MIS	Old Growth Mixed Conifer Forests	No
Northern Spotted Owl Critical Habitat - 2008			No
Northern Spotted Owl Critical Habitat – Historic*			No

Because there is no habitat or known populations of the northern spotted owl, the spotted owl will not be addressed further in this document. The project is outside the range of the northern spotted owl. The Biological Evaluation (Gregg, 2009) contains more information and rationale.

Regional Forester's Sensitive Species

Species classified as sensitive by the Forest Service are to be considered by conducting biological evaluations (BE) to determine potential effects of all programs and activities on these species (FSM 2670.32). The BE is a documented review of Forest Service activities in sufficient detail to determine how a proposed action may impact sensitive wildlife species, and to comply with the requirements of the Endangered Species Act.

The Forest Service Region 6 Sensitive Species List (USDA 2008c) was reviewed for species that may be present on the Deschutes National Forest. After a review of records, habitat requirements, and existing habitat components, it was determined the following sensitive animal species have habitat or are known to occur in the project area and will be included in this analysis:

- Northern Bald Eagle *Haliaeetus leucocephalus*
- Lewis' Woodpecker *Melanerpes lewis*
- White-headed Woodpecker *Picoides albolarvatus*

Table 3 - 12. Sensitive Species Summary for the Deschutes National Forest.

Species	Status	Habitat	Presence
Northern Bald Eagle (*Haliaeetus leucocephalus*)	Regional Forester Sensitive, MIS	Lakeside with Large Trees	**Yes**
Bufflehead (*Bucephala albeola*)	Regional Forester Sensitive	Lakes, Snags	No
Harlequin Duck (*Histrionicus histrionicus*)	Regional Forester Sensitive	Rapid Streams, Large Trees	No
Horned Grebe (*Podiceps auritus*)	Regional Forester Sensitive	Lake	No
Tricolored Blackbird	Regional Forester	Lakeside, Bullrush	No

Species	Status	Habitat	Presence
(*Agelaius tricolor*)	Sensitive		
Yellow Rail (*Coturnicops noveboracensis*)	Regional Forester Sensitive	Marsh	No
Western Sage Grouse (*Centrocercus urophasianus phaeios*)	Regional Forester Sensitive	Sagebrush Flats	No
American Peregrine Falcon (*Falco peregrinus anatum*)	Regional Forester Sensitive, MIS	Riparian, Cliffs	No
Lewis' Woodpecker (*Melanerpes lewis*)	Regional Forester Sensitive, MIS	Large, open ponderosa pine and burned forests	**Yes**
White-headed Woodpecker (*Picoides albolarvatus*)	Regional Forester Sensitive, MIS	Large, open ponderosa pine	**Yes**
Northern Waterthrush (*Seiurus noveboracensis*)	Regional Forester Sensitive	Riparian vegetation including willows and alder	No
Pacific Fisher (*Martes pennanti*)	Federal Candidate, Regional Forester Sensitive	Mixed, Complex	No
Pygmy Rabbit (*Brachylagus idahoensis*)	Regional Forester Sensitive	Sagebrush Flats	No
California Wolverine (*Gulo gulo*)	Regional Forester Sensitive, MIS	Mixed, High Elevation	No
Townsend's Big-eared Bat (*Corynorhinus townsendii*)	Regional Forester Sensitive, MIS	Caves	No
Oregon Spotted Frog (*Rana pretiosa*)	Federal Candidate, Regional Forester Sensitive	Stream, Marsh	No
Crater Lake Tightcoil (*Pristiloma arcticum crateris*)	Regional Forester Sensitive	Riparian, Perennially Wet	No
Silver-bordered Fritillary (*Boloria selene atrocostalis*)	Regional Forester Sensitive	Open riparian bogs and marshes	No
Johnson's Hairstreak (*Mitoura johnsonii*) (*Callophrys johnsonii*)	Regional Forester Sensitive	Coniferous forests with mistletoe	No

After a review of records, habitat requirements, and existing habitat components, it was also determined that the remaining sensitive species do not occur and have no habitat in

the project area and will not be included in any further analysis: bufflehead (*Bucephala albeola*), harlequin duck (*Histrionicus histrionicus*), horned grebe (*Podiceps auritus*), tri-colored blackbird (*Agelaius tricolor*), yellow rail (*Coturnicops noveboracensis*), western sage grouse (*Centrocercus urophasianus phaeios*), American peregrine falcon (*Falco peregrinus anatum*), northern waterthrush (*Seiurus noveboracensis*), Pacific fisher (*Martes pennanti*), pygmy rabbit (*Brachylagus idahoensis*), California wolverine (*Gulo gulo*), Townsend's big-eared bat (*Corynorhinus townsendii*), Oregon spotted frog (*Rana pretiosa*), Crater Lake tightcoil (*Pristiloma arcticum crateris*), silver-bordered fritillary (*Boloria selene atrocostalis*), and Johnson's hairstreak (*Mitoura johnsonii*). The Biological Evaluation (Gregg, 2009) contains additional information and rationale.

Bald Eagle, Federal Threatened, MIS

Affected Environment

The bald eagle, formerly a threatened species in the lower 48 states under the Endangered Species Act, has been delisted (August 8, 2007) because it has recovered from being at risk of extinction (Fed Reg 2007). It will continue to be protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. The bald eagle is now designated a Regional Forester Sensitive Species. The US Fish and Wildlife Service has issued National Bald Eagle Management Guidelines (USFWS 2007b) intended to minimize activities that could interfere with the eagle's ability to forage, nest, roost, breed, or raise young. Such impacts to bald eagles, where they may constitute "disturbance", are prohibited by the Eagle Act. Guidelines for off-road vehicle use near nests during the breeding season are included. In addition, the guidelines identify management practices that can be used for added benefit to bald eagles.

On the Deschutes National Forests, ponderosa pine and Douglas-fir trees averaging 32 inch+ dbh with live large, open limb structure are preferred for nesting. Nests consist of bulky stick platforms built in the super-canopy of such trees, or less frequently on cliffs. They are typically constructed within one mile of appropriate foraging habitat, which includes rivers and large lakes and reservoirs. Bald eagles are sit-and-wait predators, which predominantly capture prey from perches over water; ideal perches are large trees and snags within 330 feet. (100 m) of water (Anthony et al. 1995). Prey items include fish, waterfowl and other birds, small mammals, and carrion (Stalmaster 1987).

There are 49 known bald eagle territories on the Deschutes National Forest National Forest primarily associated with large water bodies, rivers, and streams. Annual surveys are conducted but not for all sites.

Bald Eagle Management Areas (BEMAs) (MA-3) are designated in the Deschutes National Forest Plan (USDA 1990a) to manage habitat to enhance the carrying capacity of bald eagles. Generally within MA-3, nesting and foraging areas are protected and enhanced, emphasizing old growth stands with large trees. In addition, human disturbance is to be minimized during the nesting season. Therefore, seasonal restrictions may be warranted between January 1 through August 31 to protect nest sites and key

feeding and roost sites. Currently, approximately 22,245 acres on the Deschutes NF and 2,673 acres on the Ochoco NF occur within BEMAs.

No bald eagle nest sites or BEMAs occur within the project area. There are three active territories north of the project area associated with Lake Billy Chinook. In 2002, the Eyerly Fire burned these three territories with stand replacing fire. Although eagles continue to nest in these territories, future nest trees are limited due to the fire. Use of the Lower Fly Creek Project Area by eagles has been documented during winter month, when the project area is occupied with wintering mule deer, eagles forage on winter or predator killed deer carcasses throughout the winter.

Road Impacts/Disturbance
Bald eagles have shown varied responses to human disturbances. Stalmaster and Newman (1978) reported a lower number of eagles in areas of high activity compared to areas of moderate activity. Moderate activity seemed to be tolerated though this resulted in a shift in distribution to marginal habitat and confined the population to a smaller area. They also reported that human disturbance was tolerated more often when the disturbance was partially obscured by vegetation. Grubb and King (1991) noted pedestrian disturbance was the most impactful to breeding eagles followed by vehicle disturbance. Recommended buffer distances to reduce disturbance during the nesting season for bald eagles has ranged from 300-800 meters (Anthony and Isaacs 1989, Fraser et al. 1985, McGarigal 1988, and Stalmaster 1987). Grubb and King (1991) recommended a 450 meter buffer for vehicles relative to bald eagle disturbance.

Bald Eagle Management Areas (BEMAs)
There are no designated BEMA's or identified eagle territories within the project area. There are three active territories north of the project area associated with Lake Billy Chinook. In 2002 the Eyerly Fire burned these three territories with stand replacing fire. Although eagles continue to nest in these territories, future nest trees are limited due to the fire.

Environmental Consequences

Analysis Issue – What are the effects of the project to the bald eagle?
Measure – Impacts to habitat (large ponderosa pine) that provide perch and nest sites

Alternative 1 No Action

Ecological Trends
Under the no action alternative the project will not implement any vegetation treatment within the Lower Fly Creek Project area. This alternative will have **No Impact** to the bald eagle or any bald eagle habitat. However, a long term ecological trend if no action occurs is the loss of large trees which could serve as future eagle habitat adjacent to the Eyerly Fire. Fewer large trees would develop in overstocked stands for the future. If a wildfire enters the area, large trees could be lost.

Alternative 2 Proposed Action

Direct and Indirect Impacts

The project does not occur within ¼ mile non-line of site or within ½ mile line of site of any known eagle nests. The project also does not occur within 400 meters of any known winter roost sites.

This alternative will have **No Impact** to the bald eagle or any bald eagle habitat.

Cumulative Effects

In 2002, north of the project area, the Eyerly Fire burned approximately 18,000 acres. As a result 3 eagle territories were consumed by the fire. Since 2002, as a result of the fire, historic nest trees have deteriorated and fallen down. Eagle pairs and territories have been shifting due to the need to find new nest trees. As trees continue to come down in the next 30 years nest trees will become limited within the territories. The Flymon Stewardship Demo and Flymon II Stewardship project areas are associated with the Lower Fly Creek Project Area and all are approximately 3 air miles from the nearest eagle territory. The Flymon Stewardship Demo and Flymon II Steward propose a combined total of approximately 550 acres of thinning from below. Treatments will maintain existing large trees in the project area as well as promote growth and development of future large trees. Cochran and Barret (1999) showed that 30 years after thinning ponderosa pine stands, in a Central Oregon study, there were large differences in average tree sizes among different group stocking levels. Also showing that growth rates of 20 largest diameter trees per acre were reduced by competition from smaller trees. Treatments could provide eagle nesting habitat in the long-term when nest trees are limited within historic territories associated with the Eyerly Fire. There are no incremental negative impacts to the bald eagle or it habitat associated with the proposed action therefore the project does not contribute to cumulative impacts to this species. Cumulatively Project will have a **"Beneficial Impact"** to bald eagle habitat by maintaining existing large trees, as well as promoting the development of future old growth.

Determination

The project does not contain any bald eagle nest sites and is not within any designated Bald Eagle Management Areas, or areas identified as essential eagle habitat. Therefore, the project will have "**No Impact"** to any Bald Eagle Management Areas. Alternatives 2 will have a "**Beneficial Impact"** to the bald eagle and its habitat by reducing the risk of stand replacing fire and promoting the development of large trees for eagle habitat adjacent to 3 territories that have been impacted by wild fire.

Lewis' Woodpecker, Region 6 Sensitive and MIS

Affected Environment

Formerly widespread, this species is common year-round only in the white oak ponderosa pine belt east of Mt. Hood. Habitat for the Lewis' woodpecker, a migrant in this part of its range, includes old-forest, single-storied ponderosa pine. Burned ponderosa pine

forests created by stand-replacing fires provide highly productive habitats as compared to unburned pine (Wisdom et al. 2000). Lewis' woodpeckers feed on flying insects and are not strong cavity excavators. They require large snags in an advanced state of decay that are easy to excavate, or they use old cavities created by other woodpeckers. Nest trees generally average 17 to 44 inches dbh (Saab and Dudley 1998, Wisdom et al. 2000). Known breeding has been documented in low numbers along Whychus Creek (Marshall et al. 2003) and in recent burned areas across the Deschutes.

In evaluating landscape predictor variables for the Lewis' woodpecker, Saab et al. (2002) found a negative relation to burned ponderosa pine/Douglas-fir stands with high crown closure (>70%) but was positively associated with low snag densities overall. However, although it selects for more open stands, this species selected nest sites with higher densities of large snags (≥20"dbh) (Saab and Dudley 1998). Lewis' woodpeckers are different than other woodpeckers. They are aerial insectivores during the breeding season and use lower densities of smaller snags but rely more heavily on large snags (Saab and Dudley 1998). Habitat for Lewis' woodpecker will increase 5-10 years after in fire areas as smaller snags fall.

The Lewis' woodpecker is declining throughout its range. Threats to this species include the loss of suitable habitat, competition for nest trees, and effects of pesticides on insects.

Habitat for the Lewis' woodpecker occurs north of the project area and is associated with the 18,000 acres Eyerly Fire. This area provides both nesting and foraging habitat due to the amount of burned ponderosa pine created by the stand replacing fire. Lewis' woodpeckers are observed frequently using the fire. In its current state the project area does not contain any single story large ponderosa pine stands, stand are primarily second growth mid-seral ponderosa pine with residual old growth scattered throughout the project area. However, the project does contain some large old snags, providing nesting habitat. Overall, habitat is limited within the project area.

Environmental Consequences

Analysis Issue – Effects to Lewis' Woodpecker
Measure – Impacts to snags and coarse woody material

No Action Alternative – Ecological Trend

Increased stand densities perpetuates the problem of losing large structure over time, which these species require for suitable nesting and foraging habitat. In dense stands, smaller trees will require a longer period of time to develop into suitable habitat due to competition for nutrients. It also minimizes nest site availability, which could increase competition for existing sites between species and may lead to greater risk of predation. Increased stand densities may increase the risk of loss from fire. These species require snags for nesting and utilize softer snags (moderate decay). These structures would be consumed more rapidly with increased fire intensities and may lead to large areas of the landscape being unsuitable if such an event were to occur.

Alternative 2 - Proposed Action

Direct and Indirect Impacts

There will be no known direct impacts to Lewis' woodpeckers. However, disturbance may occur during treatments which may result in altering their foraging locations or behavior. Approximately 969 acres of ponderosa pine stand that provides potential habitat are proposed for treatment. However, green trees 21 inches and greater will not be removed. In addition, large snags are not targeted for removal, but there is a possibility for incidental loss of snags during treatments.

Thinning will open up stands which should benefit Lewis' woodpecker. Thinning will open up site distances around nests, which should help this species with predator avoidance around nest sites. In addition, the thinning will reduce ladder fuels associated with large trees to fire. Ladder fuel reduction will decrease the risk of losing the remaining large trees. Removal of the understory in overstocked stands will decrease the competition for nutrients and water, which should also lower the susceptibility to insects and disease. An important benefit to thinning is the reduction in beetle caused mortality (Cochran and Barret 1999).

Currently, there are a limited number of large snags and trees available as well as replacement large trees. Many of the future large trees are within overstocked stands, which will increase the amount of time the trees will take to get to the desired size and height. Thinning overstocked stands will reduce competition which should increase growth rates to the remaining trees. Cochran and Barret (1999) were able to show that years after thinning there were large differences in average tree sizes among different group stocking levels. They also showed that growth rates of the 20 largest diameter trees per acre were reduced by competition from smaller trees. Increasing growth rates will benefit Lewis' woodpecker by creating more available suitable by increasing the number of large snag to provide nesting habitat.

Mowing and burning will reduce both activity fuels and overall fuel loadings to acceptable levels. Reduction of fuels will reduce fire risk and will reduce competition to established trees, further increasing the stands resiliency to wildfire. Prescribed natural fire will also create small isolated areas of foraging habitat from incidental fire killed trees.

Cumulative Effects

The Flymon Stewardship Demo and Flymon II Steward will implement a combined total of approximately 550 acres of thinning from below. Both projects occur within the Fly Creek watershed and within the Lower Fly Creek Project boundary. Treatments will maintain existing large trees in the project area as well as promote growth and development of future large trees.

Overall, treatments will be beneficial to Lewis' woodpecker by creating a more contiguous stand of old growth providing a diversity of large snags in the long-term providing nesting habitat. Incremental impacts to these species are minimal and habitat

will not be reduced. In the short-term, use of the area by species may change due to the change in composition and structure of these stands.

Cumulatively, the action alternative will have "**No Impact"** to Lewis' woodpecker or its habitat.

Determination
Implementation of the Lower Fly Creek Project will result in no change to suitable habitat for the Lewis' woodpecker. Therefore, Alternative 2 will have **"No Impact"** to the Lewis' woodpecker and its habitat.

White-headed Woodpecker, Region 6 Sensitive and MIS

Affected Environment
White-headed woodpeckers are uncommon permanent residents in forests east of the Cascades. They use habitat with large open ponderosa pine, low shrub level and large snags. Dixon (1995) found white-headed woodpecker densities increased with increasing old-growth ponderosa pine trees and showed a positive association with large ponderosa pine. The white-headed woodpecker is a primary cavity excavator of soft snags. This woodpecker is the only woodpecker species to rely heavily on seeds of ponderosa pine for food (Marshall et al. 2003 p. 364).

A long term study on the white-headed woodpecker occurred on the Deschutes and Winema National Forests from 1997-2004 with several Deschutes study sites occurring in the Metolius Basin area. Frenzel (2000) calculated the mean diameter for white-headed woodpecker nest trees to be 26.2"dbh while Dixon (1995) found similar results (mean diameter of 25.6"dbh). Frenzel (2003) found nests at sites with a high density of large diameter trees had a higher survival rate than nests in recently harvested sites. Unharvested sites or sites with greater than 12 trees per acre >21"dbh had a success rate of 63.1% while nests at previously harvested sites or lower densities of large trees had a success rate of 39.8%. Therefore, white-headed woodpeckers were positively associated with higher densities of large trees. On the Winema National Forest, white-headed woodpeckers were found to be using small-diameter trees, logs in a slash pile and upturned roots (6-13"dbh) where large snags were uncommon (Frenzel 2002).

Threats to this species include increased stand densities in ponderosa pine due to fire suppression, loss of large, old ponderosa pine trees and snags, wildfire, and increased shrub densities. Increased shrub densities may be factors leading to increased mammalian nest predation and increased risk of avian predation on adults (Frenzel 2000).

Environmental Consequences

Analysis Issue – Effects to White-headed Woodpecker
Measure – Impacts to snags and coarse woody material

Alternative 1 No Action – Ecological Trend

The ecological trend is that snag habitat on the 969 acres of mid-seral ponderosa pine habitat would continue to be provided in the short and long-term. These untreated dense stands would continue to see increased snag recruitment through tree mortality from natural disturbances such wildfire, wind events, insect and disease pathogens, and lightning. High tree density in some of the ponderosa pine stands would not only retard the development of large diameter (>21" dbh) ponderosa pine trees and future snags but also may hasten the development of smaller diameter snags and course woody material (CWM) as a result of mortality from bark beetles or fire. In the short-term this would provide foraging and some nesting habitat for the white-headed woodpecker. In the long-term large diameter snags that provide nesting habitat would be limited and low white-headed woodpecker abundance would reflect this in the project area. The increased fire risk that would also result would put these limited habitat features at risk. If a high intensity wildfire did burn through the planning area, much of the nesting habitat would be lost. Most species of woodpeckers take advantage of snags and insect infestation following fire at varying degrees (Saab and Dudley 1998).

Alternative 2 - Proposed Action

Direct and Indirect Impacts

The thinning and fuels treatments planned under the action alternative on 1,031 acres of mid-seral ponderosa pine which provides marginal habitat for the white-headed woodpecker are designed to reduce the risk of high intensity wildfires in the short-term (<30 years) and promote the development of late and old structured (LOS) habitat in the long-term. The action alternative does not propose commercial harvest or salvage of any snags or coarse woody material (see mitigation measures). With the exception of occasional felling of snags that may pose a hazard to human safety during thinning operations, thinning operation would have no direct effects to snags or coarse woody material habitats. Commercial harvest would directly effect green tree replacements by reducing the number of trees in treatment units. However the units would retain enough green tree replacements to exceed currently directed levels and meet the 30-80% tolerance level for white-headed woodpecker habitat. Thinning would open up areas, and the indirect effects of treatments include healthier stands, but could reduce some foraging potential in the short-term.

Proposed treatments would reduce the risk of high intensity wildfire by thinning the understory, reducing the ladder fuels that make the area susceptible to a stand replacing fire. Treatments would accelerate stand development providing long-term habitat for the white-headed woodpecker which is dependent on LOS ponderosa pine. Although the recruitment of dead wood habitats would be slow, silvicultural treatments would provide beneficial indirect effects by promoting faster growth of green tree replacements, ultimately providing larger diameter snags and down wood over the next 30+ years. As the stands age, additional snags and logs would develop, providing a higher diversity of habitat and structure. As a result, stands would contain more abundant nesting habitat for white-headed woodpecker. In the short-term thinning from below will reduce the dense understory in the ponderosa pine removing foraging habitat. Reducing understory

densities will not preclude foraging, but will limit the abundance of foraging habitat, thus changing foraging behavior to focus on residual areas of denser trees. Through project design, untreated areas will be left throughout the project that will maintain high density stands up to ½ acre in size.

Cumulative Effects

Of the approximately 109,571 acres of low elevation ponderosa pine stands in the East Side Screens across the Sisters Ranger District, approximately 52,600 acres of both nesting and foraging habitat exists within this area for the white-headed woodpecker.

Several vegetation management projects have occurred or may occur within suitable habitat (BBR Fuels, Underline Thinning, Highway 20, Canal 16 Thinning and Canal 16 underburn,). Overall, treatments were proposed to reduce the risk of loss of existing habitat from large-scale disturbances and thinned approximately10,146 acres. Mowing and burning were widely prescribed maintaining grassy understories, which should benefit white-headed woodpecker nesting habitat. Fuels treatments associated with these projects enhanced habitat for white-headed woodpeckers on approximately 4,680 acres of ponderosa pine habitat.

The SAFR Flymon, Flymon II and Glaze Forest Restoration Project would also complete fuel reduction within ponderosa pine stands, which will be beneficial to these species. The SAFR Project proposes approximately 17,000 acres of thinning the Flymon project proposes approximately 250 acres of thinning and the Glaze project proposes to approximately 874 acres of thinning. Objective are also focused around ponderosa pine obligates such as the White-headed woodpecker, therefore on a landscape basis approximately 18,124 acres of habitat in will have short-term impacts but long-term benefits to habitat for this species.

Private lands are not managed for above mentioned species. Therefore, it is assumed that any habitat provided by these parcels is incidental and may not be long-term. There is approximately 51,530 acres of eastside ponderosa pine or variation of ponderosa pine habitat associated with private lands within the zone of influence.

North and adjacent to the project area the Eyerly Fire burned 18,000 acres in 2002. The longevity of fire killed large diameter (>20”dbh) ponderosa pine is approximately 30 years. Within 30 years when most of the large snags have come down the Eyerly Fire will be large snag deficient. The Proposed Action will not reduce snag number on the landscape, but in the long-term will promote the growth of small trees that will be recruited as large snag habitat in the future providing nesting habitat.

Cumulatively, the actions associated with Alternatives 2 will be beneficial in the long-term, although Alternative 2 will reduce foraging habitat, residual foraging habitat will remain and will not preclude use by white-headed woodpeckers. The project will minimally reduce foraging habitat on approximately 1% of the habitat identified within low elevation ponderosa pine stands within the Eastside Screens. No snag or CWM will be removed under Alternative 2 except snags that pose a hazard to operation. Due to small scope of the project, the proposed action will have **“No Impact”** to the white-

headed woodpecker. The proposed action will minimally reduce foraging habitat in the short-term, but will not preclude use of the project area by this species.

Determination
Implementation of the Lower Fly Creek Project will result in minor short-term changes to habitat for the white-headed woodpecker. Therefore, Alternatives 2 will have **"No Impact"** on the white-headed woodpecker and its habitat.

Management Indicator Species and Other Species of Concern

The Deschutes National Forest Land and Resource Management Plan (LRMP) (USDA 1990a) identified a group of wildlife species as management indicator species (MIS). These species were selected because they represent other species with similar habitat requirements. Management indicator species can be used to assess the impacts of management activities for a wide range of wildlife species with similar habitat needs (FSM 2620.5). Those management indicator species selected for the Deschutes National Forest include the bald eagle, northern spotted owl, golden eagle, red-tail hawk, osprey, northern goshawk, Cooper's hawk, sharp-shinned hawk, great gray owl, great blue heron, woodpeckers (cavity nesters), peregrine falcon, California wolverine, elk, mule deer, American marten, Townsend's big-eared bat, and waterfowl. All but the following have been covered in previous sections (TES section) and will be discussed below: northern goshawk, Cooper's hawk, sharp-shinned hawk, great gray owl, great blue heron, golden eagle, osprey, waterfowl, red-tail hawk, osprey, woodpeckers, bats, American marten, elk, and mule deer.

In addition to the above mentioned MIS species there have been a number of wildlife species deemed species in which analysis is required through other directives (e.g., Landbirds, see Birds of Conservation Concern section).

Table 3-13. Management Indicator Species Summary for the Deschutes National Forest.

Species	Habitat	Habitat in Project Area
Northern Goshawk (*Accipiter gentiles*)	Mature and old-growth forests; especially high canopy closure and large trees	Yes
Cooper's Hawk (*Accipiter cooperii*)	Similar to goshawk, can also use mature forests with high canopy closure/tree density	Yes
Sharp-shinned Hawk (*Accipiter striatus*)	Similar to goshawk in addition to young, dense, even-aged stands	Yes
Great Gray Owl (*Strix nebulosa*)	Mature and old growth forests associated with openings and meadows	No habitat in project area
Great Blue Heron (*Ardea herodias*)	Riparian edge habitats including lakes, streams, marshes and estuaries	No habitat in project area

Species	Habitat	Habitat in Project Area
Northern Goshawk (*Accipiter gentiles*)	Mature and old-growth forests; especially high canopy closure and large trees	Yes
Cooper's Hawk (*Accipiter cooperii*)	Similar to goshawk, can also use mature forests with high canopy closure/tree density	Yes
Sharp-shinned Hawk (*Accipiter striatus*)	Similar to goshawk in addition to young, dense, even-aged stands	Yes
Golden Eagle (*Aquila chrysaetos*)	Large open areas with cliffs and rock outcrops	Yes
Waterfowl*	Lakes, ponds, streams	No habitat in project area
Red-tailed Hawk (*Buteo jamaicensis*)	Large snags, open country interspersed with forests	Yes
Osprey (*Pandion haliaetus*)	Large snags associated with fish bearing water bodies	No habitat in project area
Neotropical Migrants*	Various habitats	Yes
Townsend's Big-eared Bat	Caves and mines	No
American Marten (*Martes americana*)	Mixed Conifer or High Elevation late successional forests with abundant down woody material	No habitat in project area
Elk (*Cervus elephas*)	Mixed habitats	Yes
Mule Deer (*Odocoileus hemionus*)	Mixed habitats	Yes
Snags and Down Wood Associated Species and Habitat or Primary Cavity Excavators	Snags and down woody material	Yes

The project area does not contain habitat for the Great Gray Owl, Great Blue Heron, Waterfowl, Osprey, and American Marten. Therefore, these species will not be addressed any further in this document.

Northern Goshawk

Affected Environment

The goshawk is considered a management indicator species in the Deschutes Land and Resource Management Plan. This species is associated with mature and late-successional forests. All mature and late-successional habitats are considered potential nesting habitat and earlier forested seral stages are considered potential foraging habitat. Moist mixed conifer and moist ponderosa pine late-successional areas are preferred habitats, although

forest structure appears to be the more limiting factor to goshawk habitat rather than stand composition (i.e. tree species). Preferred nest stands have a minimum of 40% canopy closure; and the nest sites within these stands have >60% canopy closure (Reynolds et al. 1991).

There are no BBS (Breeding Bird Survey) data available for the state of Oregon due to the low detectability of this species using BBS methods. However, for western North America, BBS data (1966-1995) show a stable trend (Wisdom et al. 2000). There is a separate trend for fall migration conducted by Hawkwatch International from four locations in Utah and New Mexico. Data indicate an average decline of 4% annually between 1977 and 1991 (Wisdom et al. 2000).

There is approximately 728 acres of goshawk nesting habitat and approximately 1067 acres of foraging habitat within the project area and is associated with mixed conifer stand on steep north facing slopes. These stands are generally multi-storied ponderosa pine and Douglas-fir and have canopy closures exceeding 40%. The habitat is associated with both intermittent and perennial streams which are the more highly productive stands in the project area.

The suitable goshawk habitat within the project area was surveyed to Region 6 Forest Service protocol two consecutive years (survey seasons 2008 and 2009). As a result of the surveys no goshawk responses were detected and no nest sites were identified.

Road Impacts
Disturbance at specific sites and collection were road associated factors identified by Gaines et al. (2003). Human disturbance to nests have been a suspected cause of nest abandonment (Reynolds et al. 1992). In addition, roads may facilitate access for falconers to remove young from nests (Erdman et al. 1998 in Gaines et al. 2003). It is suspected that falconers have visited various nests on the two forests (K.Hennings, pers.comm).

Grubb et al. (1998) found goshawks showed no discernible behavioral responses to traffic greater than 400 meters from nest sites in forested habitats with noise levels below 54dB. In addition, Jones (1979) recommended a 400-500 meter buffer around goshawk nest sites from March 1 through September 30 to protect against disturbance. However, in a study conducted by Bautista et al. (2004), increased traffic levels were found not to impact the presence of goshawks near roads. This may be in part due to traffic being a routine disturbance and/or prey was more abundant near roads either as roadkill or live prey.

Environmental Consequences

Analysis Issue - Effects to Northern Goshawk
Measure – Acres of nesting and foraging habitat impacted

Alternative 1 No Action – Ecological Trend

Areas that currently provide suitable nesting habitat would most likely have increased mortality due to tree stress. Without treatments in the second growth ponderosa pine stands, stand densities will prolong future development of larger nesting trees. High stand densities will result in the overall decrease in tree vigor among all size classes. The most significant effect of high stand densities will be the gradual loss of the existing historic large-tree component/nesting habitat which is likely to be at a much higher rate than if stand densities were reduced to more healthy levels.

Alternative 2 - Proposed Action

Direct and Indirect Effects

No vegetation management treatments are proposed within the 728 acres of nesting habitat. However, thinning from below will occur within the 1,353 acres of foraging habitat. In the areas identified for thinning, canopies will be opened up and stand densities reduced to lessen the risk of a large-scale event (insects, disease, or fire). Thinning will directly reduce canopy cover in foraging habitat, but it will also reduce the fire risk to individual stands by breaking up the fuel continuity across the project area additionally reducing the risk of losing adjacent stands of nesting habitat. Each unit identified for thinning will leave residual untreated areas ranging from ¼ to 1 acre in size. These areas will have a higher stocking rate and will provide some diversity in stand densities across the project area, as these retention clumps could benefit some prey species.

Fuels treatments will reduce both activity fuels and overall fuel loadings to acceptable levels. Treatments will reduce fire risk and competition to established trees, increasing the stands resiliency to future wildfire. Fuels treatments will also reduce the understory complexity which may result in a change or reduction in potential prey species. However, adjacent untreated areas may be able to provide the structural complexity for prey species and will support foraging opportunities.

In addition, the project proposes to cumulatively close approximately 5.06 miles of roads within goshawk foraging habitat. Road closures will limit disturbance to goshawk foraging areas, and increase the potential use of adjacent nest stands.

Overall, there will be no change to nesting habitat associated with the proposed action. Within the identified foraging habitat overstory structural diversity will remain, but understory complexities will be reduced through thinning, burning. Although prey habitat will be reduced in the short-term residual habitat will remain providing foraging opportunities for the goshawk. Long-term benefits of treatments will promote the development of LOS ponderosa pine, creating more contiguous open stands that are less susceptible to disease infestation and wildfire, but also promote the development long-term nesting habitat.

Cumulative Effects

The low elevation ponderosa pine stands within Eastside Screens totals approximately 109,571 acres. Nesting habitat for the goshawk within ponderosa pine habitat is

associated with LOS ponderosa pine. Approximately, 12,566 acres (11%) of habitat that could potentially be used as nesting habitat exists within lower elevation ponderosa pine stands outside NWFP lands.

Approximately, 10,396 acres of thinning have or will occur under the BBR Fuels, Underline Thinning, Highway 20, Canal 16, and Flymon Stewardship Demo. projects, and 4,680 acres of prescribe natural fire. No reduction in LOS ponderosa pine has occurred within these projects and the projects were designed to expedite the development of LOS habitat by thinning early /mid seral habitat. Stands within these project areas are primarily utilized by goshawks for foraging and do not impact nesting habitat, but promote short-term foraging habitat long-term nesting habitat (30+ years).

The SAFR, Flymon II Stewardship, and Glaze Forest Restoration projects also propose approximately 18,774 acres of thinning. The majority of these treatments will not occur within nesting habitat. These treatments will also enhance residual old growth ponderosa pine as well as promote the growth of early/mid seral ponderosa pine to provide future nesting and foraging habitat for the goshawk.

Private lands are not managed for above mentioned species. Therefore, it is assumed that any habitat provided by these parcels is incidental and may not be long-term. There is approximately 51,530 acres of eastside ponderosa pine or variation of ponderosa pine habitat associated with private lands within the zone of influence.

The Lower Fly Creek Project is not proposing any treatments within nesting habitat. Cumulatively, Alternative 2 will not have incremental impacts to the reduction of nesting habitat; however structure and densities of foraging habitat will change, which may influence how goshawks utilize the areas in the short-term. Treatments will promote a more contiguous stand of LOS throughout the project area in the future, providing both nesting and foraging habitat in the same stands. The project is consistent with Deschutes Forest Plan Standards and Guides for the goshawk.

Consistency with the Deschutes LRMP
Wildlife standards and guidelines WL-6, WL-10, and WL-11 will be assessed. The project is consistent with the Deschutes LRMP.

Standard and Guideline	Do Not Meet, Meets, Not Applicable	Rationale
WL-6 – Nesting habitat for at least 40 goshawk pairs will be provided in mixed conifer, mtn. hemlock, and ponderosa pine forests outside wilderness.	Meets	Habitat is available across the Forest.
WL-10 – Locating new roads within nest site stands will be avoided.	Not Applicable	No new road construction is proposed for this project.

Standard and Guideline	Do Not Meet, Meets, Not Applicable	Rationale
WL-11 – Nests will be protected within ¼ mile from disturbing activities.	Meets	Mitigation measures are in place for seasonal restriction around known nest sites and in the event a new nest site is found.

Mitigation Measures

1. Restrict disturbance activities within ¼ mile of any newly discovered nests from April 15 through August 31. Haul restrictions will be assessed on a case by case basis. This condition may be waived in a particular year if nesting or reproductive success surveys reveal that the species indicated is non-nesting or that no young are present that year. Waivers are valid only until the start date of the restriction of the following year.

Cooper's and Sharp-shinned Hawks

Affected Environment

The Cooper's and sharp-shinned hawks are considered MIS species in the Deschutes LRMP. They often use dense cover in which to hunt and nest. Cooper's hawks tend to select nest sites in dense second growth of mixed conifer or ponderosa pine stands (Jackman and Scott 1975). Moore and Henney (1983) noted this species would routinely utilize mistletoe brooms as nesting sites. Sharp-shinned hawks utilize thickets in mixed conifer and deciduous woods. Generally, nesting habitat has been grouped into 3 types by Reynolds (1976): young, even-aged conifer stands with single-layered canopies; mature, old-growth stands of mixed conifer with multi-layered canopies; and dense stands of aspen.

A total of approximately 2,610 acres of both Cooper's and sharp-shinned hawk potential habitat exists within the project area.

Surveys were completed in 2008 and 2009 and no known nest sites were discovered. Also, no historic nest sites occur within the project area.

Environmental Consequences

Analysis Issue - Effects to Cooper's Hawk
Measure - Impacts to nesting habitat and foraging habitat by loss of black-bark pine

Alternative 1 No Action – Ecological Trend

There are no known direct impacts to Cooper's or sharp-shinned hawks associated with this alternative. Habitat conditions would remain the same for the short-term. Stand densities would continue to increase due to fire suppression. This would increase the potential habitat over time. However, with increased stand densities comes increased risk

of loss from disturbance events (insects, disease, or fire). These events would likely impact the densest stands, which would result in reduced availability of suitable habitat in the project area.

Alternative 2 - Proposed Action

Direct and Indirect Impacts

There are no active Cooper's or sharp-shinned nest sites in the project area. Of the 2,610 acres of habitat, approximately 1,884 acres will be treated. No treatments will occur within 728 acres that provides high quality nesting habitat.
The Cooper's and sharp-shinned hawks are small accipiters and therefore can utilize younger stands that offer seclusion and structure for nest support than the much larger goshawk, which needs larger trees for nest support and over head canopy to make the much larger bird more discreet.

In areas that are identified to be thinned, canopies will be opened up and stand densities reduced to lessen the risk of a large-scale event (insects, disease, or fire). Thinning will directly reduce the amount of potential Cooper's and sharp-shinned habitat, but it will also reduce the fire risk to individual stands breaking up the fuel continuity across the landscape, reducing the risk of larger scale disturbance events. Potential nesting habitat would most likely develop within proposed units within 20-40 years. However, each unit identified for thinning will leave retention clumps ¼ to 1 acre in size throughout the units. In the short-term, the designated cover clumps would provide dispersal, foraging, and possible nesting habitat.

Fuel treatments will reduce both fuels generated from thinning activities and natural fuel loadings to acceptable levels. Fuels treatments will reduce fire risk and will reduce competition to established trees, further increasing the stand's resiliency to wildfire. Treatments will also reduce the understory complexity which may result in a change or reduction in potential prey species. Foraging habitat would not necessarily decrease in acreage, but would decrease in quality from mechanical shrub treatment or prescribed fire. For Cooper's and sharp-shinned hawks, the reduction of shrubs from fuels treatments could impact the habitat of prey species like small mammals and shrub/ground nesting passerines. By reducing shrub densities, habitat for prey will diminish in the short-term reducing potential foraging areas. However, adjacent untreated areas will continue to provide the structural complexity for prey and continue to provide foraging opportunities.

Alternative 2 proposes to close approximately 2 miles of roads within the project area. These roads are associated with Cooper's and sharp-shinned hawk habitat. Closing these roads would provide undisturbed are that would better facilitate nesting habitat due to lack of motorized disturbance. Over the long-term vegetation will be reclaimed in the close roads providing additional habitat.

Overall, all treatments described above will aid in the development of a landscape which is more resilient to natural disturbances and provides a more contiguous stands of suitable Cooper's and sharp-shinned hawk habitat.

Cumulative Effects
The zone of influence for the Cooper's and sharp-shinned hawk are within low elevation ponderosa pine stand within Eastside Screens lands total 109,571 acres.

Within the zone of influence, several vegetation management projects have occurred or may occur within suitable habitat in the ponderosa pine habitat types (BBR Fuels, Canal Thinning, Davis Creek Thin, Flymon Stewardship Demo, Highway 20 Thinning, and Underline Thinning). Stand densities have been reduced on approximately 10,396 acres within treatment units or proposed treatment units, creating conditions in some areas that may not be favorable for nesting, while maintaining areas of contiguous stands that do provide nesting and foraging opportunities. Overall, treatments will reduce the risk of loss of existing habitat from other large-scale disturbances.

The Flymon II, Glaze Forest Restoration and SAFR projects propose to thin approximately 17,716 acres of ponderosa pine that could also reduce suitable nesting habitat, but will provide foraging habitat. In the future the majority of the past, present, and future proposed thinning projects will provide nesting habitat for Cooper's and sharp-shinned hawks by creating old-growth ponderosa pine stands that contain suitable nesting structure due to patches of regeneration in the understory.

An estimated 40,000 acres of potentially suitable habitat exists within Eastside Screens lands. Cumulatively, less than 1% of the overall suitable habitat that occurs will be treated with the implementation of the Lower Fly Creek project under Alternatives 2. Within ponderosa pine stands, Cooper's and sharp-shinned hawk populations are expected to remain relatively stable due to treatment types maintaining contiguous fully stocked over-story stands within this habitat type.

Cumulatively, the proposed action will maintain Cooper's and sharp-shinned hawk habitat within the 731 acres of treatments. Structure within stands will change with density reductions and may change how these species utilize the stands. However, there are no incremental impact to the species as a result of treatments, and over the next 20-30 years, better nesting and foraging habitat will develop. The proposed action is consistent with the Deschutes Forest Plan Standards and Guides for the Cooper's and sharp-shinned hawks.

Consistency with the Deschutes LRMP
Wildlife standards and guidelines WL-13, WL-18, WL-19, WL-21, WL-27 and WL-28 will be assessed. The project is consistent with the Deschutes LRMP.

Standard and Guideline	Do Not Meet, Meets, Not Applicable	Rationale
WL-13/21 – Nesting habitat for at least 60 pairs of Cooper's hawks and 60 pairs of sharp-shinned hawks will be provided	Meets	Habitat is available across the Forest.

Standard and Guideline	Do Not Meet, Meets, Not Applicable	Rationale
in mixed conifer and ponderosa pine forests outside wilderness.		
WL-18/27 – Locating new roads within nest site stands will be avoided.	Not Applicable	No new road construction is proposed for this project.
WL-19/28 – Nests will be protected within ¼ mile from disturbing activities.	Meets	Mitigation measures are in place for seasonal restrictions around known nest sites and in the event a new nest site is found.

Mitigation Measures

1. Disruptive work activities will not take place within ¼ mile (1/2 mile for helicopter) of known nest sites or activity centers from April 15 through August 31. Haul restrictions will be assessed on a case by case basis. This condition may be waived in a particular year if nesting or reproductive success surveys reveal that the species indicated is non-nesting or that no young are present that year. Waivers are valid only until the start date of the restriction of the following year.

Red-tailed Hawk

Affected Environment

The red-tailed hawk is found throughout the state in every habitat and at every elevation, although scarce in dense forests (Marshall et al. 2003 p. 156). They are perch hunters (trees, utility poles, etc.) and inhabit mixed country of open areas interspersed with woods (agricultural areas, grasslands, woodlands, meadows). They roost in thick conifers and nest in large conifer snags often in the tallest tree on the edge of the forest (Jackman and Scott 1975). They feed mainly on small to medium prey including ground squirrels, cottontails, voles, pocket gophers, snakes (Marshall et al. 2003 p.157) but may also take larger mammals (skunks), birds, reptiles, and insects (Jackman and Scott 1975).

Past harvest activities had produced habitat conditions favorable for red-tailed hawks by clear-cutting stands adjacent to mature and late-seral stands. This provided open areas for foraging adjacent to potential roosting and nesting habitat.

The project area is adjacent to the 2002 18,000+ acre Eyerly Fire and within the project area the 30+ year old Fly Creek fire exists, which burned roughly 500-1000 acres. The two fires have created large openings that provide the red-tailed hawk productive foraging areas. Adjacent to the fires also within the project area are residual individual old growth ponderosa pine which provide bother perching nesting habitat. No known nest sites occur within the project area.

Environmental Consequences

Analysis Issue - Effects to Red-tailed Hawk
Measure – Impacts to nesting habitat and foraging habitat

Alternative 1 No Action – Ecological Trend

With the no action alternative, suitable nest trees that occur within dense stands would most likely have increased mortality due to tree stress. Without treatments in the second growth stands, stand densities will prolong future development of larger nesting trees. These high density acres will remain susceptible to bark beetle activity and the susceptibility will increase over time. High stand densities will result in the overall decrease in tree vigor among all size classes. The most significant effect of high stand densities will be the gradual loss of the existing historic large-tree component/nesting habitat at are that is likely to be much faster than if the stand densities had been reduced to more healthy level.

Alternative 2 - Proposed Action

Direct and Indirect Effects

Alternative 2 would not impact or remove any nesting habitat (i.e. trees >21" dbh). The proposed action associated with this project would increase foraging areas for red-tailed hawks by removing trees (under 21" dbh) and potentially increasing access to prey at ground level on approximately 1,884 acres. Under Alternative 2, commercially treating some stands will help decrease the stress on individual residual old growth trees, thus retaining potential nest sites for the long-term (>20 years). Treatments to mid-seral stands would promote and accelerate the development of future LOS.

The reduction of shrubs from fuels treatment activities can impact prey species of ground dwelling small mammals (ground squirrels, cottontails, voles, and pocket gophers). These ground species depend on the shrubs for cover to avoid predation and grasses and forbs for food. This activity would reduce the amount of available habitat for red-tailed hawk prey species in the short-term, potentially reducing areas utilized by them for foraging as well as minimizing the availability of prey within nesting areas. However, untreated areas from ¼ to 1 acres in size will be distributed throughout treatment units. In addition, within the 4,412 acre project area, a total of 1,884 acres will receive treatment, leaving 43% of the project area untreated.

Cumulative Effects

Implementation of action alternatives for the Lower Fly Creek project area will not result in any direct or indirect adverse impacts and therefore, will not result in any cumulative impacts for the red-tailed hawk and its habitat.

Past thinning projects in the low elevation ponderosa pine (BBR Fuels, Canal Thinning, Highway 20 Thinning, and Underline Thinning) and associated fuels treatments did not impact red-tailed hawk habitat. Thinning occurred in stands not yet considered habitat due to the small average diameter of the trees and fuels treatments may have helped to improve foraging habitat by reducing brush layers and opening up the understory.

Within the SAFR and Glaze Forest Restoration projects, measures were incorporated to retain large tree and snag habitat as well as enhance habitat conditions on 18,474 acres proposed for thinning as well as the 550 acres associated with the Flymon Stewardship Demo and Flymon II Stewardship projects. Overall, treatments proposed will improve red-tailed hawk habitat conditions by promoting the development of large structure and reducing the risk of loss of existing habitat from other large-scale disturbances.

Private lands are not managed for red-tailed hawk habitat. Therefore, it is assumed that any habitat provided by these parcels is incidental and may not be long-term.

Cumulatively, red-tailed hawk populations are expected to remain stable within these low elevation dry ponderosa pine sites due to their generalist behavior. Also distribution of red-tailed hawks across the low elevation dry ponderosa pine habitat may become patchy, focusing on areas that are within abundant overstocked regenerating pine stands "black bark" that are a result of harvest in the 1930's. Long-term there may be a decrease in the populations due to the long period of time before late seral habitat develops for nesting due to these overstocked stands. The proposed action is consistent with the Deschutes Forest Plan Standards and Guides for the red-tailed hawk.

Consistency with the Deschutes LRMP
Wildlife standard and guidelines WL-2 and WL-3 were assessed. The project is consistent with the Deschutes LRMP.

Standard and Guideline	Do Not Meet, Meets, Not Applicable	Rationale
WL-2 – Maintain forested character at least 300 feet surrounding active nest sites.	Meets	There are no known nests within the project area. If a nest is located, measures will be incorporated to meet this standard.
WL-2 – While timber management may occur, maintain at least 4 dominant overstory trees per acre suitable for nest and perch trees, favoring ponderosa pine.	Meets	Residual stands will far exceed this standard since stands will remain fully stocked, retaining the largest dominant trees in the stand.
WL-3 – Seasonal restrictions will be in effect for disturbing activities within ¼ mile of active nests.	Meets	Mitigation measures are in place in the event a nest site is found.

Mitigation Measures

1. Disruptive work activities will not take place within ¼ mile (1/2 mile for helicopter) of known nest sites or activity centers from March 1 through August

31. Haul restrictions will be assessed on a case by case basis. This condition may be waived in a particular year if nesting or reproductive success surveys reveal that the species indicated is non-nesting or that no young are present that year. Waivers are valid only until the start date of the restriction of the following year.

2. Maintain forested character within 300 feet surrounding active nest sites.

Affected Environment

This species inhabits shrub-steppe, grassland, juniper, open ponderosa pine, and mixed conifer/deciduous habitats. It forages in a variety of habitat types and successional stages, preferring areas within open shrub component that provides food and cover for prey. Suitable nesting habitat can be found in mountains, canyons, and rolling hills (Marshall et al. 2003).

One historic Golden Eagle nest site occurs within the project area. Portland General Electric annually monitors the nest site for the Forest Service. The nest has not been active since 1997 and it is believed the pair has moved to PGE land.

Environmental Consequences

Analysis Issue - Effects to Red-tailed Hawk
Measure - Impacts to nesting and foraging habitat

Alternative 1 No Action – Ecological Trend

There are no known direct impacts associated with the no action alternative. Many of the large trees that provide potential nest, perch, and roost sites are surrounded by dense patches of smaller trees with and understory of brush. Competition for nutrients and water makes these trees more susceptible to insects and disease. The larger trees within densely stocked stands are more susceptible to wildfire, due to increased fuel loadings from 100 years of fire suppression. Under the no action alternative large trees will continue to be at an increased risk to insect, disease, and wildfire.

Currently there are a limited number of large trees available for potential nest and roost sites located within golden eagle habitat. Replacement large trees are also a concern. Many of the future eagle trees are within overstocked stands, which will increase the amount of time the trees will take to get to the desired height and size. Many of the future large trees have been growing in dense pockets, which create large trees with small branches. Therefore, many of the future large trees may lack larger branch structure that is needed to hold heavy nest structures that eagles create.

Alternative 2 - Proposed Action

There will be no known direct effects to golden eagles. Disturbance may occur to foraging eagles during treatments which may result in altering their foraging patterns.

Approximately 1,353 acres of golden eagle habitat will receive treatment. No treatment will occur within the stands associated with historic nest site. In addition, green trees 21 inches and greater (potential roost, nest, and perch trees) will not be removed. Large snags are not targeted for removal. Generally, snags would be avoided during treatments, those that cannot be avoided and pose a hazard to operation would be felled to meet OSHA regulations.

Thinned areas within golden eagle habitat will reduce ladder fuels associated with large trees. Ladder fuel reduction will decrease risk of losing the remaining large trees within golden eagle habitat. In addition, removal of understory in overstocked stands will decrease the competition for nutrients and water, which should also lower the susceptibility to insects and disease. An important benefit to thinning is the reduction in beetle caused mortality (Cochran and Barret 1999a).

Currently the most suitable habitat occurs on the steep canyon wall of Fly Creek Canyon. Many large trees occur within these areas and will be left untreated. However, due to stand densities in the canyon trees will remain overstocked and susceptible to insects, disease, and stand replacing wildfire. Treatments are proposed in the uplands adjacent to the canyon to; 1) reduce fuels adjacent to the canyon and 2) provide future LOS ponderosa pine in the uplands for species such as the golden eagle providing nesting habitat. Many of the future eagle nest trees are within overstocked stands outside of Fly Creek Canyon, which will increase the amount of time the trees will take to get to the desired size and height. Thinning stands in the uplands will reduce competition, increasing growth rates to the remaining trees. A study conducted by Cochran and Barret (1999a) determined that there were large differences in average tree sizes among different group stocking levels, 30 years post treatment. They also determined that the growth rates of the 20 largest diameter trees per acre were reduced by competition from smaller trees.

The existing second growth/mid-seral ponderosa pine trees have been growing in dense pockets, which will create large trees with small branches. Therefore, many of the future large trees may lack the larger branch structure that is needed to hold the heavy nest structures that eagles create. Cochran and Barret (1999b) determined that crown widths were significantly greater in the absence of understory vegetation. Using the assumption that larger crown widths equate to larger branch structures, the study shows that open grown trees with limited understory will have larger branches than large trees in densely stocked stands.

Proposed mastication and burning treatments will reduce both activity fuels and overall fuel loadings to acceptable levels. Fuels reduction will reduce fire risk and competition between established trees, increasing stand resiliency to wildfire. Fuels treatments will also reduce the understory complexity, creating more open areas that could increase habitat for golden eagles to forage.

The proposed 5.06 miles of road closure will limit disturbance within and around the historic nest site in Fly Creek Canyon. These closures will limit human disturbance, potentially providing a more secluded nest site.

Cumulative Effects

Implementation of the Proposed Action for the Lower Fly Creek Project will not result in any direct or indirect adverse impacts and therefore, will not result in any cumulative impacts for the golden eagle and its habitat.

Historically, golden eagle habitat most likely occurred on the eastern edge of the district in the ponderosa pine PAG. Therefore, the ponderosa pine PAGs on the Sisters Ranger District will be used to analyze cumulative impacts to golden eagles. There has been a history of timber harvest within the ponderosa pine. This past activity is one of the reasons acres of large tree habitat for golden eagles are currently below the historic range of variability (HRV). For example, within the ponderosa pine PAG's in the Whychus watershed, acres dominated by medium and large size tree classes have decreased by 88% (USDA, 1998). Other factors reducing golden eagle habitat across the district is the forest consists of denser stands of trees. These dense stands make flight through the forest difficult for the large eagles that prefer more open habitats. Historic open grown single story old-growth ponderosa pine stands were probably more suitable for the large golden eagles to both nest and forage in.

Past thinning projects in the low elevation ponderosa pine (BBR Fuels, Canal Thinning, Highway 20 Thinning, and Underline Thinning) and associated fuels treatments did not impact golden eagle habitat. Thinning occurred in stands not yet considered habitat due to the small average diameter of the trees and fuels treatments may have helped to improve foraging habitat by reducing brush layers and opening up the understory.

Within the SAFR and Glaze Forest Restoration projects, measures were incorporated to retain large tree and snag habitat as well as enhance habitat conditions on 18,474 acres proposed for thinning as well as the 550 acres associated with the Flymon Stewardship Demo and Flymon II Stewardship projects. Overall, treatments proposed will improve golden eagle habitat conditions by promoting the development of large structure and reducing the risk of loss of existing habitat from large-scale disturbances.

Private lands are not managed for golden eagle habitat. Therefore, it is assumed that any habitat provided by these parcels is incidental and may not be long-term.

Historically, management activities did not promote the maintenance or improvement of large tree habitats. However, under current management direction, activities are being designed to move vegetative conditions towards their HRV which will promote and maintain golden eagle habitat across the district.

Treatments are expected to benefit eagles in the long-term by creating large trees with large branches and creating a more open pine forest, which should increase the foraging opportunities for golden eagles. Cumulatively, the project is expected to increase suitable

habitat for golden eagles with the implementation of this project. The proposed action is consistent with the Deschutes Forest Plan Standards and Guides for the golden eagle.

Consistency with the Deschutes LRMP
Wildlife standards and guidelines WL-6, WL-10, and WL-11 will be assessed. The project is consistent with the Deschutes LRMP.

Standard and Guideline	Do Not Meet, Meets, Not Applicable	Rationale
WL-2 – Maintain forested character at least 300 feet surrounding active nest sites.	Meets	No treatment will occur within or adjacent to the historic nest stand.
WL-2 – While timber management may occur, maintain at least 4 dominant overstory trees per acre suitable for nest and perch trees, favoring ponderosa pine.	Meets	Large green trees are not targeted for removal with this project.
WL-3 – Seasonal restrictions will be in effect for disturbing activities within ¼ mile of active nests.	Meets	Mitigation measures are in place in the event a nest site is found.

1. Restrict disturbance activities within ¼ mile of any newly discovered nests from February 1 through July 31. Haul restrictions will be assessed on a case by case basis. This condition may be waived in a particular year if nesting or reproductive success surveys reveal that the species indicated is non-nesting or that no young are present that year. Waivers are valid only until the start date of the restriction of the following year.
2. Maintain forested character within 300 feet surrounding newly discovered nest sites.

Recommendations

Protect large snags during treatments.

Big Game

Affected Environment

Deer: There is one identified land allocation for managing deer habitat on the Deschutes National Forest –MA-7 (Transition and Winter Range). This requires a mosaic of forested conditions utilizing security and thermal cover, travel corridors, visual screens, and management of harassment potential from other activities (e.g. roads and other recreation use). Cover should make up 40% of the land area, approximately ¾ of cover areas should be thermal cover with the remainder being hiding areas. The goal for

managing MA-7 is to manage vegetation to provide optimum habitat conditions on deer winter and transition ranges while providing for some wood products, visual quality, and recreation opportunities. The entire 4,412 acre Lower Fly Creek project area is within mule deer winter range.

Elk: The Deschutes NF has one primary allocation for the management of elk habitat on forest in addition to forest-wide standards and guidelines for vegetation management. There is no Key Elk Habitat Area within the project.

Table 3-14. Big game habitat acres for the Lower Fly Creek project area.

Deer Habitat Type	**Acres of Habitat**	**Percent of Project Area***
Management Area 7 - Des	4,412	100%
Summer Range	0	
Winter Range	4,412	100%
Transition Range	0	
Elk Habitat Type	**Acres of Habitat**	**Percent of Project Area***
Key Elk Habitat Area	0	0

*Percent of the forest the allocation pertains too.

Deer Cover

Although the project area is 4,412 acres, there are unforested areas within the project which do not provide cover, nor do they have the potential to provide future cover. These areas equate to approximately 407 acres, providing a total of 4,005 acres of the project area contributing to cover calculations.

The project contains approximately 643 acres (16%) of thermal cover and approximately 965 (24%) acres of hiding cover. These areas exist within both the un-roaded portions of the Fly Creek Wildlife Primitive area, Prairie Farm Creek, and intermittent stream channels. Due to the low site potential of the project area, the average stem density is very low except within drainage bottoms where soils tend to be deeper or contains a water source. As a result, the majority of the uplands do not provide thermal cover, much of the project area is also second growth 80 + year old ponderosa pine, which does not provide hiding cover or very limited hiding cover. Table 3-15 summarizes the amount and type of cover within the project area.

Table 3-15. Mule deer hiding and thermal cover within the project area.

Cover Type	**Acres of Habitat**	**Percent of Project Area**	**Management Objective MA-7**
Thermal	**643**	**16%**	**30%**
Hiding	**965**	**24%**	**10%**

Road Densities
The Deschutes NF LRMP has set desired road densities for MA-7; target road densities for the area are 1.0-2.5 miles/sq. mile.

Table 3-16. Open road densities for the Lower Fly Creek Project Area.

	Project Area Existing Condition (not differentiated by season)
	55 miles
Project Area (mi^2)	6.89 mi^2
Open Road Density	**1.67 miles/sq. mi.**
	1.0 -2.5 miles/sq.mi.

Road Impacts
Literature has shown varying responses of deer and elk to roads and road use. In a literature review of linear recreation route effects on wildlife, Gaines et al. (2003) reported that as traffic volume increased, the mean distance elk moved away from roads increased (Johnson et al. 2000 in Gaines et al. 2003). See Table 3-17 for more information.

Table 3-17. Mean distance from roads for elk reported by Gaines et al. (2003).

Traffic Volume	**Vehicles Per Time**	**Mean Distance Elk Moved Away from Roads**
Low Traffic	0-1 vehicles/12 hours	869-890 meters
Moderate Traffic	2-4 vehicles/12 hours	909-1032 meters
High Traffic	>4 vehicles/12 hours	1103-1560 meters

Rowloff (1998 in Gaines et al. 2003) and Rowland et al. (2000) suggested a spatially explicit roads variable based on distance to open roads was more appropriate than using road density as an index for summer range. Johnson et al. (2000) also showed that differing traffic levels have different impacts on deer and elk habitat use. Therefore, to assess road and trail effects on deer and elk, roads would be buffered by those distances shown in Table 3-18. This zone of influence may be modified by topography but this area becomes the area influenced by roads (Gaines et al. 2003).

Table 3-18. Zone of Influence applied to each side of road for deer and elk (Gaines et al. 2003).

Trail or Road Type and Status	**Zone of Influence***
Motorized trails	300 meters
Closed road (no vehicle traffic but open to ATVs	300 meters
Low Traffic (0-1 vehicles/12 hours)	900 meters
Moderate Traffic (2-4 vehicles/12 hours)	1000 meters
High Traffic (>4 vehicles/12 hours)	1300 meters

*Zone of Influence – similar definition as road effect distance.

Studies on ungulates and carnivores have shown heavily traveled roads are avoided or used little in comparison to lightly traveled roads (Forman et al. 2003: 797, 615, 913, 579, 350, 302; Rowland et al. 2005). Wisdom et al. (2005) found similar results for elk but not necessarily for deer. In a study looking at spatial partitioning between elk and deer, Wisdom et al. (2005) found elk were generally farther from roads with traffic rates as low as $\geq$1 vehicle/12 hours during day and nighttime hours while deer were found closer to roads. In addition, another study conducted by Wisdom et al. (2005) on the effects of off-road recreation on mule deer and elk, showed elk had greater flight probabilities and movement rates for all four off-road activities measured (ATV, mountain biking, horseback riding, and hiking) compared to no human activity. Elk reactions were more pronounced during the ATV and mountain biking activities than to horseback riding and hiking. Lyon (1979) reported the area of avoidance for elk is generally ¼ to ½ mile from a road depending on the amount of traffic, road quality, and density of cover near roads.

Rowland et al. (2005) reported the primary effect of roads on elk was habitat fragmentation. There are fewer patches of cover large enough to function effectively (Rowland et al. 2000). This study (Rowland et al. 2004) also documented three main direct impacts on elk. They are as follows:

Elk avoid areas near roads.

Elk vulnerability to mortality from hunter harvest, both legal and illegal, increases as open road density increases.

In areas of high road densities, elk exhibit higher stress levels (Rowland et al. 2005) and energetic costs of moving away from roads may be substantial (Cole et al. 1997).

In contrast, Wisdom et al. (2005) found mule deer showed little measurable response to off-road activities. Movement rates were slightly increased during all off-road activities except during ATV use. Stankowich (2008) and Krausman et al. (2006) showed similar responses of mule deer. They found humans afoot have more impact than other stimuli (vehicles, noise, horseback) studied. Ferris and Kutilek (1989 in Montana TWS 1999) found black-tailed deer avoided OHV areas during high peak use but returned to established home ranges after traffic levels subsided.

In another study by Yarmoloy (1988 in Ouren et al. 2007), mule deer disturbed by OHVs altered their patterns of foraging and use of habitat while deer in undisturbed areas did not. Yarmoloy found disturbance of deer resulted in decreased reproductive success (less fawns) while undisturbed deer showed no change in reproductive success.

Environmental Consequences

Analysis Issue – Effects to deer cover
Measure - Impacts to thermal and hiding cover

Alternative 1 - Ecological Trends

Without treatment, it is expected hiding cover would increase in the short-term. In the long-term, as the stands mature, because of the low site potential due to the inherent soil quality, hiding and thermal cover would be lost to stress in the stand and subsequent impacts from insects, disease and wildfire.

Alternative 2 - Proposed Action

Direct and Indirect Effects

Within the 4,412 acres approximately 643 acres of thermal cover exists. The project area does not meet the thermal cover objectives for the Deschutes LRMP. No thermal cover will be removed through vegetation treatments as a result of the proposed action. The project area contains approximately 965 acres of hiding cover, which exceeds the hiding cover objectives in the Deschutes LRMP. The proposed action will thin approximately 322 acre reducing the hiding cover to 643 acres, the remaining hiding cover will still meet the Deschutes LRMP objectives (Table 3-19). In addition, throughout all treatment units, where the inherent soil quality is capable of sustaining denser stands, residual un-treated clumps ¼ to 1 acre in size will be left to break up the sight distance in each stand, provide wildlife screening throughout each implementation unit.

A total of 1,884 acres of thinning from below will occur within the project area. Within the ponderosa pine stands, approximately 1,031 acres of natural pine thinning and approximately 322 acres of plantation thinning will occur. Natural pine thinning will primarily remove trees 15” dbh and less averaging 50 trees per acre, while plantation thinning will occur on a 25 foot spacing averaging 70 trees per acre. At lower elevation, approximately 529 acres of western juniper removal has been identified. All treatment units will have mowing or burning prescribed for stand maintenance post thinning. However, many units have very little shrub production due to the dense over-story and will only receive a follow up jackpot burn to clean up residual thinning slash. Overall, combined thinning mowing and burning in the short–term will reduce screening and some hiding cover as well as some winter forage. Due to the inherent soil quality of the project area, soil productivity is very low. Dense over-story stands have fully occupied most sites resulting in either poor or no production of shrubs, and forbs. Over the long-term, treatments will create better growing sites for residual trees; maintaining stands that are less susceptible to stand replacing fire as well as promote a more diverse understory that provide viable forbs and shrubs that enhance winter forage in the project area.

Although the project meets road density objective for the Deschutes LRMP, many of the existing road closures are ineffective and are not functioning. The proposed action will close approximately 5.06 miles of roads to assist in with enforcing existing closures. The total mile of roads open and available for use by the public would change from 11.55 to 6.49, changing the open road density from 6.89 miles per square mile to 0.9 mile per square mile. This reduction takes the overall road density below the Deschutes LRMP objectives (Table 3-20). Road density reduction would reduce the short-term impacts from loss of hiding cover and lessen human disturbance to deer during winter months.

Table 3-19. Changes to hiding and thermal cover from Proposed Action.

Cover Type	Acres of Habitat	Percent of Project Area	Proposed Action (Acres/%)	Management Objective MA-7
Thermal	**643**	**16%**	**643/16%**	**30%**
Hiding	**965**	**24%**	**643/16%**	**10%**

Table 3-20. Changes to open road densities from Proposed Action.

		Project Area Proposed Action (not differentiated by season)
		6.49 miles
Project Area (mi^2)	6.89 mi^2	6.89 mi^2
Open Road Density		**0.9 miles /sq.mi.**
Target Road Density	**1.0 -2.5 miles/sq.mi.**	**1.0 -2.5 miles/sq.mi.**

Cumulative Effects

Implementation of action alternatives for the Lower Fly Creek project area will not result in any direct or indirect adverse impacts and therefore, will not result in any cumulative impacts for big game and their habitats. The "Zone of Influence" for cumulative effects was identified within the low elevation ponderosa pine interface across the district. This area is within "Eastside Screens" land allocations and covers all of the winter some transition range on the Sisters Ranger District indentified under Management Areas -7 of the Deschutes LRMP.

Several large vegetation management projects have occurred in the low elevation ponderosa pine that is used as both transition and winter range over the past several years. These projects include Highway 20, Canal Thinning, BBR Fuels, and Underline. Within these project areas, there has been an overall decrease in cover. An increase in forage has also occurred. This forage increase may have helped to increase the health and vigor of resident herds, leading to increased survival rates. Overall approximately 10,146 acres were thinned in the areas associated with winter and transition range.

Private lands are not managed for big game habitat. Therefore, it is assumed that any habitat provided by these parcels is incidental and may not be long term.

Use and movement through the ponderosa pine stands across the district is expected to change over-time as additional cover develops providing more security in areas with high open road densities and allowing the deer to utilize these areas more thoroughly due to the added security provided. (18,683 acres of thinning associated with Flymon Stewardship Demo, Flymon II Stewardship, SAFR, and Glaze Forest Restoration Projects).

Cover was analyzed on a landscape basis collectively with the Glaze and the SAFR project. Much of the SAFR project area overlaps the old Canal and Underline Thinning project areas. Overall, the Proposed Action will reduce cover within the project area but will not reduce cover below Forest Plan standards and guides for the area. Treatments are minimal and cover will be retained in the project. Although there are minor incremental impact from the loss of cover, and some short-term impact to annual available forage, the project will provide connectivity and available forage for deer annually as they migrate to and from the winter range. Thermal cover is deficit in the project area but the Proposed Action will not thin any stands identified as thermal cover. To minimize impacts from treatments, road densities will be reduced below Forest Plan objectives to minimize disturbance to deer during winter months. Cumulatively, the project is expected to increase suitable habitat for mule deer with the implementation of the Proposed Action. The Proposed Action is consistent with the Deschutes Forest Plan Standards and Guides for the mule deer winter range.

Consistency with the Deschutes LRMP

Wildlife standard and guidelines WL-43 through WL-50 will not be assessed for elk due to the lack of Key Elk Habitat Areas in the project. Wildlife standard and guidelines WL-52 through WL-59 will be assessed for deer. The project is consistent with the Deschutes LRMP.

Standard and Guideline	Do Not Meet, Meets, Not Applicable	Rationale
Within Allocated Deer Habitat (M7)		
General Theme of M7 – Cover should make up forty percent of the land area. Of that 40% three quarters should be thermal cover with the remainder being hiding areas.	Meets	Although cover only exists at 24%, where thermal cover exists in the project area it will be left unthinned. 16% of the project area will be left in hiding cover exceeding objectives of 10%.
M7-5 – Canopy cover should be managed at the highest percentage that will maintain healthy stand conditions with low risk of catastrophic damage to insects or disease.	Meets	Thinning prescriptions for the Lower Fly Creek project were designed to reduce risk while maintaining healthy stands.
M7-10 – Habitat management will be designed to provide a mosaic of forested conditions which incorporate the concepts of escape and hiding cover, thermal cover, travel corridors, visual screens.	Meets	The Lower Fly Creek project is designed to provide a mosaic of cover, screens, and corridors.
M7-11 – The analysis area should be large enough that meaningful	Meets	Deer Winter Range comprises the entire project area 4,412 acres

habitat conditions can be determined. Normally this would be greater than 3,000 acres.		within the SAFR project.
M7-14 – Forage conditions will be maintained or improved with emphasis on increasing the variety of plants available and a mixture of age classes of shrubs.	Meets	Treatments are designed to reduce tree densities and promote shrub and forb production.
M7-15 – Where forage improvement activities involve crushing or prescribed burning, the size of the treatment normally will be 300 to 500 acres. If more than one area is treated areas should be 600 to 1200 feet apart.	Meets	Treatment units have been designed to fit within the 300 to 500 acre guideline.
M7-22 – Target open road densities should average 1.0 to 2.5 miles per square mile within each implementation unit.	Exceeds	The Lower Fly Creek project proposes to reduce road densities below the target open road densities.
M7-23 – To minimize animal disturbance local road may be closed for vehicle travel from December 1 through March 31. Road closures will coordinated with ODF&W	NA	No winter range closures occur within the project area.
M7-26 – Prescribed burning prescriptions will provide for re-establishment of bitterbrush within 20 years. Approximately 2 to 2.5 percent of this Management Area could be burned annually	Meets	Treatments are designed to reduce overstory densities to promote bitterbrush production in the short-term (<15 years). Fuels treatments post thinning will focus on residual thinning slash clean up.

Mitigation Measures

Where the inherent soil quality can maintain higher stand densities, no treatment area ¼ to 1 acre in size will be left to provide screening cover throughout treatment units.

Within MA7 - Where mastication and burning occur limit treated blocks to approximately 500 acres per year with approximately 1,200 feet between treatment blocks.

Snags/Coarse Wood Material

Affected Environment

Numerous species of animals use snags and coarse woody material (CWM) for foraging, nesting, denning, roosting, and resting. A snag is defined as a dead tree over 10 inches dbh and taller than 10 feet. Coarse woody material is considered to be dead and down material that is greater than 5 inches in diameter (Ohmann and Waddell, 2002; Mellen et al 2006). The most notable species that use snags and CWM are the primary cavity nesters (e.g. woodpeckers and nuthatches), which are considered Management Indicator Species (MIS) in the Deschutes National Forest Land and Resource Management Plan (LRMP). These species excavate nest cavities in decayed wood in standing trees. On the Deschutes National Forest 10 species of woodpeckers excavate cavities that are used by 33 other species of cavity-nesters incapable of excavating their own cavities. Vacated cavities are subsequently used by many other birds and small mammals (i.e. secondary cavity users).

Forest Plan Direction

The Deschutes National Forest Land and Resource Management Plan (USDA 1990a) establishes standards and guidelines for dead standing and downed wood for various levels of biological potential in each management area for Primary Cavity Excavators (PCEs). The plan was amended in 1995 by the Regional Forester's Forest Plan Amendment #2, also known as the "Eastside Screens." This amendment requires the retention of snags and green replacement trees greater than or equal to 21 inches diameter breast height (or the representative diameter in the overstory) at 100 percent potential population levels for primary cavity excavators or the best available science. The Forest Plan, as amended, requires that an average 2.3 snags per acre, 21 inches dbh and greater, be maintained within forested stands. It is assumed that these snag and down log levels will provide the minimum level required for 100% of potential population levels of primary cavity excavators (USDA 1990).

The dominant plant association group within the project area is dry ponderosa pine. Residual old growth ponderosa pine exists as individuals and in small clumps and is intermixed with second growth ponderosa pine that is around 60 to 80 years old. Approximately, 1,322 of ponderosa pine are identified for treatment with an average diameter of approximately 12 inches dbh. Due to high intensity harvesting in the 1930's, very few large diameter snags and logs occur within the project area. Bark beetles are beginning to attack some of the dense second growth and small diameter trees are being recruited as snags and logs.

DecAID Advisor

The DecAID Advisor (Mellen et.al 2006) is a planning tool intended to help specialists manage snag and log levels best suited for their management area and associated wildlife species. This tool uses the best available science and most recent research for species dependent on snags and coarse woody material. Densities are given in the form of wildlife species tolerance levels at the 30%, 50%, and 80% levels. Thus, an 80% tolerance level indicates 80% of the individuals in the population have a value for the

parameter of interest between 0 and the value for the 80% tolerance level. Or conversely, 20% of the individuals in the population have a value for the parameter of interest greater than the 80% level.

The DecAID Advisor contains a risk rating guide to help managers determine the risk of a project to snags and CWM. Due to the small size of the project, thinning involved will not be taking any dead wood, the science associated with this type of plant association is well established, and the project is designed to minimize impacts to this habitat type, the project is determined to be low risk.

Qualitative Analysis

Snags

Existing snag densities (Table 3) for the Lower Fly Creek project were extrapolated from stand exams associated with the project area as well as the surrounding areas immediately adjacent. Stands were queried using GIS mapping and Microsoft Access Database. Size classes of snags were queried based upon those displayed in the decayed advisor.

Table 3-21 displays the estimated snags per acre within the project area taken from stand exam data by size class.

Table 3-21. Snags by diameter within the Lower Fly Creek project Area.

Snags Per Acre	
≥10" dbh	**≥20" dbh**
3-5	0-2

These units all contain low snag densities as a result of past management activities, due to the fact the area was logged 60 to 80 years ago the majority of the area is mid seral ponderosa with little residual old growth. Stand exams were taken from 1995-1998 and due to stand densities and beetle mortality, estimates are low. Also, exams plots are done randomly, and in areas with low snag densities, plots will not pick up all snags or certain areas may just have fewer plots.

Stands within the ponderosa pine plant association groups (PAG) were classified as the Ponderosa Pine/Douglas Fir Forest habitat type for the DecAID analysis.

Data provided in DecAID allows the user to relate the abundance of deadwood habitat for both snags and logs to the frequency of occurrence of selected wildlife species that require deadwood habitat for some part of their life cycle. Tolerance levels (30%, 50%, & 80%) are used to describe the percent of the population that utilizes a particular habitat characteristic (e.g. snag density, downed wood density, etc.). Essentially, the lower the tolerance level, the fewer individuals will likely use the area (landscape, watershed, etc.). For example, at the 30% tolerance level for any given species, it would be expected that 30% of a population would find suitable or usable habitat at the specified snag density. Consequently, 70% of a population would not find suitable habitat conditions at that snag density. It should not be assumed the highest tolerance level (80%+) is always the goal

for management. In many instances, historic conditions, particularly in the dry forest types, did not support the density of snags at the 80% level. Therefore, it may be better to tie an appropriate tolerance level to a landscape by the capability of that landscape to produce snags.

While DecAID provides data on wildlife use of snags and down wood, it does not measure the biological potential of wildlife populations. There is no direct relationship between tolerances, snag densities and sizes used in DecAID and snag densities and size that measure potential population levels (Mellen et al 2003).

Snag densities are important for determining level of habitat provided. DecAID displays tolerance levels for three of the cavity excavators identified as occurring in the project (MIS): white-headed, cavity nesting birds, pygmy nuthatch, and Williamson's sapsucker. White-headed woodpecker is addressed in the Biological Evaluation for the project. Pygmy nuthatch and Williamon's sapsucker are addressed below under Landbird Strategic Plan. Data is summarized in Table 3-22. Snag density data is synthesized by habitat type, structural stage, snag size and tolerance level. It should be noted that snag density use varies between the species.

Table 3-22: Synthesized Wildlife Data for PPDF Habitat S/L

Species and Wildlife Habitat Type	Snags > 10" dbh			Snags > 20" dbh		
	30% TL Snag Density (#/acre)	50% TL Snag Density (#/acre)	80% TL Snag Density (#/acre)	30% TL Snag Density (#/acre)	50% TL Snag Density (#/acre)	80% TL Snag Density (#/acre)
Cavity Nesting Birds (PPDF Habitat_S/L)	1.2	4.7	10.0	0.0	1.0	2.8
Pygmy Nuthatch (PPDF Habitat_S/L)	1.1	5.6	12.1	0.0	1.6	4.0
Williamson's Sapsucker	14.0	28.4	49.7	3.3	8.6	16.5

PPDF = Ponderosa Pine/Douglas Fir Wildlife Habitat
L = Large Structural Stage; S = Small and Medium Structural Stage
TL = Tolerance Level; NA = Not Available

Existing snag densities in the Lower Fly Creek project and surrounding areas (Table 3-21) were compared to the DecAID data (Table 3-22). For cavity nesting bird and pygmy nuthatch, average snag densities meet or exceed the 30% tolerance levels for the project area in the >10-inch diameter group and meet or exceed the 30% tolerance levels for ≥20-inch diameter group. For Williamson's sapsucker, this species relies on high densities of large and small diameter snags. Estimates for the project area do not meet the 30% tolerance level for the ≥10-inch diameter or ≥20-inch diameter.

Coarse Woody Material (Downed Logs)

Currently, retention of downed logs is based on the Forest Plan, as amended by the Regional Forester's Eastside Forest Plans Amendment #2. Forest Plan standards are displayed in Table 3-23. DecAID was not used to analyze the effect of treatment on downed wood in the analysis area for several reasons. DecAID provides estimates of percent cover of downed wood. Available data for the analysis area could be converted

to percent cover; however, without the length of each piece of wood counted (data which was unavailable), this analysis would likely underestimate percent cover.
Current downed wood densities in the analysis area most likely do not meet Forest Plan standards. Due to low snag densities as displayed above recruitment of CWM in the analysis area would also be low.

Table 3-23: Forest Direction for Snags and Down Wood

Regional Forester's Forest Plan Amendment #2		
Species	**Minimum Log Size Criteria**	**Down Wood Density**
Ponderosa pine	Small end diameter >12" and piece length >6' Total lineal length 20-40 ft.	3-6 pieces per acre
Mixed Conifer	Small end diameter >12" and piece length >6' Total lineal length 100-140 ft.	15-20 pieces per acre

Environmental Consequences

Analysis Issue – Effects of the project to Coarse Woody Material
Measure - Impacts to coarse woody material, consistent with Eastside Screens

Alternative 2 - Proposed Action

Direct and Indirect Effects

Green trees 21 inches and greater (future large snags) will not be removed. Snags and down wood are not targeted for removal, but there is a possibility for incidental loss of snags during treatments. Generally, snags would be avoided during treatments, but due to OSHA regulations snags posing a hazard may be removed.

Future large down wood (currently smaller green trees) are a concern, many are in overstocked stands, which will increase the time it takes the trees to reach desired size and height. Thinning overstocked stands will reduce competition which should increase growth rates to the remaining trees. Cochran and Barret (1999a) were able to show that 30 years after thinning there were large differences in average tree sizes among different group stocking levels. They also showed that the growth rates of the 20 largest diameter trees per acre were reduced by competition from smaller trees. Thinning is expected to reduce down wood recruitment in the short-term, however in the long-term there will be more large trees that can be recruited into down wood. Overall, treatments will maintain the longevity of the residual habitat while accelerating the development of late and old structured stands (LOS). The future LOS will provide more fire resilient habitat that provides both nesting and foraging habitat.

Cumulative Effects

The zone of influence for dead wood habitat is the 109,571 acres of ponderosa pine habitat within the Eastside Screens. Timber harvest and fire suppression have impacted the distribution and density of snags and down wood across the project area. These activities have created the existing condition of deadwood habitats in the analysis area.

Approximately 550 acres of thinning activities are occurring or are proposed to occur within the project area, these activities are associated with the Flymon Stewardship Demo project and the Flymon II Stewardship project. Projects would promote the development of large ponderosa pines snags. The SAFR and Glaze Forest Restoration projects will focus on reducing understory vegetation to reduce risk of loss from wildfire across approximately 18,474 acres. It is assumed snags will not be impacted however, except for smaller sized down woody material depending on fuels treatments proposed. Overall, these impacts are expected to be minor and material for future recruitment will be available in the remaining stands.

Historic harvest has occurred within the project area dating back to the 1930's throughout approximately 1,884 acres Harvest activities occurring during the 1930's removed majority of the large structure where the project is generally deficient in snag that are >20" dbh.

Sales planned after 1995 utilized the Eastside Screens, which calls for 2.25 snags 20 inches dbh or greater per acre and 20 to 40 lineal feet per acre in ponderosa pine and 100-140 lineal feet per acre in mixed conifer.

Shelterwood harvest prescriptions (1975 to present) retained 8 to 20 live overstory trees providing for some future large snag and log habitat as the younger stand develops into a mature stand, but would have eliminated the understory and mid-story cover and feeding substrate. Removal of snags does not normally occur with this treatment; however, incidental removal occurs due to safety reasons. There are no shelterwood harvests associated with the Lower Fly Creek project.

Within the zone of influence, three wildfires occurred in the early 1990's, the Delicious and Stevens Canyon Fires. Then in 2002, the 18,000+ acre Eyerly Fire occurred. These events created pulses of higher snag and down wood densities than would normally occur with natural succession. These high density snag rich areas are short-lived on the landscape with most snags falling down within 25 years.

Danger tree activities include the routine removal of snags along roads, high use recreation areas, and facilities. This activity occurs approximately 160 feet (one site potential tree height) either side of roads and from high use areas. Snag habitat remains in these areas; however, as they pose a danger to the public or facilities they are removed, therefore these areas are not managed for this habitat component. An annual danger tree removal project occurs focusing on recreation areas like campgrounds. Snag levels continue to decline around these facilities.

BBR Fuels, Canal 16 Underburn, Highway 20 Thinning, and Underline Thinning have all had past prescribed fire associated with them. These treatments were designed to reintroduce natural fire and promote development of early/mid seral ponderosa pine stands, while minimizing competition of resources to residual old growth. However, through implementation of prescribed natural fire, generally some trees are lost and snags are created in the process. Generally, these are smaller snag, but overall treatments from these projects promote the development of future old growth to recruit large snags in the future. Approximately 4,680 acres of prescribed burning has been completed within these projects.

Alternatives 2 will not target snags or down wood for removal. The action alternatives may remove snag habitat due to the potential of losing snags and down wood during prescribed fire activities and the loss of snags for safety reasons. To minimize the loss of snags for safety reasons, landings will be designated in area to reduce conflict.

Consistency with the Deschutes LRMP and Eastside Screens
Wildlife standard and guidelines WL-37 and WL-38 will be assessed. The action alternatives associated with this project are consistent with the Deschutes LRMP.

Standard and Guideline	Do Not Meet, Meets, Not Applicable	Rationale
WL-37 – As amended by the Eastside Screens, snags will be maintained to provide 100 percent of potential population levels of cavity nesting species. In addition live replacement trees will be left during any harvest to assure 100 percent of population potential through the rotations.	Meets	No snags are targeted for harvest. In addition the project is thinning from below and sufficient retention trees will be provided for future snags.
WL-38 – Specific guidance will be provided by the Deschutes National Forest Wildlife Tree Implementation Plan.	Meets	No snags are targeted for harvest. In addition the project is thinning from below and sufficient retention trees will be provided for future snags.
WL-38 – As amended by the Eastside Screens, 20 to 40 lineal feet per acre in ponderosa pine and 100-140 lineal feet per acre in mixed conifer will be retained	Meets	No down wood is targeted for removal. In addition snags identified as hazards will be felled and left as down wood.
Eastside Screen – Fire prescription parameters will ensure that consumption will not exceed 3 inches total (1 ½ inches per side) of diameter reduction in the 20 to 40 lineal feet per acre of ponderosa pine and the 100-140	Meets	Mitigation measures have been placed to ensure the required lineal feet of down wood remains post prescribed fire.

Standard and Guideline	Do Not Meet, Meets, Not Applicable	Rationale
lineal feet per acre of mixed conifer.		

1. Harvest activities, both pre-commercial and commercial, will retain all existing snags greater than or equal to 10 inches dbh except where they create a safety hazard. Standing dead trees, which present a safety hazard, would be felled and left in place.
2. Apply a sufficient buffer of live trees around existing snags to minimize the need to fall snags as hazard trees during logging operations.
3. During prescribed fire operation, consumption of down wood at least 12 inches diameter at small end and at least 6 feet in length at rate of 40 lineal feet per acre in ponderosa pine and 140 lineal feet per acre in mixed conifer will not exceed 3 inches total (1 ½ inches per side) in order to meet Forest Plan Amendment #2 (USDA 1995).

1. During prescribed fire operations consider lining large snags (i.e. 21 inches dbh or larger) that are at a high risk of consumption.
2. Consider spring burning (when 1,000 hour fuel moistures are higher) to decrease the chances of large snag and down wood consumption by fire.

Birds of Conservation Concern

In January 2001, President Clinton issued an executive order on migratory birds directing federal agencies to avoid or minimize the negative impact of their actions on migratory birds, and to take active steps to protect birds and their habitats. Federal agencies were required within two years to develop a Memorandum of Understanding (MOU) with the U.S. Fish and Wildlife Service to conserve migratory birds including taking steps to restore and enhance planning processes whenever possible. To meet this goal in part the U.S. Fish and Wildlife Service developed the Birds of Conservation Concern released in December 2002 (USFWS 2002) and an update to the original list was released in 2008 (USFWS 2008a).

The “Birds of Conservation Concern 2008” (BCC) identifies species, subspecies, and populations of all migratory non-game birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act (ESA) of 1973. Bird species considered for inclusion on lists in this report include non-game birds, gamebirds without hunting seasons, subsistence-hunted non-game species in Alaska, landbirds, shorebirds, waterbirds, and Endangered Species Act candidate, proposed endangered or threatened, and recently delisted species. While all of the bird species included in BCC are priorities for conservation action, the list makes no finding with

regard to whether they warrant consideration for ESA listing. The goal is to conserve avian diversity in North America and includes preventing or removing the need for additional ESA bird listings by implementing proactive management and conservations actions (USFWS 2008a). The 2008 lists were derived from three major bird conservation plans: the Partners in Flight North American Landbird Conservation Plan, the United States Shorebird Conservation Plan, and the North American Waterbird Conservation Plan. Conservation concerns stem from population declines, naturally or human-caused small ranges or population sizes, threats to habitat, or other factors.

Bird Conservation Regions (BCRs) were developed based on similar geographic parameters and are the basic units within which all bird conservation efforts should be planned and evaluated (USFWS 2008a). One BCR encompasses the Lower Fly Creek Project Area – BCR 9, Great Basin. See Table 3-24 for a list of the bird species of concern for the area, the preferred habitat for each species, and whether there is potential habitat for each species within the Lower Fly Creek project area.

Table 3-24. BCR 9 (Great Basin) BCC 2008 list.

Bird Species	Preferred Habitat	Habitat within the Lower Fly Creek Project Area (Y or N)
Greater Sage Grouse (Columbia Basin DPS)	Sagebrush dominated Rangelands	No
Eared Grebe (non-breeding)	Open water intermixed with emergent vegetation	No
*Bald Eagle	Lakeside with large trees	Yes
Ferruginous Hawk	Elevated Nest Sites in Open Country	No
Golden Eagle	Elevated Nest Sites in Open Country	Yes
Peregrine Falcon	Cliffs	No
Yellow Rail	Dense Marsh Habitat	No
Snowy Plover	Dry Sandy Beaches	No
Long-billed Curlew	Meadow/Marsh	No
Marbled Godwit	Marsh/Wet Meadows	No
Yellow-billed Cuckoo	Dense riparian/cottonwoods	No
Flammulated Owl	Ponderosa pine forests	Yes
Black Swift	Cliffs associated with waterfalls	No
Calliope Hummingbird	Open mountain meadows, open forests, meadow edges, and riparian areas	No
Lewis' Woodpecker	Ponderosa pine forests	Yes
Williamson's Sapsucker	Ponderosa pine forests	Yes
White-headed Woodpecker	Ponderosa pine forests	Yes
Loggerhead Shrike	Open country with scattered trees or shrubs	No

Bird Species	Preferred Habitat	Habitat within the Lower Fly Creek Project Area (Y or N)
Pinyon Jay	Juniper, juniper-ponderosa pine transition, and ponderosa pine edges	Yes
Sage Thrasher	Sagebrush	No
Virginia's Warbler	Scrubby vegetation within arid montane woodlands	No
Green-tailed Towhee	Open ponderosa pine with dense brush	Yes
Brewer's Sparrow	Sagebrush clearings in coniferous forests/bitterbrush	No
Black-chinned Sparrow	Ceanothus and oak covered hillsides	No
Sage Sparrow	Unfragmented patches of sagebrush	No
Tricolored Blackbird	Cattails or Tules	No
Black Rosy Finch	Rock outcroppings and snowfields	No

Landbird Strategic Plan

The Forest Service has prepared a Landbird Strategic Plan (USDA 2000) to maintain, restore, and protect habitats necessary to sustain healthy migratory and resident bird populations to achieve biological objectives. The primary purpose of the strategic plan is to provide guidance for the Landbird Conservation Program and to focus efforts in a common direction. On a more local level, individuals from multiple agencies and organizations with the Oregon-Washington Chapter of Partners in Flight participated in developing publications for conserving landbirds in this region. A Conservation Strategy for Landbirds of the East-Slope of the Cascade Mountains in Oregon and Washington was published in June 2000 (Altman 2000). This document outlines conservation measures, goals and objectives for specific habitat types found on the east-slope of the Cascades and the focal species associated with each habitat type. These documents provide recommendations for habitat management. The East-Slope Cascades Strategy covers the Deschutes National Forest and the forest is contained within the Central Oregon subprovince. See Table 3-25 for specific habitat types highlighted in these documents, the habitat features needing conservation focus and the focal bird species for each.

A Conservation Strategy for Landbirds of the East-slope of the Cascade Mountains in Oregon and Washington

Table 3-25. Priority habitat features and associated focal species for the East-Slope Cascade Strategy.

Habitat	Habitat Feature	Focal Species for Central Oregon
Ponderosa Pine	Large patches of old forest with large snags	White-headed woodpecker
	Large trees	Pygmy nuthatch
	Open understory with regenerating pines	Chipping sparrow
	Patches of burned old forest	Lewis' woodpecker
Mixed Conifer (Late-Successional)	Large trees	Brown creeper
	Large snags	Williamson's sapsucker
	Interspersion grassy openings and dense thickets	Flammulated owl
	Multi-layered/dense canopy	Hermit thrush
	Edges and openings created by wildfire	Olive-sided flycatcher
Lodgepole Pine	Old growth	Black-backed woodpecker
Whitebark Pine	Old growth	Clark's nutcracker
Meadows	Wet/dry	Sandhill Crane
Aspen	Large trees with regeneration	Red-naped sapsucker
Subalpine fir	Patchy presence	Blue Grouse

Eleven species are identified from these lists with the potential to be found within the Lower Fly Creek project area. These include bald eagle, flammulated owl, Lewis' woodpecker, Williamson's sapsucker, white-headed woodpecker, pinyon jay, green-tailed towhee, pygmy nuthatch, chipping sparrow, and olive-sided flycatcher. Some of these species are covered in other sections of this document either as an individual species or as a group of species. The species will be addressed as they relate to specific habitat associations.

The bald eagle, white-headed woodpecker, and Lewis' woodpecker are all Region 6 Sensitive species. These species have been addressed in the Biological Evaluation completed for the Lower Fly Creek project area.

Ponderosa Pine – Large Trees and Snags – Pygmy Nuthatch, Flammulated

Owl, and Williamson's Sapsucker

Affected Environment

The pygmy nuthatch is a resident of ponderosa pine forests east of the Cascades but outside the breeding season, is found just outside the ponderosa pine zone. The flammulated owl is unique in the Pacific Northwest. It preys almost exclusively on insects and is a neotropical migrant. Williamson's sapsuckers are summer residents east of the crest and are most often found in ponderosa pine during the breeding season (Marshall et al. 2003). The flammulated owl and Williamson's sapsucker breed on the eastern slope of the Cascades and are found in mature to old growth forests with limited understories at mid to high elevations (Marshall et al. 2003). All species are closely associated with mature or old growth ponderosa pine forests but may be found in mixed conifer forests dominated by ponderosa pine. Flammulated owl habitat also includes dense patches of saplings or shrubs used for roosting. All species nest in snags or live trees with decay. Williamson's sapsuckers are weak excavators and select for the soft and decayed wood for nest sites regardless of tree species (Marshall et al. 2003). Pygmy nuthatches excavate their own cavity while flammulated owls utilize pileated woodpecker or northern flicker holes. Nuthatches forage on the outer branches in the upper canopy on needle clusters, cones, and emerging shoots with some limited foraging on bark. (Marshall et al. 2003). The flammulated owl forages exclusively at night primarily for nocturnal arthropods (USDA 1994b). Little is known on the population status of the flammulated owl and no data are available for the pygmy nuthatch to indicate significant population declines (Marshall et al. 2003). Risks to these species include loss of mature ponderosa pine forests, fire suppression resulting in overstocked stands and reduced snag recruitment, salvage logging, and chemical use (Marshall et al. 2003). Williamson's sapsuckers are highly adaptable and are able to withstand considerable disturbance. Populations seem to be fairly stable however, snag removal remains the primary threat for this species (Marshall et al. 2003).

Environmental Consequences

Analysis Issue – Effects of the project to Pygmy Nuthatch, Flammulated Owl, and Williamson's Sapsucker
Measure - Impacts to snags and coarse woody material habitat

Alternative 1 No Action – Ecological Trend

Existing shrub layers in suitable habitat limits the available forage base for the owl by decreasing plant diversity due to competition, this may discourage some arthropods and other insects from occupying these sites. It also hinders foraging attempts due to the somewhat limited maneuverability of flammulateds with increased shrub structure (USDA 1994).

Increased stand densities perpetuates the problem of losing large structure over time from competition and disturbance events, which this species requires for suitable nesting and foraging habitat. It also limits available nest sites, resulting in more competition for existing sites between species. Increased stand densities may increase the risk of loss

from fire. This species requires snags for nesting and utilizes softer snags (moderate decay). In the event of fire softer snags are lost and replaced with hard snags, limiting nesting habitat until developed by primary cavity excavators.

Currently there are a limited number of large trees available for potential use. Replacement large trees are a concern. Many of the future habitat trees are within overstocked stands, which will increase the amount of time the trees will take to get to the desired size.

Many of the large trees that provide potential habitat are surrounded by dense patches of smaller trees with some shrubs in the understory. Competition for nutrients and water makes these trees more susceptible to insects and disease. In addition, large trees within densely stocked stands are more susceptible to wildfire, due to increased fuel loadings and ladder fuels from 100 years of fire suppression. Large trees will continue to be at an increased risk to insect, disease, and wildfire.

In the long-term, habitat for these species may still be limited. Habitat is not static and in the short term (<50 years), may be reduced in quality or lost due to environmental factors such as insects, disease, and/or wildfires.

Alternative 2 - Proposed Action

Direct and Indirect Impacts

There will be no known direct effects to flammulated owls or the brown creeper. Approximately 1,031 acres of mature forest will receive treatment. However, green trees 21 inches and greater will not be removed. In addition large snags are not targeted for removal, but there is a possibility for incidental loss of snags during treatments. Generally, snags would be avoided during treatments, however as a result of OSHA regulations requirements for safety during operations some would be removed. This would be minimized by placing landing strategically away to avoid snag issues and impacts.

Thinned areas within flammulated owl, pygmy nuthatch, and Williamson's sapsucker habitat will reduce ladder fuels associated with large trees. Ladder fuel reduction will decrease the risk of losing the remaining large trees. In addition, removal of the understory in overstocked stands will decrease the competition for nutrients and water, which should also lower the susceptibility to insects and disease. An important benefit to thinning is the reduction in beetle caused mortality (Cochran and Barret 1999). The 10-20% retention clumps that will occur within treatments units will create dense thickets next to openings, which should benefit flammulated owl habitat.

Currently, there are a limited number of large snags and trees available as well as replacement large trees. Many of the future large trees and snags occur within overstocked stands, prolonging development of trees of the desired size and height. Thinning 1,031 acres of overstocked second growth stands will reduce competition increasing growth rates to the remaining trees. Cochran and Barret (1999) were able to show 30 years after thinning there were large differences in average tree sizes among

different group stocking levels. They also show growth rates of the 20 largest diameter trees per acre were reduced by competition from smaller trees.

Prescribed natural fire will occur on approximately within the same 1,031 acres. Treatments will benefit the these species by creating an open understory providing foraging habitat within both mid seral and old growth ponderosa pine stands. These same treatments will also provide short-term foraging habitat for the both pygmy nuthatch and Williamson's sapsucker from small diameter trees incidentally killed by fire, when the bark begins to slough.

Overall, the proposed treatment will maintain old growth ponderosa pine stands and accelerate the development of second growth ponderosa pine stands providing both nesting and foraging habitat for these species on approximately 1,031 acres.

Cumulative Effects

Implementation of action alternatives for the Lower Fly Creek project will not result in any direct or indirect adverse impacts and therefore, will not result in any cumulative impacts for the pygmy nuthatch, flammulated owl, and Williamson's sapsucker and their habitats.

Approximately, 52,666 acres of both nesting and foraging habitat exists for flamulated owl, pygmy nuthatch, and Williamson's sapsucker, within low elevation ponderosa pine stands in the Eastside Screens.

Several vegetation management projects have occurred or may occur within suitable habitat (BBR Fuels, Underline Thinning, Highway 20, Canal 16 Thinning and Canal 16 underburn). Overall, treatments were proposed to reduce the risk of loss of existing habitat from large-scale disturbances and thinned approximately 10,146 acres. Mowing and burning were widely prescribed maintaining grassy understories, which should benefit flamulated owl foraging. Fuels treatments associated with these projects enhanced habitat for these species on approximately 4,680 acres of ponderosa pine habitat.

The SAFR, Flymon Stewardship, and Glaze Forest Restoration projects also propose fuel reduction within ponderosa pine stands, which will be beneficial to these species. The SAFR Flymon Stewardship Demo, Flymon II Stewardship and Glaze Forest Restoration projects proposed approximately 19,024 acres of thinning and burning. Objective are also focused around ponderosa pine obligates such as the pygmy nuthatch, therefore on a landscape basis approximately 19,024 acres of habitat will have short-term impacts but long-term benefits to habitat for these species.

Private lands are not managed for above mentioned species. Therefore, it is assumed that any habitat provided by these parcels is incidental and may not be long-term. There is approximately 51,530 acres of eastside ponderosa pine or variation of ponderosa pine habitat associated with private lands within the zone of influence.

Cumulatively, the actions associated with the proposed action will both be beneficial in the long-term, although in the short-term will reduce minor amounts of foraging habitat for all species, residual foraging habitat will remain under both alternative and will not preclude use by flammulated owl, Williamson's sapsucker, or pygmy nuthatches. The project will minimally reduce foraging habitat on approximately 1% of the habitat identified within low elevation ponderosa pine stands within the Eastside Screens. Therefore the project is consistent with the Conservation Strategy for Landbirds on the East-Slope of the Cascade Mountain in Oregon and Washington.

Landbird Strategy

Biological objectives for pygmy nuthatch habitat in open understory ponderosa pine with large trees will be assessed. The project meets objectives outlined in the Conservation Strategy for Landbirds on the East-Slope of the Cascade Mountains in Oregon and Washington.

Objective	Do Not Meet, Meets, Not Applicable	Rationale
Where ecologically appropriate initiate actions in ponderosa pine forests to maintain or provide: mean of >10 trees/ac >21"dbh and at least 2 of the trees >31" dbh (foraging trees and replacement snags	Meets	There will be no removal of trees 21 inches dbh or greater.
Where ecologically appropriate… maintain or provide: mean 1.4 snags/ac >8" dbh with 50% >25" dbh in a moderate to advanced state of decay	Meets	No snags are targeted for removal.

flammulated owl

Objective	Do Not Meet, Meets, Not Applicable	Rationale
Where ecologically appropriate initiate actions in ponderosa pine forests to maintain or provide: >10 snags/100 acres >12" dbh and >6 feet tall	Meets	No snags are targeted for removal.
Where ecologically	Meets	There will be no removal of trees

Objective	Do Not Meet, Meets, Not Applicable	Rationale
appropriate… maintain or provide: >8 trees/acre >21” dbh to function as recruitment snags		21 inches dbh or greater.
Where ecologically appropriate… maintain or provide: at least one large or 2 smaller dense, brushy thickets of sapling/pole trees for roosting habitat	Meets	Within the project area approximately 643 acres of densely stocked stand will remain untreated throughout the project area. In addition untreated clumps will be left throughout treatment units ½ to 1 acre in size.
Where ecologically appropriate… maintain or provide: at least one large or 2 smaller grassy openings within the territory	Meets	Approximately 407 acres of unforested opening are distributed throughout the project area. These areas will not receive any vegetation management.

Williamson’s sapsucker

Objective	Do Not Meet, Meets, Not Applicable	Rationale
Where ecologically appropriate initiate actions in ponderosa pine forests to maintain or provide: >1 snags/acre >12” dbh except ponderosa pine should be 18”dbh	Meets	No snags are targeted for removal.
Where ecologically appropriate… maintain or provide: mean canopy cover 25-70%	Meets	In areas where the inherent soil quality will support denser stand, approximately 643 acres will remain untreated providing stand with >30% canopy cover.

Open Habitats/Open Understories with Regenerating Pines – Chipping Sparrow

Affected Environment

The chipping sparrow is an uncommon to common summer resident preferring open habitats with a shrub or grass component. Chipping sparrows prefer open coniferous forests or stands of trees interspersed with grassy openings or low foliage (Marshall et al. 2003 pp. 538-540). In Central Oregon, good numbers of chipping sparrows can be found in juniper, ponderosa pine, and lodgepole pine communities but are not present in sagebrush (Marshall et al. 2003 pp. 540-542). This sparrow breeds in scattered locations in the Cascades and throughout higher elevations of eastern Oregon. The diet of this sparrow is not well known. A study conducted for central Oregon (Eastman 1960 in Marshall et al. 2003) shows a preference for weed seeds. Declines in populations have been noted from Breeding Bird Survey (BBS) results (1966-2000) for the chipping sparrow showing a 3.9% decrease per year. Some reasons for this decline includes habitat changes due to fire suppression resulting in closed canopy habitat, cowbird parasitism, and competition with house sparrows and house finches.

Environmental Consequences

Analysis Issue – Impacts of the project to Chipping Sparrow
Measure - Acres of fuels reduction within ponderosa pine stands

Alternative 1 No Action – Ecological Trend

Primary risks to habitat will continue due to increased fuel loading from fire suppression, which has resulted in increased stand densities. The densely stocked stands that currently exist impact this species by reducing the open areas. Potential habitats that occur adjacent to densely stocked stands are more susceptible to wildfire, due to increased fuel loadings and ladder fuels from the last 100 years of fire suppression. Under the no action alternative habitat will continue to be at an increased risk to insect, disease, and wildfire.

Alternative 2 - Proposed Action

Direct and Indirect Impacts

The proposed action will thin approximately 1,031 acres of ponderosa pine stand that are comprised of residual old growth, but the majority being second growth mid-seral ponderosa pine, allowing for the development of better herbaceous ground vegetation. The proposed treatments would influence the growth response of the remaining trees, and fewer regenerating pines would exist. No trees with old growth for regardless of the diameter will be remove, treatments will focus on thinning the mid-seral second growth ponderosa pine. Treatments will move the ponderosa pine towards conditions that better meet the habitat requirements of chipping sparrows. Thinning from below will create a more open understory. Each thinning unit will retain untreated habitat leaving pockets of shrubs and regenerating pine in areas where the inherent soil quality can sustain the denser stands. Understory thinning would occur on trees 21” dbh and less throughout the

project area. Thinning would replicate naturally occurring densities across the project area. Nesting habitat for chipping sparrows would occur within untreated wildlife areas. Mowing and prescribe natural fire will also occur reducing shrub densities in the stands, and increasing an open grassy understory. With a variety of treatments occurring across the project in ponderosa pine, more habitat should be available for chipping sparrows post treatment. These treatments should move ponderosa pine closer to historical conditions.

Cumulative Effects

Implementation of action alternatives for the Lower Fly Creek project will not result in any direct or indirect adverse impacts and therefore, will not result in any cumulative impacts for the chipping sparrow and its habitat.

Several vegetation management projects have occurred or may occur within suitable habitat (BBR Fuels, Underline Thinning, Highway 20, Canal 16 Thinning and Canal 16 underburn). Overall, treatments were proposed to reduce the risk of loss of existing habitat from large-scale disturbances and thinned approximately 10,146 acres. Mowing and burning were widely prescribed maintaining grassy understories, which should benefit flamulated owl foraging. Fuels treatments associated with these projects enhanced habitat for these species on approximately 4,680 acres of ponderosa pine habitat.

The SAFR and Flymon Project also propose fuel reduction within ponderosa pine stands, which will be beneficial to this species. The SAFR and Glaze Forest Restoration projects propose approximately 18,474 acres of thinning/burning and the Flymon Stewardship Demo, and Flymon II Stewardship projects proposed approximately 550 acres of thinning and burning. Objective are also focused around ponderosa pine obligates such as the chipping sparrow, therefore on a landscape basis approximately 19,024 acres of habitat will have short-term impacts but long-term benefits to habitat for these species.

Private lands are not managed for above mentioned species. Therefore, it is assumed that any habitat provided by these parcels is incidental and may not be long-term. There is approximately 51,530 acres of eastside ponderosa pine or variation of ponderosa pine habitat associated with private lands within the zone of influence.

Cumulatively, all of the projects listed within the zone of influence will be beneficial to chipping sparrow. Therefore the project is consistent with the Conservation Strategy for Landbirds on the East-Slope of the Cascade Mountain in Oregon and Washington.

Landbird Strategy

Biological objectives for chipping sparrow habitat in open understory ponderosa pine with regenerating pines will be assessed. The project meets objectives outlined in the Conservation Strategy for Landbirds on the East-Slope of the Cascade Mountains in Oregon and Washington.

Objective	Do Not Meet, Meets, Not Applicable	Rationale
Where ecologically appropriate initiate action in ponderosa pine forests to maintain or provide: interspersion of herbaceous ground cover with shrub and regenerating pine patches	Meets	Fuels treatments within harvest units will provide for herbaceous growth while untreated areas will provide for shrub growth.
Where ecologically appropriate… maintain or provide: 20-60% cover in the shrub layer	Meets	Implementation units were designed to promote shrub production in various seral classes across the project area. Units are designed to reduce densities of pine and juniper stands to promote shrub development.
Where ecologically appropriate… maintain or provide: >20% of shrub layer in regenerating sapling conifers especially pines	Meets	Approximately 30% of the project area will be left untreated or will maintain stands that contain sapling size regenerating pines.
Where ecologically appropriate… maintain or provide: 10-30% mean canopy cover	Meets	Where the inherent soil quality will support high density stands with canopy cover >30%, areas will be left untreated within the project area. In addition
Where ecologically appropriate at the landscape level maintain or provide: a mix of understory conditions such that 10-30% of the landscape meets site-level conditions mentioned above	Meets	Approximately 99% of mature ponderosa pine forests remain on the within the zone of influence.

1. To avoid potential nest destruction and loss of broods, schedule harvest and post harvest activities after the nesting season in appropriate habitat (after June 15th).

Mixed Conifer/Ponderosa Pine, Edges and Openings Created by Wildfire – Olive-sided Flycatcher

Affected Environment

The olive-sided flycatcher is a summer resident that breeds in low densities throughout coniferous forests of Oregon. The olive-sided flycatcher, an aerial insectivore, prefers forest openings or edge habitats where forest meets meadows, harvest units, rivers, bogs,

marshes etc. (Marshall et al. 2003). Nesting success for the flycatcher was highest within forest burns where snags and scattered tall, live trees remain (Marshall et al. 2003 and Wisdom et al. 2000 p. 215). Common features of nesting habitat include tall prominent trees and snags used as foraging and singing perches. The flycatcher forages from high prominent perches at the tops of snags or from the uppermost branches of live trees and needs unobstructed air space to forage. It preys on flying insects and in particular, bees and wasps (Marshall et al. 2003 pp. 374-375).

Population trends based on BBS data show highly significant declines with an Oregon statewide decline of 5.1% per year from 1966-1996 for the olive-sided flycatcher. Factors potentially contributing to population declines on breeding grounds include habitat loss through logging, alteration of habitat through management activities (e.g., clearcutting, fire suppression), and lack of food resources (Marshall et al. 2003 p. 376). Wisdom et al. (2000 p. 218) also noted that where altered fire regimes result in fewer but larger fires, the juxtaposition of early and late seral habitats becomes less favorable. However, within the Columbia Basin our area (Southern Cascades) shows increases of >60% for the olive-sided flycatcher compared to other areas.

Environmental Consequences

Analysis Issue – Impacts of the project to Olive-sided Flycatcher
Measure - Acres of prescribed burning in ponderosa pine stands.

Alternative 1 No Action – Ecological Trend

Currently suitable habitat would become denser, thus losing habitat components needed by the olive-sided flycatcher. Existing dense stands would continue to fall apart due to tree mortality, opening these up to eventually provide habitat. This alternative would leave the stands in a dense condition, making them susceptible to fire, which could benefit this species by providing early post-fire habitat it needs. However, there is a risk that no green trees would be left due to the intensity of the fire and would only provide habitat for this species in the short-term until trees fell.

Alternative 2 - Proposed Action

Direct and Indirect Effects

The majority of the project area provides habitat due to the diversity of the habitats found. The project area provides wooded streamside vegetation along Fly Creek, and due to the Eyerly and Fly Creek Fires there is adjacent natural edge. Treatments under the Proposed Action will alter the vegetation within all the described forested habitats. However, treatments would favor habitat for this species by thinning from below, maintaining the tallest and healthiest trees in all stands.

Treatments may change use patterns within the project area by opening stands up, however approximately 643 acres of forested stand within the project area will remain untreated. In addition where the inherent soil quality will support denser stands conditions, untreated areas will be left throughout treatment units ¼ to 1 acre in size, maintaining density and structural diversity providing habitat.

Olive-sided fly catcher has also been identified as being dependent on post-fire habitat. Prescribed natural fire on approximately 1,031 acres will incidentally kill individual understory and an occasional overstory trees providing habitat in the short-term. In addition, the 2002 18,000 + acre Eyerly Fire is adjacent to the project and currently provides foraging habitat.

Cumulative Effects

Implementation of action alternatives for the Lower Fly Creek project will not result in any direct or indirect adverse impacts and therefore, will not result in any cumulative impacts for the olive-sided flycatcher and its habitat.

Within the zone of influence several vegetation management projects have occurred or may occur within suitable habitat (BBR Fuels, Underline Thinning, Highway 20, Canal 16 Thinning and Canal 16 underburn,). Overall, treatments were proposed to reduce the risk of loss of existing habitat from large-scale disturbances and thinned approximately 10,146 acres. Mowing and burning were widely prescribed maintaining grassy understories, which should benefit white-headed woodpecker nesting habitat. Fuels treatments associated with these projects enhanced habitat for white-headed woodpeckers on approximately 4,680 acres of ponderosa pine habitat.

The SAFR Flymon Stewardship Demo, Flymon II Stewardship, and Glaze Forest Restoration Project also propose fuel reduction within ponderosa pine stands, which will be beneficial to these species. The SAFR Project proposes approximately 17,600 acres of thinning the Flymon Stewardship Demo and Flymon II Stewardship projects proposes approximately 550 acres of thinning and the Glaze project proposes approximately 874 acres of thinning. Objective are also focused around ponderosa pine obligates such as the olive-sided flycatcher, therefore on a landscape basis approximately 19,024 acres of habitat in will have short-term impacts but long-term benefits to habitat for these species.

Private lands are not managed for above mentioned species. Therefore, it is assumed that any habitat provided by these parcels is incidental and may not be long-term. There is approximately 51,530 acres of eastside ponderosa pine or variation of ponderosa pine habitat associated with private lands within the zone of influence.

Landbird Strategy

Biological objectives for olive-sided flycatcher habitat in mixed conifer stands with edges and openings created by wildfire were assessed. The project is not applicable to the objectives outlined in the Conservation Strategy for Landbirds on the East-Slope of the Cascade Mountains in Oregon and Washington because the project is not associated with post fire habitats.

Objective	Do Not Meet, Meets, Not Applicable	Rationale
Where ecologically appropriate in mixed conifer through natural	Not applicable	This is not a post fire salvage project.

Objective	Do Not Meet, Meets, Not Applicable	Rationale
events or management maintain: >2% of landscape as post-fire habitat		
Where ecologically appropriate in mixed conifer through natural events or management maintain: >40% of the post fire landscape as unsalvaged.	Not applicable	The project is not a fire salvage project.
Where salvage is occurring in post fire old ponderosa pine forest maintain or provide: in burns >100 acres, salvage <50% of standing dead and down	Not applicable	The project is not a fire salvage project.
Where salvage is occurring in post fire old ponderosa pine forest maintain or provide: retain all trees/snags >20”dbh and >50% of those 12-20”dbh	Not applicable	The project is not a fire salvage project.
Where salvage is occurring in post fire old ponderosa pine forest maintain or provide: patches with a mix of live and dead trees/snags to provide potential nesting trees in context of potential foraging and perch trees	Not applicable	The project is not a fire salvage project.

1. To avoid potential nest destruction and loss of broods, schedule harvest and post harvest activities after the nesting season in appropriate habitat (after June 15th).

Coniferous Forests – Edges – Northern Flicker

Affected Environment

The northern flicker is a common resident throughout Oregon and is encountered in almost any terrestrial habitat. It is generally most abundant in open forests and forest edges adjacent to open country while they tend to avoid dense forest (Marshall et al. 2003). There is some evidence the flicker prefers older mature forests. Reinkensmeyer (2000 in Marshall et al. 2003) noted the preference for old growth versus mid-successional western juniper in central Oregon. Most nests in forested areas are found in older, open forests, along older forest edges, and in large diameter remnant snags (Marshall et al. 2003). They also tend to nest in trees with moderate to heavy decay. The

flicker diet consists of ants, beetles, crickets, other insects, fruits, and seeds and they prefer to forage on the ground (Marshall et al. 2003). BBS data (1966-2000) for Oregon show a non-significant decrease of 0.6% per year decline. The flicker requires open space and may gain foraging habitat from human caused changes but the presence of decayed wood is still required.

Environmental Consequences

Analysis Issue – Impacts of the project to Northern Flicker
Measure – Effects of project to coarse woody material

Alternative 1 No Action – Ecological Trend

Increased stand densities perpetuates the problem of losing large structure over time from competition and disturbance events, which this species requires for suitable nesting and foraging habitat. It also limits available nest sites, resulting in more competition for existing sites between species. Increased stand densities may increase the risk of loss from fire. This species requires snags for nesting and generally utilizes larger snags associated with older mature forests. In the event of fire existing snags are lost and replaced with hard snags, but generally will not preclude the use by flickers.

Currently there are a limited number of large trees available for potential use. Replacement large trees are a concern. Many of the future habitat trees are within overstocked stands, which will increase the amount of time the trees will take to get to the desired size.

Many of the large trees which provide potential habitat are surrounded by dense patches of smaller trees with some shrubs in the understory. Competition for nutrients and water makes these trees more susceptible to insects and disease. In addition, large trees within densely stocked stands are more susceptible to wildfire, due to increased fuel loadings and ladder fuels from 100 years of fire suppression. Large trees will continue to be at an increased risk to insect, disease, and wildfire. The 18,000+ acre Eyerly Fire is north and adjacent to the project area, and provides an abundance of dead trees for nesting and foraging habitat.

Alternative 2 - Proposed Action

Direct and Indirect Effects

The thinning and fuels treatments planned under the action alternative on 1,031 acres of mid-seral ponderosa pine which is not the preferred stand age and structure for the flicker, are designed to reduce the risk of high intensity wildfires in the short-term (<30 years). In addition treatments will maintain residual old growth ponderosa pine trees that exist throughout the project area and promote the development of late and old structured (LOS) habitat in the long-term. The action alternative does not propose commercial harvest or salvage of any snags or coarse woody material (see mitigation measures). With the exception of occasional felling of snags that may pose a hazard to human safety during thinning operations, thinning operation would have no direct effects to snags or coarse woody material habitats. Commercial harvest would directly effect green tree

replacements by reducing the number of trees in treatment units. However the units would retain enough green tree replacements to exceed levels for snag recruitment in the long-term. Thinning would open up areas, and the indirect effects of treatments include healthier stands, but could reduce some foraging opportunities in the short-term.

Proposed treatments would reduce the risk of high intensity wildfire by thinning the understory, reducing the ladder fuels that make the area susceptible to a stand replacing fire. Treatments would accelerate stand development providing long-term habitat for the flicker which is prefers a variety of habitat types but focus on mature stands. Although the recruitment of dead wood habitats would be slow, silvicultural treatments would provide beneficial indirect effects by promoting faster growth of green tree replacements, ultimately providing larger diameter snags and down wood over the next 30+ years. As the stands age, additional snags and logs would develop, providing a higher diversity of habitat and structure. As a result, stands would contain more abundant nesting habitat. In the short-term thinning from below will reduce the dense understory in the ponderosa pine, which could promote ground foraging for the flicker. Through project design, untreated areas will be left throughout treatment units maintaining high density stands from ¼ to 1 acre in size.

Cumulative Effects

Implementation of action alternatives for the Lower Fly Creek project will not result in any direct or indirect adverse impacts and therefore, will not result in any cumulative impacts for the northern flicker and its habitat.

Approximately, 52,666 acres of both nesting and foraging habitat exists for northern flicker woodpecker within low elevation ponderosa pine stands in the Eastside Screens across the Sisters Ranger District.

Several vegetation management projects have occurred or may occur within suitable habitat (BBR Fuels, Underline Thinning, Highway 20, Canal 16 Thinning and Canal 16 underburn,). Overall, treatments were proposed to reduce the risk of loss of existing habitat from large-scale disturbances and thinned approximately 10,146 acres. Mowing and burning were widely prescribed maintaining grassy understories, which should benefit flicker nesting habitat. Fuels treatments associated with these projects enhanced approximately 4,680 acres of ponderosa pine habitat.

The SAFR, Flymon Stewardship Demo, Flymon II Stewardship, and Glaze Forest Restoration projects also propose fuel reduction within ponderosa pine stands, which will be beneficial to this species. The SAFR Project proposes approximately 17,600 acres of thinning, the Flymon Stewardship Demo and Flymon II Stewardship projects proposes approximately 550 acres of thinning, and the Glaze project proposes approximately 874 acres of thinning. On a landscape basis approximately 19,024 acres will have short-term impacts but long-term benefits to habitat for this species.

Private lands are not managed for above mentioned species. Therefore, it is assumed that any habitat provided by these parcels is incidental and may not be long-term. There is

approximately 51,530 acres of eastside ponderosa pine or variation of ponderosa pine habitat associated with private lands within the zone of influence.

North and adjacent to the project area the Eyerly Fire burned 18,000+ acres of Forest Service Land in 2002. The longevity of fire killed large diameter (>20”dbh) ponderosa pine is approximately 30 years. Within 30 years when most of the large snags have come down the Eyerly Fire will be deficient of large snags. The Proposed Action would not reduce snag numbers on the landscape, but in the long-term would promote the growth and development of these small trees which would provide future habitat.

Cumulatively, the actions associated with Alternative 2 will be beneficial in the long-term for nesting habitat and will also promote foraging habitat. Although the Proposed Action will reduce foraging habitat, residual foraging habitat will remain and would not preclude use by northern flicker. The project would minimally reduce foraging habitat on approximately <1% of the habitat identified within low elevation ponderosa pine stands within the Eastside Screens. No snag or CWM would be removed under Alternative 2 except snags that pose a hazard to operation.

Consistency
Implementation of the Lower Fly Creek project is consistent with the Standards and Guidelines for the Deschutes National Forest Land Resource Management Plan. Treatments will not remove any snags that provide nesting habitat and project design will continue to provide and promote foraging habitat. Road closures would decrease disturbance to northern flicker and their habitat.

High Density Shrublands – Green-tailed Towhee

Affected Environment
The green-tailed towhee is a fairly common summer species east of the Cascades in central Oregon. This species prefers vigorous shrub stands and high shrub density. This species is known to occupy brushy slopes with intermittent trees, juniper and mountain mahogany stands, riparian areas in dry open country, and ponderosa pine-sagebrush associations. However, for central Oregon it was detected at higher densities in grasslands with 5% shrub cover than in shrub-steppe. It was also detected using juniper stands and ponderosa pine stands with a shrub understory as well (Marshall et al. 2003). Their diet consists primarily of insects and weed seeds but may also consume fruit. Trends are difficult to discern for this species. BBS data (1982-1991) for Oregon shows a marginally significant increase but for the overall population the data shows a slight (1.7% per year) decline (BBS data 1966-2000). Threats include fire suppression which may degrade habitat by reducing forest openings with brushy regrowth (Marshall et al. 2003).

Environmental Consequences

Analysis Issue – Impacts of the project to Green-tailed Towhee
Measure – Acres of project impacts to shrub habitat

Alternative 1 No Action – Ecological Trend

Primary risks to habitat will continue due to increased fuel loading from fire suppression. In the mature ponderosa pine stands, shrub densities are low due to stand densification. Over time as stand densities increase, shrub production will decrease. The densely stocked stands that currently exist impact this species by reducing the open areas. In areas of the project containing western juniper, as the juniper continues to spread it begins to out compete other vegetation for resource, sagebrush and bitter brush stands in these areas are diminishing and will continue.
Under the no action alternative habitat will continue to be at an increased risk wildfire.

Alternative 2 - Proposed Action

Direct and Indirect Impacts

Thinning, burning and mowing are proposed on approximately 1,884 acres of mature ponderosa pine, ponderosa pine plantation, and western juniper stands. Treatments are primarily designed to reduce stand densities to promote better, grass shrub and forb production. Secondarily, treatment will reduce the risk of wildfire to the remaining habitat within 4,412 acre project area. These treatments are not expected to reduce habitat, due to its marginality for the green-tailed towhee.

While treated areas develop into more resilient and vigorous habitat, large untreated areas approximately 1,040 acres in size will remain to provide short-term habitat for this species.

Cumulative Effects

Implementation of the Proposed Action for the Lower Fly Creek project will not result in any direct or indirect adverse impacts and therefore, will not result in any cumulative impacts for the green-tailed towhee and its habitat.

Within the zone of influence several vegetation management projects have occurred or may occur within the suitable habitat of low elevation ponderosa pine stands associated with Eastside Screens (BBR Fuels, Underline Thinning, Highway 20, Canal 16 Thinning and Canal 16 underburn). Overall, treatments were proposed to reduce the risk of loss of existing habitat from large-scale disturbances and thinned approximately 10,146 acres. Mowing and burning were widely prescribed on 4,680 acres, maintaining grassy understories and a variety of seral classes of shrubs, which should benefit green-tailed towhee.

The SAFR, Flymon Stewardship Demo, Flymon II Stewardship, and Glaze Forest Restoration projects also propose fuel reduction within ponderosa pine stands, which will be beneficial to this species. The SAFR project proposes approximately 17,600 acres of thinning, the Flymon Stewardship Demo and Flymon II Stewardship projects proposed approximately 550 acres of thinning and burning, and the Glaze project proposes 874 acres. Objective are also focused around ponderosa pine obligates, therefore on a landscape basis approximately 17,500acres of habitat will have long-term benefits to habitat for the green-tailed towhee.

Private lands are not managed for above mentioned species. Therefore, it is assumed that any habitat provided by these parcels is incidental and may not be long-term. There is approximately 51,530 acres of eastside ponderosa pine or variation of ponderosa pine habitat associated with private lands within the zone of influence.

Consistency
Implementation of the Lower Fly Creek project is consistent with the Standards and Guidelines for the Deschutes National Forest Land Resource Management Plan. Treatments would not remove any high quality habitat and project design would continue to provide and promote nesting and foraging habitat. Road closures would decrease disturbance to green-tailed towhee and their habitat.

Juniper – Ponderosa Pine Transition – Pinyon Jay

Affected Environment

1999) indicate an annual 3.5% decline per year throughout their range. Oregon's population is small compared to the majority of their range (pinyon pine areas). Threats include the increased vulnerability of isolation from the core population, as well as increased populations of crows and ravens due to human expansion which leads to an increased predation risk. Effects of juniper expansion and large scale juniper removal are unknown.

Environmental Consequences

Alternative 1 No Action – Ecological Trend
The eastern portion of the project areas is within the ponderosa pine/ western juniper interface. Historically the project was primarily ponderosa pine, but due to fire suppression, and logging during the 1930's, western juniper has fully occupied the southeastern portion of the project area. The project area is within the breeding range of the pinyon jay. Due to densification of ponderosa pine and western juniper, the diversity of understory vegetation diminishes, shrubs become decadent, while forbs become non-existent. Overall the project area and pinyon jay habitat continue to be at a high risk of stand replacing wildfire.

Alternative 2 – Proposed Action

Direct and Indirect Impacts

The project proposes to implement juniper removal on approximately on 529 acres. No juniper will be removed greater than 21" dbh. Juniper trees in this area are all encroaching trees that have occupied the site due to the last 100 years of fire suppression. The objective of this treatment is to return the site to an open ponderosa pine community with juniper present but not a dominant tree species. As a result treatment will continue to provide habitat for the pinyon jay within and throughout the project area.

Cumulative Effects

Implementation of the proposed action for the Lower Fly Creek project would not result in any direct or indirect adverse impacts and therefore, will not result in any cumulative impacts for the pinyon jay and its habitat.

Within the "Zone of Influence" several vegetation management projects have occurred or may occur within the suitable habitat of low elevation ponderosa pine stands associated with Eastside Screens (BBR Fuels, Underline Thinning, Highway 20, Canal 16 Thinning and Canal 16 underburn). Overall, treatments were proposed to reduce the risk of loss of existing habitat from large-scale disturbances and thinned approximately 10,146 acres. Mowing and burning were widely prescribed providing a variety of grasses and shrubs, but also maintaining consistent foraging opportunities in both the short-term and long-term. Fuels treatments associated with these projects enhanced habitat for these species on approximately 4,680 acres of ponderosa pine habitat.

The SAFR and Flymon Project also propose fuel reduction within ponderosa pine stands, which will be beneficial to these species. The SAFR Project proposes approximately 17,600 acres of thinning, the Flymon Stewardship Demo and Flymon II Stewardship projects proposed approximately 550 acres of thinning and burning, and the Glaze project proposes 874 acres. Objective focused on maintaining a contiguous overstory of old growth ponderosa pine where it exists, and accelerating the development of mid seral ponderosa pine for future stands of old growth. Therefore, on a landscape basis approximately 19,024 acres of habitat will have long-term benefits to habitat for the pinyon jay.

Private lands are not managed for above mentioned species. Therefore, it is assumed that any habitat provided by these parcels is incidental and may not be long-term. There is approximately 51,530 acres of eastside ponderosa pine or variation of ponderosa pine habitat associated with private lands within the zone of influence.

These areas due not focus on western juniper removal and therefore do not cumulatively contribute to the overall removal of western juniper within the range of the pinyon jay.

Consistency

Implementation of the Lower Fly Creek project is consistent with the Standards and Guidelines for the Deschutes National Forest Land Resource Management Plan. Treatments would maintain a contiguous stand of overstory ponderosa pine continuing to

provide nesting habitat, while project design would promote foraging habitat. Road closures would decrease disturbance to pinyon jay and their habitat.

The section below summarizes the existing condition information, along with the direct, indirect and cumulative effects as analyzed in the Soils Specialist Report for this project (Craigg, T. 2009). Additional information is contained in the full specialist report.

Indicator: Change in extent of detrimental soil disturbance.

Indicator: Amount of coarse woody debris (CWD) and surface organic matter retained post treatment

Indicator: Project design applied to minimize adverse impacts that would alter the soils ability to function in a desirable manner.

Existing Condition

Landscape Characteristics

The project area is located on the lower eastern flank of a shield volcano known as Green Ridge in the north east corner of the Sisters Ranger District in central Oregon. Essentially all landforms, rocks and soil materials in this area are derived from volcanism. Elevations in the planning area are around 3,300 feet and the annual precipitation is estimated to be around 18 inches.

The Deschutes Soil Resource Inventory (SRI) identifies several different soil mapping units within the Lower Fly Creek project area (Table 3-26). Soil mapping units are identified based on similarities in soils, landforms, geology, and climatic conditions that influence defined patterns of soil and vegetation (Soil Resource Inventory, Larsen, 1996). During a field recognizance of the planning area these soil mapping units were further stratified into one or more soil-vegetation ecotypes which repeat across the landscape. The biophysical characteristics of these eco-types can be interpreted to identify productivity potentials and suitability's for natural resource planning and management. Ecotypes are described in detail in the Inherent Soil Quality section below.

Table 3-26: Project units with soil codes and ecotype acreages

Unit #	SRI Soil Code	Ecotypes	Acres
5	61	3	38
6	61	3	306
7	53	5,6	262
8	61/51	3	42
9	61	3	17
10	61	1,3	163
11	61	3	178
12	53	5,6,7	39
13	53	3	22

Unit #	SRI Soil Code	Ecotypes	Acres
14	61	3	85
15	53	5,6,7	530
16	51	1,3	28
17	50/TB	3	94
18	53	3,4	80
Total			**1,884**

Inherent Soil Quality

Field investigations of soils and existing vegetation within the Lower Fly Creek project resulted in the identification of the four ecotypes described below. Different ecotypes represent different site potentials which are initially identified based on differences in soil type and the existing vegetation. An ecotype is considered to differ in site potential from other ecotypes and each is expected to respond differently to various management activities such as thinning of trees, mowing of brush, and prescribed fire. This difference in response to disturbance of individual eco-types is expected to produce a set of seral stages that is unique to each ecotype, and with a lack of disturbance, a unique climax vegetation condition. The desired condition for an ecotype may or may not be the climax condition. Management activities such as thinning trees, mowing brush, and applying prescribed fire can produce various seral stages for an individual ecotype which in turn provide a desired habitat for wildlife as well as other resources.

Ecotype 1 – Shallow Rocky Soil – Bitterbrush/Idaho Fescue

Ecotype 1 occurs in long narrow bands which are typically 60 to 120 feet wide and run for long distances through the planning area. The ecotype has very shallow to shallow soils (less than 20 inches deep) formed from volcanic ash and residuum from a variety of volcanic rocks. Rock content within the soil profile typically ranges from 35 to 60%. Vegetation on these sites consists of predominantly bitterbrush with and occasional scattered juniper and or ponderosa pine.

Ecotype 1: Soil profile representative of Ecotype 1 (*Shallow Rocky Soil – Bitterbrush/Idaho Fescue).*

Existing Condition

- Current vegetative conditions within ecotype one consist of an occasional scattered juniper or ponderosa pine and a shrub cover of old decadent bitterbrush and minor amounts of Idaho fescue and forbs.

Projected Ecological Succession

- Early seral stages for this eco-type may include a fescue/forb ground cover with an occasional open growth ponderosa pine/juniper.
- Climax vegetation appears to be a bitterbrush shrub layer with an occasional open growth ponderosa pine/juniper. Rocky un-vegetated areas also make up a portion of this ecotype.

Figure 5: Ecotype 1 – *Shallow Rocky Soil – Bitterbrush/Idaho Fescue* shown in foreground and to the left in picture. Note the rocky soil surface and lack of trees.

Ecotype 2 – Moderately Deep Soil (Moist Phase) – Ponderosa Pine/Bitterbrush/Idaho Fescue

Like Ecotype 1, Ecotype 2 also occurs in long narrow bands typically 60 to 120 feet wide and running long distances within the planning area. This ecotype has moderately deep soils (20 to 40 inches deep) formed from volcanic ash materials. Ecotype 2 is likely receiving runoff water from the adjacent shallow soils of Ecotype 1. This additional runoff along with a moderately deep soil results in Ecotype 2 growing thick stands of ponderosa pine.

Ecotype 2: Soil profile representative of Ecotype 2 (*Moderately Deep Soil (Moist Phase) – Ponderosa Pine/Bitterbrush/Idaho Fescue).*

Existing Condition

- Current vegetative conditions within ecotype two consist of thick stands of ponderosa pine with most trees typically ranging from 10 to 16 inches dbh. The understory consists predominantly of Idaho fescue with some bitterbrush. The thick stands of trees may be shading out the bitterbrush in these areas.

Projected Ecological Succession

- Due to the high soil moisture and moderately deep soils in these areas this ecotype appears to have a variety of potentials for managed seral stages. One of these seral potentials is the ability of the site to grow and maintain thick stands of ponderosa pine.
- Climax vegetation would likely consist of a relatively high basal area for the planning area of large diameter ponderosa pine.

Figure 6: Ecotype 2 – *Moderately Deep Soil (Moist Phase) – Ponderosa Pine/Bitterbrush/Idaho Fescue)*. Note the location of Ecotype 2 which is adjacent to the more open Ecotype 1 located in the far left of the picture.

Ecotype 3 – Moderately Deep Soil (Dry Phase) – Ponderosa Pine/Bitterbrush/Idaho Fescue

Ecotype 3 occurs as large landscape blocks within the planning area. This ecotype has moderately deep soils (20 to 40 inches deep) formed from volcanic ash materials. Vegetation consists of an overstory of ponderosa pine with a bitterbrush and Idaho fescue understory.

Ecotype 3: Soil profile representative of Ecotype 3 (*Moderately Deep Soil (Dry Phase) – Ponderosa Pine/Bitterbrush/Idaho Fescue).*

Existing Condition

- Current vegetative conditions within Ecotype 3 consist of uneven aged stands of ponderosa pine with a mature bitterbrush understory.

Projected Ecological Succession

- Managed seral stages for this ecotype may include a variety of shrub size classes including early, mid, and late seral. There is also the potential to manage for an Idaho fescue dominated understory. Hiding and thermal cover may be better managed for in Ecotype 2 rather than Ecotype 3.

Figure 7: Ecotype 3 – Moderately Deep Soil (Dry Phase) – Ponderosa Pine/Bitterbrush/Idaho Fescue).

Ecotype 4 – Shallow/Moderately Deep Soil (Seep Phase) – Ponderosa Pine/Bitterbrush/Idaho Fescue/Ribes

Ecotype 4 is located adjacent to the canyon rims. Soils in this area are shallow to moderately deep and appear to have areas of small seasonal seeps which support a Ribes shrub component in these areas. Other areas within this ecotype are similar to Ecotype 3.

Ecotype 4: Soil profile representative of Ecotype 4 (*Shallow/Moderately Deep Soil (Seep Phase) – Ponderosa Pine/Bitterbrush/Idaho Fescue/Ribes).*

Existing Condition

- Ribes shrubs appear to be competing with other vegetation for limited soil moisture.

Projected Ecological Succession

- Management in this area may include removal of competing vegetation around identified seasonal seeps to promote the growth of desirable species which occur to a limited extent in the area.

Figure 8: Ecotype 4 – Shallow/Moderately Deep Soil (Seep Phase) – Ponderosa Pine/Bitterbrush/Idaho Fescue/Ribes.

Ecotype 5 – Very Shallow to Shallow Soils – Juniper/Bitterbrush/Idaho Fescues
Ecotype 5 occurs on flats and ridgetops, and includes lands known as "scabflats." Soils are very shallow to shallow (10 to 20 inches deep) with large amounts of rock. Soils are variable, but often have a very thin loam to sandy loam surface over a loam to clay loam subsoil. Vegetation on these sites consists of scattered juniper with a bitter brush understory.

Existing Condition

- Current vegetative conditions within Ecotype 5 consist of scattered juniper with a shrub cover of very large old and in some cases decadent bitterbrush along with small amounts of Idaho fescue and forbs.

Projected Ecological Succession

- Soils in this ecotype are not capable of growing ponderosa pine except in relatively small scattered micro sites having deeper soils.
- Early seral stages for this ecotype may include a fescue/forb ground cover with and occasional open growth ponderosa pine/juniper.
- Based on the relatively large size of the current bitterbrush plants currently found within the ecotype. An intermediate seral stage may include a vigorously growing younger bitterbrush understory capable of growing large amounts of forage with areas of scattered juniper.
- Climax vegetation appears to be a larger than usual bitterbrush shrub undestory with scattered juniper.

Figure 9: Ecotype 5 – *Very Shallow to Shallow Soils – Juniper/Bitterbrush/Idaho Fescues*. Note larger than usual size of the bitterbrush.

Ecotype 6 – Moderately Deep Soil (Very Dry Phase) – Ponderosa Pine/Bitterbrush/Idaho Fescue

Ecotype 6 occurs in small narrow bands and pockets within areas of Ecotype 5. These areas are associated with more productive moderately deep soils (20 to 40 inches deep) that occur within and adjacent to the less productive shallower soils. Vegetation on these sites consists of ponderosa pine with an understory of bitterbrush and Idaho fescue.

Existing Condition

- The current vegetative conditions within Ecotype 6 consist of open grown stands of ponderosa pine with an understory of bitterbrush and Idaho fescue.

Projected Ecological Succession

- These are very dry sites and therefore maintenance of the large pine may be enhance by removing understory vegetation and small trees that are competing for limited soil moisture.

Figure 10: Ecotype 6. Moderately Deep Soil (Very Dry Phase) – Ponderosa Pine/Bitterbrush/Idaho Fescue.

Ecotype 7 – Shallow/Moderately Deep Soil (Seep Phase) – Service Berry

Ecotype 7 includes small and somewhat unique areas within the larger landscape of Ecotype 5. Soils in these areas are shallow to moderately deep and appear to have areas of small seasonal seeps that support a service berry shrub component.

Existing Condition

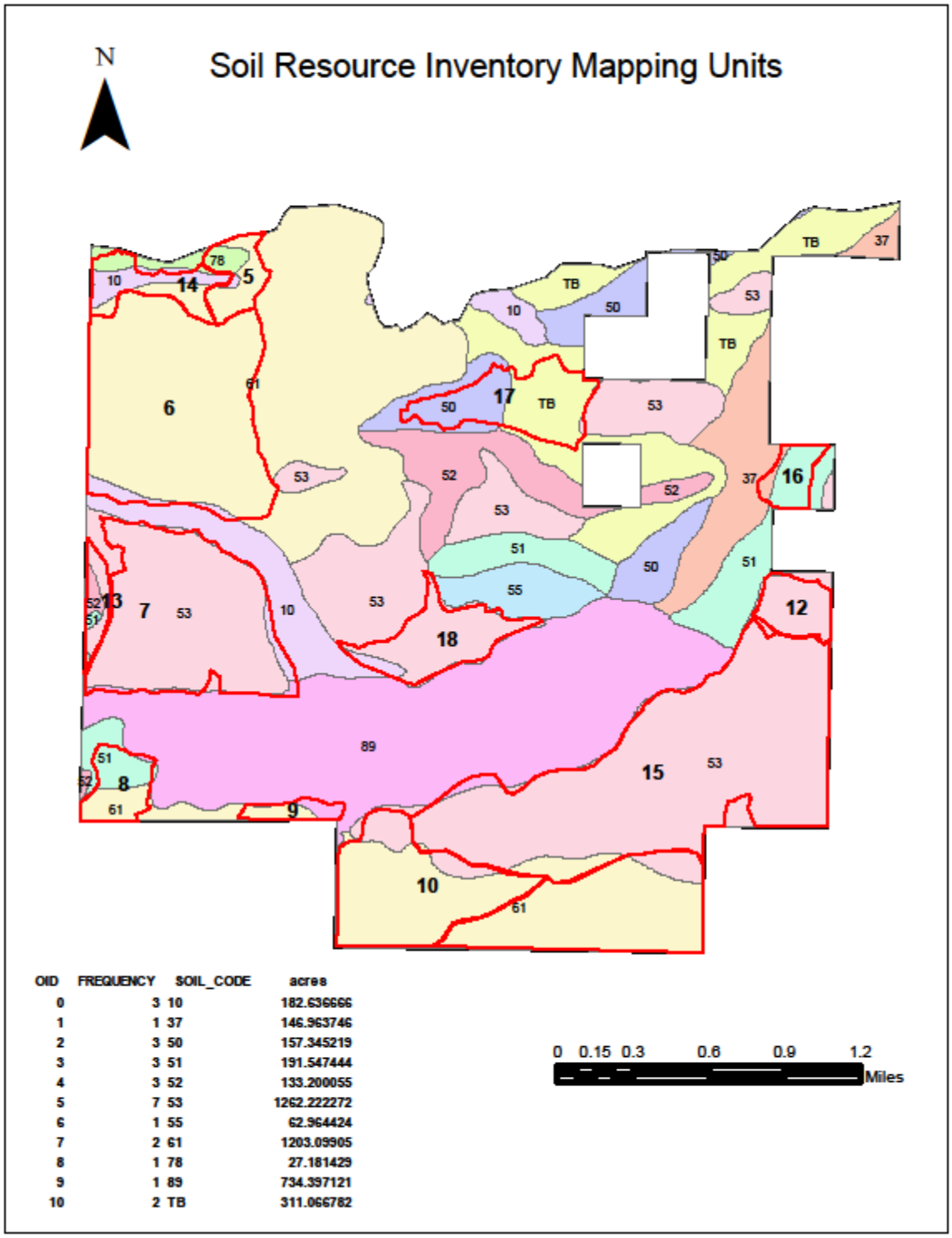
- Service berry shrubs appear to be competing with other vegetation for limited soil moisture.

Projected Ecological Succession

- Management in this area may include removal of competing vegetation around identified seasonal seeps to promote the growth of desirable species that occur to a limited extent.
- These areas may also be enhanced by building exclosures that limit access and browsing by wildlife.

Figure 11: Ecotype 7 – Shallow/Moderately Deep Soil (Seep Phase) – Service Berry

Figure 12. Soil Mapping Units



OID	FREQUENCY	SOIL_CODE	acres
0	3	10	182.636666
1	1	37	146.963746
2	3	50	157.345219
3	3	51	191.547444
4	3	52	133.200055
5	7	53	1262.222272
6	1	55	62.964424
7	2	61	1203.09905
8	1	78	27.181429
9	1	89	734.397121
10	2	TB	311.066782

Sensitive Soil Types
Criteria for identifying soils that are sensitive to management are described in the Deschutes NF Land Resource Management Plan (LRMP) (Deschutes LRMP Appendix 14, Objective 5). Based on these criteria none of the soils within the Lower Fly Creek planning area were identified as sensitive soil types.

DYNAMIC SOIL QUALITY

Existing Condition of the Soil Resource
The current condition of soil within the Lower Fly Creek Project area is directly related to soil porosity and the quantity and quality of surface organic matter within the planning area (Powers and Avery 1995). Ground disturbing management activities (i.e. timber harvest, road building, recreation) have caused some adverse changes to soil quality in previously managed areas, especially where mechanical disturbances removed vegetative cover, displaced organic surface layers, or compacted the soil.

ACE Model (Action/Change/Effect)
Forest thinning and fuel reduction treatments have the potential to cause soil disturbance and in turn affect the long term sustainability of forest ecosystems. The long term sustainability of forest ecosystems depends on the productivity and hydrologic function 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 surface organic layers or reduce soil porosity through compaction. Detrimental disturbances can reduce the soils ability to supply nutrients, moisture, and air that support soil microorganisms and the growth of vegetation. The biological productivity of soils also relates to the amount of surface organic matter and coarse woody debris retained or removed from affected sites. Therefore, an evaluation of the potential effects on soil productivity is essential for integrated management of forest resources.

Magnitude of Disturbances (Extent/Distribution/Degree/Duration)
Effects of soil disturbances on site productivity or hydrologic function of watersheds is dependent on the extent, distribution, degree and duration of the disturbance (Froehlich, 1976; Snider and Miller, 1985; Clayton et al., 1987; Seybold et al., 1999). Extent refers to the amount of land surface occupied by the disturbance expressed as a percentage of a specified area. Distribution of soil disturbance within a management area may likely be more important than the actual estimated extent. The distribution of a soil disturbance can occur as small evenly disturbed polygons, or in large polygons in one or a few locations and that can have very different effects on the soil's ability to function. Degree refers to the amount of change in a particular soil property such as soil porosity, bulk density, or strength and the depth to which that change occurs. And the duration of a disturbance is the length of time disturbance effects persist.

Extent, distribution, and in some instances, degree of disturbance can be mitigated by imposing management constraints such as limiting season of operation, spacing of skid roads and trails, and number of equipment passes (Froehlich, 1976). Degree and duration of effects are largely determined by inherent soil properties that influence resistance to, and ability to recover from, disturbance (Seybold et al., 1999). In some cases soil restoration activities are performed to shorten the duration of soil impacts. An example of a soil restoration activity would include subsoiling of compacted soils to accelerate their recovery (Powers et al., 1999).

Bounding Spatial and Temporal Changes within the Zone of Influence

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 its feasible unit for sampling and evaluating" (FSM2520 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 and thus are defined as the "zone of influence." Thus, the discussion of soil effects and soil quality standards will be focused on the units proposed for treatments.

Assumptions

Quantitative analyses, literature reviews and professional judgment were used to evaluate the issue measures by comparing existing conditions to the anticipated conditions which would result from implementing the proposed actions. 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. Also considered were the effectiveness and probable success of implementing the management requirements, mitigation measures, and Best Management Practices (BMPs) which are designed to avoid, minimize or reduce potentially adverse impacts to soil productivity.

Soil Issues and Measures

Issues are used to formulate alternatives, prescribe mitigation measures, and analyze the environmental effects of management activities. Analysis issues regarding the Lower Fly Creek Project were originally identified by the Interdisciplinary Team (IDT) and emphasized by the public during scoping. Although the soil productivity issue was not used to formulate and alternative, plans for projects must include provisions for mitigation of ground disturbances where activities are expected to cause resource damage that exceed Regional and LRMP standards and guidelines.

Issue Statement: Soil Productivity and Proper Hydrologic Function

The proposed use of ground based equipment can potentially increase the amount and distribution of detrimental soil conditions within the individual activity areas proposed for mechanical treatments. The removal of trees from activity areas and application prescribed fire can potentially cause adverse changes in organic matter levels.

Issue Measures:

1. Change in extent of detrimental soil conditions following proposed harvest and mitigation treatments within the individual activity areas proposed for mechanical treatments.
2. Amount of coarse woody debris (CWD) and surface organic matter that would likely be retained to protect mineral soil from soil erosion and provide both short and long term nutrient supplies for maintaining soil productivity on treated sites.
3. The probable success in project design and implementation of management requirements and mitigation measures that would be applied to minimize adverse impacts that would alter the soils ability to function in a desirable manner.

The existing condition of the soil resource was initially described in relation to each of the soil issues measures listed above.

Measure #1: Detrimental Soil Disturbance

Natural Disturbances

There is currently no evidence of detrimental soil conditions from natural disturbance events within the Lower Fly Creek planning area. No recent large wildfires have occurred within the planning area. Although fires have occurred in the past enough time has passed since their occurrence that existing vegetation and forest litter are providing adequate sources of ground cover to protect mineral soil from water and wind erosion. Therefore, natural soil disturbances were not included as existing sources of detrimental soil conditions within any of the activity areas proposed for this project.

Management Related Disturbances

The extent, distribution, degree and duration of compacted soil can vary with the size and type of equipment used for forest vegetation management, volume and type of material being removed, frequency of entries, soil type and the soil conditions when the activity takes place (Froehlich 1976, Adams and Froehlich 1981, Gent et al. 1984, Snider and Miller 1985, Clayton et al. 1987, Miller et al. 1986, Page-Dumroese 1993). Soil monitoring results on local landtypes and similar soils have shown that from less than 5 to 30 percent of the unit area can de detrimentally disturbed by ground-based harvest systems depending on types of equipment used, harvest prescriptions, and soil conditions at the time of harvest (Deschutes Soil Monitoring Reports, 1995, 1996, 1997, 1999, 2005 and 2006).

The primary sources of detrimental soil conditions are associated with the transportation systems used for timber harvest and yarding activities. Temporary roads, log landings, and primary skid trails were constructed and used to access individual harvest units of past timber sales. Most project related impacts to soils occurred on and adjacent to these heavy use areas. Mechanical disturbances include the removal of vegetative cover, displacement of organic surface soils, or compaction of the soil. Research studies and local soil monitoring have shown that soil compaction and soil displacement account of the majority of detrimental soil conditions resulting from ground based logging operations (Page-Dumroese 1993, Geist 1989, Powers 1999, Deschutes Soil Monitoring Reports).

Within the last decade limited areas within the planning area have been treated. Treatments have included the mowing of brush and the use of prescribed burning to both reduce fuels and provide a forest and meadow structure that will be more resistant to wildfires. Soil condition assessments were conducted for a representative sample of past activities that include the following general prescriptions; partial removal harvest. Qualitative assessments of soil disturbance were made by establishing line transects and recording visual evidence of soil disturbance within previously harvested areas (Howes et al. 1983; Craigg and Howes 2005). Detrimental soil compaction was the primary disturbance category observed where equipment operations occurred on main skid trail systems, log landings, and existing roads.

Shovel probing was used to assess soil compaction using resistance to penetration as a measure. Soil displacement, as defined by FSM 2521.03, was more difficult to distinguish due to the establishment of native vegetation and the accumulation of forest litter. Observations suggested that equipment turns or movement generally caused more mixing of soil and organic matter than actual removal form a site.

Measure #2: Coarse Woody Debris (CWD) and Surface Organic Matter
The effects of management activities on soil productivity as well as other desired soil functions also depend on the amount of coarse woody debris (CWD) and surface organic matter retained or removed on affected sites. Due to the historical frequent fire occurrence within the ecological types in the planning area, there most likely were not large amounts of CWD historically. Observations of prescribed burns indicate that recruitment of CWD is a significant process for maintaining adequate levels of CWD for desired soil functions. Prescribed fires commonly burn CWD on the ground while recruiting new materials through the killing of some trees as well as causing dead standing trees to fall to the ground. Observations indicate that through these processes CWD is maintained at an adequate level in areas of prescribed burns.

A balance between fuel management objectives and ensuring adequate amounts of CWD 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 of CWD per acre on mixed conifer 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.

Conserving surface litter (i.e., organic materials such as pine needles, twigs and branches less than 3 inches in diameter) is also important for protecting mineral soil from erosion, buffering the effects of soil compaction, and supplying nutrients that support the growth of vegetation and native populations of soil organisms. The management goal is to provide a balance between fuel management objectives that will reduce the risk of soil

impacts that may result from wildfire and the maintenance of enough surface litter to maintain soil functions.

Measure #3: Project Design and Mitigation
Cumulative levels of existing and predicted amounts of new soil disturbance need to be considered to determine whether soil quality standards will be met following project implementation. For activity areas that have already been impacted by previous management, project plans need to include options for avoiding, reducing, and mitigating adverse impacts for project activities to meet soil quality standards (see Mitigation Measures and project Design Criteria).

Management Direction
The Deschutes Land and Resource Management Plan (LRMP) specifies that management activities are prescribed to promote maintenance or enhancement of soil productivity potential following land management activities (Forest Plan page 4-70, SL-1 and SL-3). Forest-wide standards and guidelines ensure that soils are managed to provide sustained yields of managed vegetation without impairment of the productivity of the land.

When initiating new activities:

> 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).
>
> 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 new improvement in soil quality.

Standard and Guideline (SL-4) also 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.

In addition to the LRMP standards and guidelines, the Pacific Northwest Region developed soil quality standards and guidelines that limit detrimental soil disturbances associated with management activities (USDA 1991). This Regional guidance supplements LRMP 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 Soil Compaction in volcanic ash/pumice soils is an increase in soil bulk density of 20 percent, or more, over the undisturbed level.
Detrimental Soil Puddling occurs when the depth of ruts or imprints is six inches or more.
Detrimental Soil 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 (USDA 1991) provides policy for planning and implementing management practices which maintain or improve soil quality. This Regional guidance is consistent with LRMP interpretations for standards and guidelines SL-3 and SL-4 that limit the extent of detrimental soil conditions within activity areas.

Target Landscape Condition
Primary management goals for this landscape are described in the Lower Fly Creek project Purpose and Need statement. Management goals for the soil resource are to maintain or enhance soil conditions at acceptable levels which allow the soil to function in a desirable manner. The extent of detrimental soil disturbances will be minimized through the application of management requirements and mitigation measures designed to minimize, avoid or eliminate potentially significant impacts, or rectifying impacts in site specific areas by restoring the affected environment. The functioning of the soil is ensured by management prescriptions that retain adequate supplies of surface organic matter and coarse woody debris without compromising fuel management objectives and the risk of soil damage from large scale stand replacement wildfire.

Environmental Consequences

Introduction
Information about the proposed action (EA, Alternative Descriptions) was used in conjunction with the location of activities to analyze the potential effects on the soil resource. 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. These analyses also considered the effectiveness and probable success of implementing the soil mitigation and resource protection measures which are designed to avoid, minimize or reduce potentially adverse impacts to soil productivity.

Important Interactions
The proposed management activities include commercial and non-commercial thinning of forest stands combined with fuel reduction treatments to reduce stand densities and

hazardous fuels. Types of mechanical harvest equipment used in the thinning operation vary with the types of trees being removed. Thinning would include predominantly tress in the smaller diameter class. This may be accomplished manually using chainsaws or with the use of specialized low ground pressure machinery. Low ground pressure machinery would only be allowed to make a limited number of equipment passes to transport material to existing roads or other disturbed sites for use as firewood or processing wood fiber. Both hand piling and mechanical piling of slash may occur. Mechanical slash piling would be limited to working off of existing trails. Management activities also include mechanical shrub and small tree treatments (mowing or mastication) and the use of prescribed fire to reduce fuel loadings and treat the shrub layer.

Soil condition assessments for similar soils and types of harvest equipment, research references, local monitoring reports, Lower Fly Creek project field surveys and observation were used to predict the potential extent, distribution, degree, and duration of detrimental soil disturbance associated with this project proposal (Deschutes Soil Monitoring Reports 1996, 1997, 1999, 2005 and 2006). Estimates for predicted amounts of detrimental soil conditions 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. Since the same types of mechanical treatments are proposed on similar landtypes and ash influenced soils, the nature of the effects to the soil resource is similar for project activities that use ground based equipment to accomplish management objectives.

A combination of treatments including thinning trees from below, mechanical treatment of small trees and brush, and prescribed burning would be used to reduce the fuel loading in the planning area. Most of the slash generated from commercial harvest would be ether hand piled or machine piled and burned on log landings and/or main harvester trails. Machine piling on temporary roads or main skid trails would have a minimal effect on the overall extent of detrimentally disturbed soil because equipment would operate off the same logging facilities used during yarding operations. The same designated trail systems would be used as primary travel routes. The use of specialized equipment such as tracked excavators with grapple arms and other low ground-pressure machines are capable of accumulating woody materials without moving appreciable amounts of topsoil into slash piles. Monitoring of these types of operations on similar soils on the District indicate that impacts would not exceed soil standards and guides (Craigg and Howes, 2005).

Mechanical treatment of brush and small trees (mowing and mastication) would not cause detrimental soil displacement and increases in soil bulk density are inconsequential. The primary factors that limit soil compaction are the low ground pressure of the tractor and mowing heads, the limited amount of traffic (one equipment pass), and the cushioning effect of surface organic matter. These activities have been monitored in the past, and results show that increases in soil displacement and compaction do not meet the criteria for detrimental soil conditions (Soil Monitoring Report, 1997).

Prescribed fire would be used to reduce fuel accumulations in some of the activity areas proposed for mechanical harvest and non-commercial thinning as well as other activity areas where prescribed burning would be used exclusively to treat the shrub and grass layer and reduce natural fuels. Prescribed burning activities are conducted at times and under conditions that maximize benefits while reducing the risk of resource damage. The degree of soil heating depends upon fuel type (grass, brush, trees), fuel density, nature of the litter and duff layers (thickness, moisture content), and burn conditions at the time of ignition. For the treatment areas proposed with this project, natural fuel accumulations consist mainly of fine fuels (i.e., decadent brush, tree branches, and needle cast litter) that typically do not burn for long duration and cause excessive soil heating. Therefore, it is expected that there would be no detrimental changes in soil properties from prescribed burning activities in timber stands because soil moisture guidelines would be included in burn plans to minimize the risk for intense ground-level heating.

meet fuel and visual management objectives

(Graham et al., 1994). The successful implementation of these proposed activities would likely result in beneficial effects by reducing fuel loadings and wildfire potential as well as increasing nutrient availability in burned areas.

In most cases existing roads and other existing fuel breaks would be used to effectively control the spread of fire within treatment units. The extent of disturbed soil would be limited to the minimum necessary to achieve fuel management objectives.

Under the proposed action, soil restoration treatments may be applied with a self-drafting winged subsoiler to reclaim and stabilize detrimentally compacted soil on specific roads and some of the primary skid trails and log landings following post-harvest activities (Craigg 2000). Additional treatment options for improving soil quality on disturbed sites include redistributing topsoil in areas of soil displacement damage and pulling available logging slash and woody materials over the treated surface.

Some of the soils within the project area are well suited for tillage treatments due to their naturally low bulk densities and the absence of rock fragments within soil profiles. These sandy-textured soils have little or no structural development within the principal root development zone (4 to 12 inches in depth) where changes in soil compaction (bulk density) are assessed according to Regional direction (FSM 2521.03). Although equipment traffic during harvest operations can decrease soil porosity on these soil materials, compacted sites can be mitigated physically by tillage with a winged subsoiler (Powers, 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). Subsoiling treatments have been implemented with good success due to the absence of rock fragments on the surface and within soil profiles. 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 because the equipment is designed to allow adequate clearance between the tool bar and the surface of the ground for allowing smaller logging slash to pass through without building up. Any mixing of soil and organic matter does not cause detrimental soil displacement because these materials are not removed off site. 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.

Although the biological significance of subsoiling is less certain, these restoration treatments likely improve subsurface habitat by restoring the soils ability to supply nutrients, moisture, and air that support soil microorganisms. Research studies on the Deschutes National Forest have shown that the composition of soil biota populations and distributions rebound back toward pre-impact conditions following subsoiling treatments on compacted skid trails and log landings (Moldenke et al., 2000). The subsoiling specialist and trained crew members work with the equipment operator to identify locations of detrimentally compacted soil. Implementation and effectiveness monitoring is then conducted on treatment areas to assure that soil resoration objectives have been met.

Direct, Indirect, and Cumulative Effects

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. No Action - Ecological Trends

Measure #1: Detrimental Soil Disturbance
Under the No Action the management activities proposed in this document would not take place. No additional land would be removed from production to build roads or logging facilities for harvest and yarding operations. There would be no cumulative increase in detrimental soil conditions above existing levels. Although disturbed soils would continue to recover naturally from the effects of past management, the current extent of detrimental soil conditions would likely remain unchanged for an extended period of time.

Soil productivity would not change appreciably unless future stand-replacing wildfires cause intense ground-level heating that results in severely burned soils. Detrimental changes to soil properties typically result from extreme surface temperatures of long duration, such as the consumption of large diameter logs on the forest floor. Although hazardous fuels have been reduced in some previously managed areas, fire exclusion has resulted in undesirable vegetation conditions and excessive fuel loadings in other portions of the project area (see Fire/Fuels Section). Alternative 1 would defer fuel reduction opportunities at this time.

If a large amount of fuel is present during a future wildfire, soil temperatures can remain high for an extended period of time and excessive soil heating would be expected to produce detrimental changes in soil chemical, physical, and biological properties. Severe burning may cause soils to repel water, thereby increasing surface runoff and subsequent erosion (Robichaud et al. 2005). The loss of protective ground cover would also increase the risk for acelerated wind erosion on the loose, sandy textured soils which are widespread throughout the project area.

Under Alternative 1 (No Action), the extent of detrimental soil conditions would not increase above existing levels because no additional land would be removed from production to build temporary roads and logging facilities. The effects of past and current management activities were previously described under Existing Condition of the Soil Resource. The primary sources of detrimental soil conditions from past management are associated with existing roads and ground-based logging facilities which were used for previous timber management activities.

Measure #2: 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. In forested areas, coarse woody materials will continue to increase through natural mortality, windfall, and recruitment of fallen snags over time. 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 wild land fires which may completely consume heavy concentrations of fuel and ground cover vegetation. High-to-extreme fire hazard and potential for excessive soil

heating exists when downed woody debris exceeds 30 to 40 tons per acre (Brown et al., 2003). 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. Over time, burned areas would have increased levels of CWD as fire killed trees are recruited to the forest floor.

Measure #3: Project Design and Mitigation
Under Alternative 1, there would be no cumulative increase in detrimental soil conditions from the proposed management activities. Implementation of project design criteria and mitigation measures would not be necessary.

Alternative 2. Proposed Action

Direct and Indirect Effects
The Proposed Action is designed to reduce the potential for intense wildfires and their rates of spread and restore desired vegetation conditions by implementation of commercial and non-commercial tree thinning and a combination of various fuel reduction treatments. The nature of the effects to the soil resource has already been described under “Important Interactions” in the Environmental Effects section.

Measure #1: Detrimental Soil Disturbance
The use of ground-based equipment for vegetation management treatments would increase the amount and distribution of soil disturbance within the proposed activity areas. The development and use of temporary roads, log landings, and trail systems are the primary sources of new soil disturbance that may result in adverse changes to soil productivity. Most soil impacts would occur on and adjacent to heavy-use areas where multiple equipment passes typically cause detrimental soil compaction. Mitigation and resource protection measures would be applied to avoid or minimize the extent and distribution of soil disturbance in random locations between main skid trails and away from log landings.

Specialized equipment with lower grown pressures than harvest equipment which has been used in the past, are being used increasingly in these types of thinning operations. One type of equipment is the harvester forwarder machinery. This equipment typically has a cutting head mounted on a 30 foot boom. This allows the harvester to cut and process materials while making parallel passes across the harvest unit at a spacing of approximately 60 feet. Harvested materials are positioned so they can be reached from alternate harvester trails by the forwarder machine. This results in two types of trails within the harvest unit (1) those that been driven across only one time by the harvester (ghost trails) and (2) trails that have been driven across by the harvester followed by the forwarder (harvester-forwarder trails). Because trees area limbed and toped at the time of felling there are no landings within the harvest unit. Once the forwarder has collected harvested materials they are piled next to a haul road prior to loading on log trucks. Soil monitoring of this type of operation has shown that soil disturbances resulting from equipment operation are not to a degree which would be considered detrimental (Craigg and Howes 2005).

A second type of harvest operation which is being used increasingly in this type of thinning is the use of "all season vehicles" (ASV's). These machines are much smaller than most other types of equipment and work well when small diameter (8 inch diameter at base height) trees are removed. Again, soil monitoring of this type of operation has shown that soil disturbances are not to a degree which would be considered detrimental.

Non-commercial thinning by hand felling small-diameter trees with chainsaws would not cause additional soil impacts because machinery would not be used for yarding activities. Mechanical shrub and slash treatments would be accomplished using low ground-pressure machinery and soil disturbances from these activities are not expected to qualify as a detrimental soil condition.

The depth of compaction from only one or two equipment passes would not reduce soil porosity to levels that would require subsoiling mitigation to restore soil physical properties. On gentle to moderately sloping terrain, the maneuvering of equipment generally does not remove soil surface layers in large enough areas to qualify as detrimental soil displacement (FSM 2520, R-6 Supplement). The dominant sandy-textured soils within the project area are not susceptible to soil puddling damage due to their lack of plasticity and cohesion. Prescribed underburns in timber stands are conducted under carefully controlled conditions that maximize benefits while reducing the risk of resource damage.

Table 3-27 displays existing and predicted amounts of soil disturbance in acres and percentages for the project area. Surface area calculations (acres) of designated areas such as roads, main skid trails, and log landings were used to determine existing and expected areas of soil disturbance. Again if specialized equipment is used in place of traditional types of logging equipment the amount of detrimental soil impacts would be less than the predicted.

Table 3-27: Existing soil condition based on previous treatments and determined by transecting proposed activity areas and quantifying different soil disturbances.

EA Unit Number	Unit Acres	Existing Detrimental Soil Conditions		Estimated Detrimental Soil Condition after Treatment	
		Acres	Percent of Unit	Acres	Percent of Unit
5	38	1.4	3	3.8	10
6	306	18.3	6	45.9	15
7	262	7.9	3	26.2	10
8	42	1.3	3	4.2	10
9	17	0.5	3	1.7	10
10	163	9.8	6	24.4	15
11	178	10.7	6	26.7	15
12	39	1.2	3	3.9	10
13	22	0.7	3	2.2	10

EA Unit Number	Unit Acres	Existing Detrimental Soil Conditions		Estimated Detrimental Soil Condition after Treatment	
		Acres	Percent of Unit	Acres	Percent of Unit
14	85	5.1	6	12.7	15
15	530	15.9	3	53.0	10
16	28	1.7	6	4.2	15
17	94	2.8	3	9.4	10
18	80	2.4	3	8.0	10
Total	1884	79.7	4	226.3	12

Under the Proposed Action an estimated total of approximately 8 acres of soil is currently disturbed by existing roads, logging facilities, and recreation trails. It is predicted that the direct effects of the proposed harvest and yarding activities would result in the number of acres of soil disturbance to increase to approximately 45 acres of additional soil disturbances associated with trail systems and log landings. Soil compaction would account for the majority of these impacts. The proposed actions would, however, comply with LRMP standards and guidelines SL-3 and SL-4 and Regional policy (FSM 2520, R-6 Supplement No. 2500-98-1) for maintaining or enhancing soil productivity.

Measure #2: Coarse Woody Debris (CWD) and Surface Organic Matter
The measure for CWD and surface organic matter was evaluated qualitatively based on the probable success of implementing appropriate Best Management Practices and recommended guidelines that address adequate retention of these important landscape components to meet soil productivity and wildlife habitat objectives (see Wildlife Section and Chapter 2 Mitigation). 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 desirable biological benefits for maintaining soil productivity without creating an unacceptable fire hazard.

The proposed harvest activities would reduce potential sources of future CWD. However, harvest activities also recruit CWD to the forest floor through breakage of limbs and tops during felling and skidding operations and when processing logs using a harvester forwarder machine. Existing down woody debris would be protected from disturbance and retained on site to the extent possible. Understory trees, damaged during harvest operations, would also contribute woody materials that provide ground cover protection and a source of nutrients on treated sites. It is expected that enough broken branches, unusable small-diameter trees, and other woody materials would likely be available after mechanical thinning activities to meet the recommended guidelines for CWD retention.

Fuel reduction treatments would potentially reduce CWD and some of the forest litter by burning logging slash and natural fuel accumulations. Most of the logging slash generated from commercial harvest would be machine piled and burned on log landings and/or along main skid trails. Post-harvest review by fuel specialists would determine the need for prescribed underburn treatments, especially where fine fuel accumlations

increase the risk of wildfire to unacceptable levels. If prescribed fire is recommended, burning would occur during moist conditions to help ensure adequate retention of CWD and surface organic matter following treatment. Fuel reductions achieved through planned ignitions usually burn with low-to-moderate intensities that increase nutrient availability in burned areas. Low intensity fire does not easily consume material much larger than 3 inches in diameter, and charring does not substantially interfere with the decomposition or function of coarse woody debris (Graham et al., 1994). Any dead trees killed from prescribed burn treatments will eventually fall to the ground and become additional sources of CWD.

A cool-temperature prescribed burn would remove some of the surface litter and duff materials without exposing extensive areas of bare mineral soil. Some of the direct and indirect beneficial effects to the soil resource include: 1) a reduction of fuel loadings and wildfire potential, 2) increased nutrient availability in localized areas, and 3) maintenance of organic matter that supports biotic habitat for mycorrhizal fungi and microorganism populations, 4) increase in available soil moisture due to removal of vegetation in overstocked stands.

Measure #3: Project Design and Mitigation

The management requirements, mitigation measures, and project design elements built into the Proposed Action are all designed to avoid, minimize, or rectify potentally adverse impacts to the soil resource from ground-disturbing management activities. Operational guidelines for equipment use are included in project design elements to provide options for limiting the amount of surface area covered by logging facilities and controlling equipment operations to locations and ground conditions that are less susceptible to soil impacts in random locations of activity areas. Existing logging facilities would be reutilized to the extent possible. The short-term effects of only one or two passes by specialized machinery are not expected to qualify as a detrimental soil condition (Craigg and Howes 2005). If grapple skidders are used they would only be allowed to operate on designated trails. 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. The successful application of these management practices would help lower the estimated percentages of detrimental soil conditions displayed in Table 3-27.

The project area is located on the eastern flanks of the Cascade Mountain Range where frozen ground and during short periods ample snowfall accumulations provide favorable winter logging conditions. By harvesting over frozen ground or compacted snow, the direct and indirect effects to soils is greatly reduced or eliminated. Soil displacement and compaction are not a major concern when equipment is operated under conditions and in locations which are suitable for winter logging activities. There is no potential for soil puddling damage because dominant soils lack plasticity and cohesion, and equipment operations are discontinued during wet weather conditions. Best results are achieved by harvesting over frozen ground (at least 6 inches in depth) or on a compacted snow base (at least 12 inches in depth) if the soil is not frozen. If the compacted snow base begins to melt due to warmer temperatures or rain-on-snow events, harvesting operations would be discontinued until freezing temperatures and/or additional snowfall allows operations to

continue. If project implementation includes the use of winter logging operations, it is anticipated that there would be very little or no visual evidence of soil compaction, rutting, displacement, or loss of protective plant and litter cover within activity areas.

All reasonable Best Management Practices (BMPs) would be applied to minimize the effects of road systems and timber management activities on the soil resource. A variety of BMPs are available to control erosion on roads and logging facilities. The BMPs are tiered to the Soil and Water Conservation Practices Handbook (FSH 2509.22), which contains conservation practices that have proven effective in protecting and maintaining soil and water resource values. The Oregon Department of Forestry evaluated more than 3,000 individual practices and determined a 98 percent compliance rate for BMP implementation, with 5 percent of these practices exceeding forest practice rules (National Council for Air and Stream Improvement, 1999).

Soil moisture guidelines would be included in prescribed burn plans to minimize the potential for intense ground-level heating and adverse effects to soil properties. Under all action alternatives, guidelines for adequate retention of coarse woody debris and fine organic matter are included as management requirements to assure both short-term and long-term nutrient cycling on treated sites.

If the Responsible Official selects an action alternative, the management requirements, project design elements and mitigation measures are to be implemented during and following project activities to meet the stated objectives for protecting and maintaining soil productivity.

Alternative 2. Proposed Action

Cumulative Effects
Measure #1: Detrimental Soil Disturbance
The Proposed Action would cause some new soil disturbances where ground-based equipment is used for mechanical harvest and yarding activities during this entry. The combined effects of current disturbances and those anticipated from implementing the project activities were previously addressed in the discussion of direct and indirect effects. The majority of project-related soil impacts would be confined to known locations in heavy use areas (such as roads, log landings, and main trails) that can be reclaimed through soil restoration treatments. Estimates of existing and predicted amounts of detrimental soil conditions were previously displayed and summarized in Table 3-27. Treatment activity areas are not expected to exceed the LMRP standard of 20 percent determental soil impacts following treatment. If any of the activity areas proposed for mechanical treatments do exceed the LRMP standard of 20 percent detrimental soil conditions soil restoration activities will be implemented to meet the standard.

Mechanical shrub and slash treatments would be accomplished using low ground pressure machinery and soil disturbances from these activities are not expected to qualify as detrimental soil compaction due to the low ground pressure of the equipment, the limited amount of traffic, and the cushioning effect of surface organic matter.

Monitoring results have shown that brush mowing activities would not increase the cumulative amount of detrimental soil conditions within activity areas (Soil Monitoring Report, 1997). Slash disposal by the hand pile and burn method would not cause a measurable increase in detrimental soil conditions because machinery would not be used and burning small concentrations of slash materials is not expected to cause severely burned soil. Fuel reductions achieved through prescribed underburning in timber stands are conducted at times and under conditions that result in low-to-moderate intensity burns that do not cause detrimental changes in soil properties.

Measure #2: Coarse Woody Debris (CWD) and Surface Organic Matter
As previously described for the direct and indirect effects, it is expected that the Proposed Action would comply with the recommended management guidelines that ensure adequate retention of snags, coarse woody debris, and fine organic matter for surface cover, biological activity, and nutrient supplies for maintaining soil productivity on treated sites.

Measure #3: Project Design and Mitigation
Under the Proposed Action, project implementation includes the application of management requirements, project design elements and mitigation measures during and following project activities to meet stated objectives for protecting and maintaining soil productivity. Operational guidelines for equipment use provide options for limiting the amount of surface area covered by logging facilities and controlling equipment operations to locations and ground conditions that are less susceptible to detrimental soil impacts within activity areas.

All reasonable BMPs would be applied to minimize the effects of road systems, fuels and timber management activities on the soil resource. The BMPs are tiered to the Soil and Water Conservation Practices Handbook (FSH 2509.22), which contains conservation practices that have proven effective in protecting and maintaining soil and water resource values.

Forested Vegetation

The section below summarizes the existing condition information, along with the direct, indirect, and cumulative effects as analyzed in the Forest Vegetation Specialist Report for this project (Rankin-Bates, B. 2009). Additional information is contained in the full specialist report available in the project file at the Sisters Ranger District office.

Indicator: Improvements (acres treated) to Forest Health Sustainability and Resiliency

Indicator: Size of Tree Removed.

Indicator: Economic viability, lack of commercial product associated with the project area and cost per acre to complete restoration activities.

Introduction

Types of Forest Vegetation

This section describes the historic and current vegetation in the Lower Fly Creek Project Area, disturbance events that have influenced vegetation, and the potential old-growth. There is also a discussion about the concept of "Range of Variability" and sustainable conditions.

Plant associations were determined through field mapping of the potential natural vegetation using the protocol established by Volland (1985), with input from the Area IV Ecologist and other Forest Specialists including silviculturists, ecologists, botanists and stand exam personnel. The associations and series were then grouped by their climax species, site potential, and temperature and moisture similarities into Plant Association Groups, using the categories listed in the Deschutes WEAVE (Watershed Evaluation and Analysis for Viable Ecosystems) document (USDA, 1994) and are displayed in Table 3-28.

Table 3-28. Plant Association Groups.

Plant Association Group	Acres	Percent
Ponderosa Pine (wet and dry)	4,073	92%
Mixed Conifer Dry	13	<1%
Meadow and Riparian	115	3%
Xeric Shrublands	207	5%
Juniper Woodlands	4	<1%
Total	4,412	100%

Ponderosa pine: Ponderosa pine (wet and dry) plant associations are found over a majority (92%) of the project area. In this plant association group, ponderosa pine is the main seral and climax species, growing in small, even-age groups. Minor amounts of western juniper, lodgepole pine, incense cedar, white fir and Douglas-fir may be present particularly in the ecotones between the juniper woodland, mixed conifer and riparian plant associations. Ponderosa pine is the dominant species across this plant association, however, due to adjacent seed sources and protection from fire, incense cedar, fir and lodgepole pine is increasing adjacent to the mixed conifer and riparian plant associations and western juniper is increasing in the eastern portion of the project area.

Mixed Conifer (Wet and Dry): Mixed Conifer plant associations, where the dominant climax species is grand fir/white fir comprise less than 1 percent of the Lower Fly Creek Project Area. These plant associations are found primarily in the higher elevations on the west portions of the project area. The majority of the acres in these plant associations are dominated by early seral species such as ponderosa pine and lodgepole pine with minor amounts of late seral species such as incense cedar, white/grand fir, Douglas-fir and Engelmann spruce.

Xeric Shrublands and Juniper Woodlands: These types are found on approximately 5% of the project area. These types are found on the eastern and southern portions of the project area where there is less moisture. Vegetation in these areas is generally comprised of bitterbrush and sagebrush with an overstory of western juniper.

Riparian: This type is found on approximately 3% of the project area and is found in the interface between terrestrial and aquatic ecosystems. This interface is primarily associated with streams and springs. These are the plant associations were plants that are dependent on a year-round or nearly year-round source of water are found; consequently, vegetation in these plant associations can be very diverse.

Historic Condition of Vegetation

The forested area within the Lower Fly Creek project ranges from dry mixed conifer at the western edge to western juniper/grasslands on the eastern edge of the project. The majority of the area is comprised of a ponderosa pine forest type. The stands are predominately comprised of naturally regenerated, second growth ponderosa pine from seedlings to middle growth (around 8-14 inches), with lesser amounts of incense cedar, Douglas-fir, white fir and western juniper. Typically, major disturbances in these plant associations are infrequent. Fires in this plant association tend to be of low intensity and have a short return interval (generally between 5-15 years). Historically, bark beetles were probably the initial agents of disturbance, creating small openings and adding to surface fuel accumulation as the infected trees break down and fall. When surface fires encounter these patches of heavier fuels, the resulting fire is more intense and creates a seedbed consisting of bare mineral soil with reduced competition. Within this plant association group seral forest vegetation during historical disturbance regimes was principally ponderosa pine.

Periodic low intensity surface fires thin the established regeneration and maintain an open forest structure. Douglas-fir, white fir, incense-cedar and other fire intolerant species may be able to occupy the site but are usually unable to tolerate the frequent fire intervals. Within the Lower Fly Creek project area the consequences of past fire exclusion has resulted in incense-cedar and fir establishment outside of its historical range. Additionally, with the removal of fire as a thinning agent, ponderosa pine regeneration has accelerated to an overstocked condition throughout most of the stands.

Change is an integral part of Eastside forest ecosystems. Disturbance events, such as fire, insect and disease create and maintain a shifting mosaic of landscape patterns. The foundation of the ecosystem and wildlife standard direction is the concept of historical range of variability (HRV). This concept compares the relative abundance of existing species and structural stages of forested stands in a watershed to what would have been sustained if natural disturbances had been the dominant factor that had shaped the landscape. Historically, if natural disturbance regimes had continued in the Lower Fly Creek project planning area, the majority of the acreage would have been in the Late Old Structural stage (LOS).

Stands within the Lower Fly Creek project area are mid-seral structure and are not late and old structure (LOS) as described under the Eastside Screens (structural stages 6 and 7). Interim direction for stands outside Late Old Structure is to maintain or enhance LOS components in stands subject to timber harvest. Vegetative structure that does not meet LOS conditions is to be manipulated in a manner that moves toward these conditions. Open, park-like conditions are to be maintained where they occurred historically and the development of large diameter, open canopy structure is to be encouraged. Encroachment of the fire intolerance species such as white fir, incense-cedar and Douglas-fir combined with the overstocked condition of the ponderosa pine component are indicators that the project area is outside of its HRV with respect to species

composition, structure and density. Those conditions are reflected in the relative over abundance of multi-story stands and the scarcity of single-story LOS stands.

The preferred stand density management strategy is one that precludes significant insect and disease induced mortality. This strategy is characterized by defining the Upper Management Zone (UMZ) and the Lower Management Zone (LMZ) using the Stand Density Index (SDI) for the desired tree species in that plant association. Widely used in the Western United States, SDI is based on the relationship between tree size and the number of trees per acre (Daniel and others 1979, Reineke 1933). Stand density index, being independent of site quality and stand age, gives silviculturists the ability to compare levels of growing stock, competitive stress, degree of site occupancy and relative growth among stands, regardless of differences in site quality and age. For ponderosa pine, the LMZ is approximately 52 sq.ft. basal area per acre and the UMZ is approximately 78 sq. ft. (Cochran 1994). The current average basal area for the Lower Fly Creek project planning area varies by stand, but generally is approximately 110 sq. ft. basal area per acre.

The ponderosa pine has some western dwarf mistletoe with some pockets of western and mountain pine beetles, and the occasional tree hit by red turpentine beetle (see Existing condition section).

Disturbance Influences on Vegetation

Disturbance Size and Intensity

Disturbances are an important process in continuing the cycle of renewal in most ecosystems, and some amount of mortality from disturbances is desirable, particularly for those species such as woodpeckers that are associated with snags. However, there has been an important change in the type of disturbances that are now affecting this ecosystem. The primary historic disturbance was frequent, low-intensity fire, which helped maintain stable ecosystem functions and old growth characteristics in the ponderosa pine plant associations that dominate the Lower Fly Creek project area. Other important historic disturbance agents in the project area were western pine beetle and western dwarf mistletoe. In general, historical disturbances in the Lower Fly Creek project area caused mortality from single trees to small groups of trees and rarely, larger patches. This resulted in the important, though minor, structural elements of diseased, dead, damaged and down trees. Many species (wildlife, plant, insect, fungi, microorganisms, etc.) have evolved with the historic cycles and scales of disturbance and successional patterns.

The current primary types of disturbances on the Sisters Ranger District are uncharacteristic wildfire (less frequent, moderate to high severity) and insects and diseases, primarily bark beetles and western dwarf mistletoe. This change may result in fluctuations in habitat conditions more extreme than historic levels for this forest, with potential loss of important habitat elements, such as larger long-lived trees, canopy cover, large snags and down wood (Graham et al., 1999). In addition, there may be a trend of slower recovery of the system, partly due to the effect of high intensity wildfires on soil productivity. The result is a greater impact on those species which have adapted to dense

habitat conditions, while it may benefit some early seral species, which can tolerate extreme disturbances.

This mortality has had the positive effect of moving toward restoring the historic snag component, much of which was removed in harvest activities over the last 50 years. However, it is also indicative of stand conditions that are placing stress on the overstory, and when drought conditions return another wave of mortality would be expected.

Fire

The historical fire regime for the ponderosa pine series, which dominates the Lower Fly Creek project area, has been described by Agee (1993 and 1994). Prior to fire suppression, ponderosa pine forests within the Lower Fly Creek project area experienced frequent, low-intensity surface fires. Frequent fires in the ponderosa pine type maintained surface fuels at fairly low levels, kept understory trees and vegetation at low levels preventing the formation of ladder fuels that could carry fire into the upper canopy. The high crowns and thick bark of mature trees protected them from the low-intensity wildfires common in the ponderosa pine type.

The frequent low-intensity fire regime of the ponderosa pine type led to the most stable landscape pattern of all the eastside forest vegetation types. The historic landscape pattern in the ponderosa pine type was uneven-aged at the landscape scale but even-aged at the stand or group scale that resulted in a landscape of open park-like stands of trees with the understory dominated by herbaceous vegetation. The even-aged patches within the landscape pattern were created when individual trees or small groups of trees died creating gaps in which new even-aged clumps would develop.

Insects and Disease

The roles of insects and diseases as disturbance agents in the forest are very closely tied to vegetation patterns. Factors such as species composition, size structure, and density of forest stands are all very important in determining which agents are likely to be present in the forest, their abundance, and how profound their effect is likely to be on that vegetation. By their actions, forest insects and diseases sometimes alter the vegetative patterns that provided them with suitable habitat, and set the stage for new processes to occur.

The primary insects within the project area include the western pine beetle, mountain pine beetle and pine engraver beetle. Bark beetles prefer old trees in dense stands with low vigor (Eglitis, 1997) and so may present an additional risk to large trees in the project area. Acres above the upper management zone for density are considered imminently susceptible to bark beetles.

The primary disease found in the project area is western dwarf mistletoe. Dwarf mistletoe is widespread across Central Oregon, and a study (DeMars, 1980) on the Deschutes National Forest showed that the parasite could be found in approximately 45% of the ponderosa pine stands, with about 24% of the trees in these stands exhibiting some

level of infection. Based on field surveys, an estimated 10,000 to 13,000 acres of ponderosa pine in the project area are infected by dwarf mistletoe.

Harvest Activities

Records show harvest activities around the Lower Fly Creek project began in the late 1960's, with activities occurring inside the Lower Fly Creek project area up to the early 1980's. In the earlier harvest entries, the larger, higher valued ponderosa pine were typically the preferred species removed using primarily ground based harvest methods. Consequently, the project area has experienced some form of harvest activity and associated ground disturbance. The Lower Fly Creek project area experienced a partial removal in the early 1980's, which removed the majority of the larger ponderosa pine. The majority of these harvest practices did not result in created openings or understocked stands and did not necessitate the need for artificial regeneration. In most harvests, overstory trees were removed leaving a residual understory of adequately stocked smaller diameter trees.

Affected Environment of Vegetation

Within the Lower Fly Creek project planning area the stands currently consists of multi-story ponderosa pine with scattered incense cedar, Douglas-fir, white fir and western juniper. There is a high percentage of seedling/sapling size trees scattered throughout the second growth, with a few residual large ponderosa pine trees distributed throughout the stand. Throughout the stands there are open grown trees surrounded by denser clumps. There are plantations scattered across the western portion of the planning area. As you move east across the project area the forest type transitions from ponderosa pine dominated to stands dominated by western juniper due to the shallow soils and lower annual rainfall.

The area has been delineated into seven ecotypes based on site productivity (see soils report for more information on ecotypes). Ecotypes one through four occur within the ponderosa pine-dominated sites and ecotypes five through seven occur in the dryer, western juniper-dominated sites. Ecotype one is the areas with shallow, less developed soils that are rocky. This ecotype supports few scattered ponderosa pine trees that tend to be older, slower growing. Ecotype two is the areas around ecotype one that appear to get more moisture from water running off the rocks in ecotype one into ecotype two. The soils are deeper and more developed, thus are able to support a higher number of trees,

mainly ponderosa pine with some incense cedar and Douglas-fir. There tend to be dense clumps of trees throughout ecotype two that are growing faster than those in ecotype one.

Ecotype three is more of a stand-alone ecotype that is not influenced by the other ecotypes within the stand. Productivity in ecotype three is somewhere between ecotype one and two. Within this ecotype one sees more open grown ponderosa pine trees with occasional groups which were probably results of seed cashes. It supports more trees per acre than the rocky scabs of ecotype one, but not as many as the moister ecotype two.

The last ecotype is four, which is the area along the rim of the project area. At the rim of the project there is a significant change in slope with rocky cliffs. Along the edge of these cliffs the slope begins to increase which creates a slight increase of moisture within the soil as it moves downhill. This makes this soil slightly more productive than the ecotype one and more like ecotype three with a higher percentage of rock like ecotype one. There is a slight shift in the shrub/forb community in this ecotype.

Ecotypes five through seven are similar in character to ecotypes one through four, only they tend to be shallower and occur in the eastern portion of the project area, supporting mainly western juniper with scattered stringers of ponderosa pine. Ecotype five has very shallow soils with high amounts of rock, occurring on flats and ridgetops, also known as "scabflats." These soils support scattered western juniper with bitterbrush in the understory. Ecotype six occurs in small narrow bands and pockets within ecotype five. Soils in ecotype six are deeper and more productive than those within ecotype five, therefore supporting ponderosa pine with a bitterbrush and Idaho fescue understory. Ecotype seven occurs in small, unique pockets within ecotype five. The soils are shallow to moderately deep and appear to have areas of small seeps that support a service berry shrub component.

Multiple past timber harvest activities have occurred within the project area, mainly in the western portion of the project area. The most recent occurred in 1980 as a partial overstory removal, removing the majority of the overstory trees and leaving approximately 5 pre-settlement, old growth trees per acre. Subsequently, the majority of remaining trees are black bark second growth approximately 75-85 years old. Currently there is an average of about 700 trees per acre and a basal area of 110 square feet, with the majority of the trees being composed of understory regeneration. Ideally there would be a basal area of 40 to 80 square feet, which would put the stands between the upper and lower management zones. Currently the stands are above the upper management zone.

Three species of bark beetles can be found throughout the stand. All of which tend to attack injured, diseased and low vigor trees outside of outbreaks. These trees tend to be in areas that are overstocked. There are occasional clumps of western pine beetle (*Dendroctonus brevicomis*) and mountain pine beetle (*Dendroctonus ponderosae*) within the project area. Some were successful, killing trees and others were unsuccessful where the trees were strong enough to fight off the attacks. These attacks were in areas with clumps of trees that were most likely stressed from being overstocked. There is also an occasional tree attacked by red turpentine beetle (*Dendroctonus valens*), none of which

have resulted in tree mortality. Dwarf mistletoe (*Arceuthobium campylopodum*) has affected the ponderosa pine within the stand. There are varying degrees of infection from a dwarf mistletoe rating (DMR) 1, light infection to a DMR 5, heavy infection. The majority of the dwarf mistletoe infection in the stand is light, but could increase if not treated.

The bitter brush within the stand is at varying seral stages (early, mid and late). However, for the most part it is decadent (late) or suppressed with little obvious regeneration (early). The current bitter brush condition is most likely related to stand density and lack of fire within the stand.

Large decadent bitter brush, combined with increasing bark beetle activity that is causing increased tree mortality, increases fire hazards. Ladder fuels are abundant in the stand which puts the associated old growth at risk of crown fire. Most of the stands do not contain enough trees per acre 21" plus DBH to be considered possible old growth (or LOS).

Forest Structure

Stand Density is a primary factor affecting growth and vigor of forest vegetation, and its resilience to disturbances. Different parts of the project area can support different stand densities, depending, in part, on available water, light, nutrients and soil quality. For instance, forest stands on wetter, more productive sites can usually tolerate higher densities than stands on dry, low productivity sites.

Ponderosa pine is more sensitive to high stand densities than other tree species in the project area. The longer a ponderosa pine remains in overcrowded conditions, the less it is likely to reach 21" or greater diameter. Stump analyses on the Sisters Ranger District revealed that large ponderosa pine trees initially had rapid growth rates (due to little competition) for the first 50 to 100 years and less growth over time as density increased and trees aged.

The "upper management zone" is the stand density threshold above which forest conditions and large tree health are likely to deteriorate (Cochran et al, 1994). Stands that are far above the upper management zone (the point at which tree mortality begins to occur due to competition) are more susceptible to severe disturbances than stands less densely stocked.

Tree Size (measured by the diameter of the trunk at 4.5 feet above the ground) is an indicator of the stage of development of old growth trees. An important structural element in the Lower Fly Creek Project area forests is the large ponderosa pines. Highly valued, both socially and ecologically, there is concern about the potential loss of large trees across the project area. Proposed actions intend to improve the ability for existing large trees to survive, and to create conditions more favorable for the development of future large trees. The proposed action is to thin dense forest stands to reduce the competition stress on remaining large trees, to improve the health and growth of smaller trees so that they may grow into the medium/large tree components sooner, and to reduce

the high fuel levels and ladder fuels. Research shows (Tappenier et al. 1997, and Hall 1998) that low densities are a requirement for development of large "old growth" trees with large branches. It appears that large branches (an important habitat component for several old growth dependent species) can only develop if the tree's bole is exposed to ample light for most of the tree's life. If existing densities are not reduced, it is predicted there would be delayed development of future large trees and a loss of existing large trees due primarily to competition related stress.

Old Growth Structure Large old trees are the key structural components of old-growth forests both for their habitat functions as living trees, and because they contribute to the large snag and down wood component of these forests. Altered successional patterns are working against the long-term survival of these old-growth trees. All growing sites have a fixed quantity of resources and growing space, and as inter-tree competition increases it is usually the large trees that die first (Dolph et. al. 1995, In: Fitzergerald et. al. 2000). It is thought that we may have only a few decades to deal with this situation, or we risk losing the large trees (Fitzgerald, 2002. personal communication). Large trees would be lost at a faster rate at higher stand densities than at lower stand densities.

Recent studies have shown the ability of old growth trees to respond to reductions in density from thinning treatments, indicating an improvement in tree vigor and increased resistance to insects and pathogens. Latham and Tappeiner (2002) measured diameter growth increments of old-growth ponderosa pine, Douglas-fir, and sugar pine in the southern Cascades of SW Oregon. Ponderosa pine basal area growth was significantly greater in the treated stands than in the control stands. Fitzgerald and colleagues (2000) are testing the hypothesis that managed old-growth stands, where density and composition are maintained at historic levels, remain viable longer as old-growth habitat (Genesis Research and Demonstration Area). Stands were treated with thinning followed by underburning. Preliminary results, after 3 years of measurement, indicate that vigor of residual old-growth trees is increasing. A similar study has been initiated in the Whitehorse area of the Lolo National Forest (Hillis, et. al. 2001). The authors anticipate increased growth response of the residual old-growth trees, based on nearby research showing response of 800 year old pine to release from competition by fire.

Based on this research, it is assumed that reducing stand densities would help maintain existing large trees, and provide better conditions for the growth of future large trees.

For this project, possible old growth was measured as stands with sufficient number of trees 21" diameter or greater (in ponderosa pine it would be 13 trees or more per acre greater than 21" diameter, and in mixed-conifer it would be 15 trees per acre that size). No Alternatives would remove any trees 21" diameter or greater, so would not have a direct detrimental effect on the number of large trees. However, all action alternatives remove trees where densities or ladder fuels are high and can indirectly benefit remaining large trees by reducing risk and competition for nutrients and water.

There are several other characteristics of old growth stands (snags, down wood, multiple canopy layers, ground vegetation) that were not measured in this analysis. These other characteristics may be affected by actions that remove or potentially consume old growth elements (e.g., prescribed fire).

Species Composition

An identified objective is to keep species within a healthy range of variability depending on the plant association, specifically referring to the amount of fire intolerant species such as western juniper and white fir in ponderosa pine and mixed conifer plant associations, respectively. Species composition is a factor influencing the risk and stability of forests in the planning area. The mixed conifer plant associations were historically dominated by fire-climax ponderosa pine, which is more resistant to fire, disease, and insects than white fir (Hessburg et al., 1994). A reduction of western juniper and white fir in this project area can help move toward species composition more within the natural range of variability (Graham et al, 1999).

The effects of the alternatives on species composition are difficult to quantify, but in general, the greater the diameter of the trees cut, and the more thinning done (as opposed to use of prescribed fire), the greater the shift will be towards fire-tolerant/adapted ponderosa pine.

Shrubs Shrub species are discussed under Wildlife, in relation to big game habitat.

Disturbance Processes

Disturbance size, intensity and patterns can be affected by the previous factors of forest structure, stand density and species composition, and relate to the sustainability of forest stands over the long-term. Disturbances are an important process in forest ecosystems because they may enhance nutrient cycles and promote diversity of habitat and species. However, the severity of disturbances tends to increase when forest conditions are outside the historic range of variability. Severe disturbances can result in the loss, amount, and quality of old-growth characteristics, such as large trees.

Factors that affect disturbance size, intensity and patterns include severe drought, stand densities, stand structure and species composition. Actions under the Alternative that influences these factors are tree thinning, mowing, and prescribed burning. These actions are disturbances in themselves, and range in severity with thinning and prescribed burning being the most intensive and mowing the least. As with natural disturbances, these actions can both benefit (reduce competition, enhance nutrient cycling, create diversity and mosaics), and impact (compaction, loss of individual habitats, fragmentation) affected stands. However, all are considered less impactive than a severe wildfire or insect and disease epidemic. They also begin to move ecosystem processes back toward the natural range of variability.

The severity of impacts from future disturbances can be reduced, maintaining more resistant species (i.e., ponderosa pine) with prescribed fire, increasing the distribution of single or two storied-stands, maintaining vigor by thinning to lower densities, and making treatment units as large as possible (Brookes, et al., 1987; Wickman, 1992).

For instance, thinning can enhance vigor of ponderosa pine trees, which could aid them in resisting severe impacts from dwarf mistletoe, which is present in many of the stands within the project area and is expected to become a primary disturbance in these stands.

The primary biotic risk agents identified in the project area were bark beetles and dwarf mistletoe. Key measures of the effects of the alternatives on these agents are the following:

> Bark beetle risk reduction is measured in terms of the acres above upper management zone treated with density-reducing treatments (Eglitis 1997).
>
> Dwarf mistletoe risk reduction is measured in terms of the acres of mistletoe infected stands treated with thinning.

Prescribed underburning is not expected to have an effect on these risk factors because it does not typically have an appreciable effect on stand densities in the types of stands where it can be successfully employed (Covington et. al. 1997). With dwarf mistletoe, underburning would reduce the amount of mistletoe in the understory, but would not be an effective treatment to reduce infection and spread because the overstory would still be infected.

It is assumed that reduced stand densities increase vigor and reduces stand susceptibility.

Economics

Factors that can affect economic value are the amount of saw timber versus chip/pulpwood, the volume available for sale, and the costs of required brush disposal and road reconstruction. The market value for pulp and chip is considerably lower than for saw logs, and could deter potential purchasers. It is estimated that a majority of the trees proposed for removal from the project area would not be considered suitable for milling into saw logs, but only suitable for pulp and chips.

This project does not have the same objectives as a traditional timber sale, which primarily would be to offer wood products in the most cost efficient manner. The objectives are wildlife habitat improvement, fire hazard reduction and forest health restoration, or “forest stewardship.” Cost efficiency is desirable, but should not drive the project. Much of the work done on National Forests, other than traditional timber sales, are funded through a variety of means, including appropriated funds, partnerships with other agencies or private entities, and services or stewardship contracts. Those options would be considered as ways to fund the restoration work under this project, as well as through viable timber sales.

There are opportunities to use timber sales to remove material when receipts from sale of the material cover the costs for conducting the timber sale operation. However, since a majority of the trees proposed for removal to meet restoration objectives have very low market value (pulp), a timber sale may not be the most cost efficient way for removing that material. Consequently, alternative funding methods are recommended.

Assumptions regarding values of possible wood products were based on estimated market value in the summer of 2009 for various sizes of ponderosa pine, the primary species to be removed. If the markets go down, the values would be less. The following assumptions were used in appraising the value of products under the different alternatives:

> Logging costs were based on similar recent offerings.
>
> Ponderosa pine would be the primary species harvested.

Hauling costs were based on the haul to Gilchrist, Oregon.

Chip prices were assumed to be $20/ton.

Table 3-29. Average selling value for logs delivered to the mill assuming ponderosa pine is the primary species harvested.

Size (DBH)	Value/MBF
<12”	$200
12” to 21”	$250

Non-Market Values

The preceding economic analysis was presented from the view of resource utilization, where wood-fiber is a market commodity. The economic principles are fairly well understood and are an important consideration in overall project design and resulting consequences.

Another economic aspect of resource management consideration is the values of “ecosystem services.” Ecosystem services can include purification of air and water, generation and preservation of soils and renewal of their fertility, protection of stream channels and banks from erosion during high water, and provision of aesthetic beauty and intellectual stimulation that lift the human spirit. Direct relationships and clear principles for accounting for such things are only beginning to be developed, including how to quantify the value of the forest in its current condition, or the value of standing timber as a form of “natural capital,” the biophysical structure that provides ecosystem services (Hawken et al. 1999).

While some ecosystem services may be on a much larger scale than would be measurably affected by this project (e.g. partial stabilization of climate) some of the proposed actions, on a local-scale, can affect certain ecosystem services, and are discussed under the other resources in this Chapter.

Wildfire Costs

The purpose of the action alternative is to enhance wildlife habitat by restoring historic forest conditions and reducing fire hazard, thus the risk from wildfire. It is important to understand there would be costs associated with impacts from a potential wildfire (to people, property and resources) and related wildfire suppression expenditures. Costs to ecosystem services are described qualitatively under the other sections on effects to resources in this Chapter.

There is a considerable range to suppression costs, and expenditures are dependent on a variety of factors. Assumptions were made that the more fuel that is removed from the landscape, particularly relating to crown bulk densities, the less severe a wildfire would be and the lower the suppression costs. However, there are many factors that affect suppression costs that cannot be determined at this time; including conditions under which a wildfire may burn (wind speed and direction, fuel moistures, terrain, immediate

risks to people, etc.). The average suppression cost should only be used for comparison purposes, and may not reflect actual costs of suppression of a future wildfire in the project area.

The costs for suppressing small wildfires can be significantly greater than the costs for suppressing large wildfires on a per acre basis, but clearly the total costs would be less for small fires than for large ones. It is assumed that firefighters would be better able to control wildfires under the action alternative that reduces surface and ladder fuels and crown bulk densities the most, thus keeping the overall size of wildfires smaller and resulting in lower total costs for wildfire suppression.

Employment

The primary effect on local communities would be in terms of employment provided by preparation, implementation and administration of wildlife habitat improvement, fuel reduction and forest health activities by alternative. The action alternative provides a variety of activities that would require widely varying equipment and skills. The level of benefit to local communities would depend on the capacity of existing contractors residing in the area in terms of skills and equipment, the labor force available to these contractors, the amount of existing work they have under contract, their desire to acquire larger contracts, new contractors seeking opportunities, and other contracting requirements such as programs for small businesses.

The level would also depend on the amount of funding received for activities over the next 5+ years. It is unknown how many and what type of jobs could be created by stewardship contracting opportunities in Central Oregon, or the extent to which they could support or enhance the social well-being and economies of rural communities. However, forest health and fuel reduction employment could help diversify (Committee of Scientists 1999).

Another economic benefit from fuel reduction and forest health activities in the Lower Fly Creek Project area is a supply of wood products to mills in Eastern and Central Oregon and the Willamette Valley. Secondary benefits to employment in the wood products industry could result over the 10+ years during which the project is implemented.

Environmental Consequences

Important Interactions

The issue that relates to size of trees removed is primarily one of social acceptability and debate over whether it is appropriate to harvest trees, and how big those trees should be to meet goals. The information analyzed here does not answer those questions; they relate to choices and tradeoffs that will be addressed by the District Ranger in the Record of Decision for this project. This analysis discloses the predicted effects of tree thinning and harvest on forest health and sustainability.

The factors that are analyzed, and that influence forest health and sustainability are forest/stand structure (i.e., tree size), stand densities, species composition, and disturbance processes. Actions that can affect these factors are the type and amount of vegetation management (e.g. tree thinning and harvesting, prescribed burning, mowing and aspen restoration), and risk of extensive disturbances.

Management activities, which incur costs and generate impacts, are also expected to change the risk and intensity of wildfires and their associated costs and impacts. Cost and benefits associated with reducing the risk of moderate to high severity wildfire were not assigned a dollar value. There would, however, likely be changes in resource values such as increases or decreases in wildlife habitat, recreation use and other ecosystem services, and costs associated with wildfire suppression. Non-market values are also briefly discussed.

Analysis Issue #1: Improvements to Forest Health Sustainability and Resiliency

Would the planned treatments of thinning trees from below and treatments to reduce dwarf mistletoe be effective?

Issue Measures:

Effects of the alternatives on continued risk of losses to insects and diseases, especially the risk of continued loss of old-growth and mature pines to bark beetles

- Acres of thinning to maintain or restore forest health and reduce fire, insect and disease related mortality.

Effects of the alternatives on stand structure and species composition in relation to historic conditions

- Acres of thinning that maintain or accelerated the development of late or old structural stage ponderosa pine habitat.
- Acres of prescribed burning or mowing

Analysis Issue #2: Size of Trees Removed

What size trees should be cut and removed to meet project objectives?

Issue Measures:

Acres of thinning to maintain or restore forest health and reduce fire, insect and disease related mortality.

Analysis Issue #3: Economic Viability

What are the costs and revenues to implementation?

Issue Measures:

Costs and revenues of each alternative.

Alternative 1 No Action – Ecological Trends

Issue #1: Improvements to Forest Health Sustainability and Resiliency

Effects of No Action on Stand Structure and Species Composition in Relation to Historic Conditions

No thinning or prescribed burning or mowing would occur within the project area under the no-action alternative (1). Stand structure and density under the no action alternative would continue to deviate from historical conditions in the following ways:

Stands would continue to be dominated by small trees (<21 in. dbh).

Stand structure of most stands would consist of dense, multi-storied canopies, resulting in large areas of contiguous ladder fuels.

Dead fuel on the surface would continue to accumulate in the form of decadent brush, dead material from insect and disease mortality, limbs, and needles, adding to the fuels that have accumulated since the last burn cycle.

The shift in species composition towards fire intolerant species (western juniper and white fir) would continue with the following effects:

There would be less fire-resistant species on the landscape, and there would be more ladder fuels from the fire tolerant trees in the understory

There would be more shorter-lived trees (i.e., white fir)

There would be more stress on overstory ponderosa pine

There would be an increased risk of future bark beetle outbreaks, which increases the fire hazard over the landscape

Effects of No Action on Continued Risk of Losses to Insects and Diseases, Especially the Risk of Continued Loss of Old-Growth and Mature Pines to Bark Beetles

Stand densities will remain high in areas where they are already high. In areas where they may not already be high they will continue to increase, eventually reaching undesirable levels. High stand densities will result in the overall reduction in tree vigor among all size classes. A reduction in tree vigor will predispose those trees to the various insects and diseases that take advantage of low vigor/weakened trees (e.g., bark beetles and root diseases). The most significant effect of high stand densities will be the gradual loss of the existing historic large-tree component at a rate that is likely to be much faster than if stand densities had been reduced to more sustainable levels.

Under the no action alternative, the large tree component, as well as smaller trees, which represent future large trees, would exhibit low resistance to bark beetle attack, and higher risk of mortality from diseases. With continued competition from understory trees, mortality within the large tree component would be expected to increase. Losses would be especially pronounced under drought conditions. An indirect effect of no action is that the recruitment of large trees would be slowed due to the continued density-related decline in tree growth and vigor. Stands would continue to decline in growth and vigor due to increasing competition and reduced crown development. Risk to insects and disease would continue to intensify. Increased bark-beetle activity would be anticipated with the next drought cycle. Dwarf mistletoe infection would continue to increase in all affected species.

Issue #2: Size of Trees Removed

No trees would be thinned in under the No Action Alternative, except for trees generally 12” diameter or less in plantations (already covered under a separate analysis).

Issue #3: Economic Viability

The main economic ramification of the No Action alternative is that, in the long run, funds that would be spent in the Lower Fly Creek Planning Area would be for emergency fire suppression, and not for treatments that would reduce the potential for large-scale uncharacteristic fires, improve wildlife habitat and restore the historic forest condition. Non-market values, or ecosystem services, would not be directly affected under this alternative; however, there would be an increased risk of impacts to many of the local services due to the current extensive areas at risk of high severity uncharacteristic wildfire, insects and disease. There would be no potential net savings in wildfire-related costs and benefits. See description under Alternative 1 (No Action) under the other resources addressed in this chapter for an understanding of non-market values as they currently exist.

Alternative 2 - Proposed Action

Direct and Indirect Effects

Issue #1: Improvements to Forest Health Sustainability and Resiliency

Effects of Proposed Action on Stand Structure and Species Composition in Relation to Historic Conditions

A total of 1,884 acres (includes 529 acres of western juniper treatments) or approximately 64% or the project area would be thinned, prescribed burned and masticated (e.g., mowed) to reduce tree and shrub density, increase tree size and favor fire tolerant species. Stand structure and density under the proposed action would be moved towards historical conditions in the following ways:

Average stand diameter would be increased, increasing the resistance of the stand to fire. .

Stand structure of most stands would still consist of multi-layered canopies, but large areas of contiguous ladder fuels would be broken up and crown bulk densities would be reduced.

Dead fuel on the surface in the form of decadent brush, dead material from insect and disease mortality, limbs, and needles, would be treated along with activity created fuels

The current trend, in some portions of the project area, in species composition towards fire intolerant species (western juniper and white fir) would be abated with the following effects:

More fire- and disease-resistant species would occupy the landscape, and ladder fuels in the form of shade-tolerant trees in the understory would be reduced

Less fire intolerant species (white fir and western juniper) would occupy the landscape

There would be a reduction in competitive stress on overstory ponderosa pines.

Effects of Proposed Action on Continued Risk of Losses to Insects and Diseases, Especially the Risk of Continued Loss of Old-Growth and Mature Pines to Bark Beetles

Management practices aimed at maintaining vigorously growing stands can considerably reduce the potential impact of insect and disease agents and enhance forest health (Helms 1994). Under the proposed action, thinning treatments would reduce competition stress on larger, older ponderosa pine by thinning from below. The small trees and western juniper represent a considerable component of competition with the older overstory pines. Reducing the small tree component and western juniper around older pines would provide needed growing space to keep overstory trees growing at rates that would allow them to be resistant to bark beetles.

Under the proposed action (alternative 2) approximately 56% of the treated stand acres would be thinned to densities that are below the upper management zone.

Dwarf mistletoe in ponderosa pine is scattered throughout the Lower Fly Creek project area. By thinning from below and favoring the least dwarf mistletoe infected trees, considerable progress can be made in reducing the incidence of this disease across the project area. Additionally, pruning of dwarf mistletoe infected trees within and adjacent to existing plantations will help reduce the future spread of this disease into plantations. By reducing the amount of dwarf mistletoe across the project area, will help meet project objectives of reducing fire hazard and improving forest health and to maintain and grow large trees.

Issue #2: Size of Trees Removed

Under alternative 2, trees up to 21” dbh could be thinned. This limit has effects to stand densities, species composition, stand structure, dwarf mistletoe infection

and project economics. Discussions of these effects can be found under the other key issues above.

Issue #3: Economic Viability

Non-market values of ecosystem services would be enhanced under the action alternative, though short-term impacts would be expected on many of the services (e.g. visual impacts during the project implementation). See discussion under the other resources in this Chapter for an understanding of effects on relevant local ecosystem services.

The action alternative is analyzed in terms of total costs and total product values. Table 3-30 summarizes the estimated costs of vegetation and fuels treatments. Table 3-31 summarizes the volume and value of products produced. Table 3-32 summarizes the net value (total costs minus total product values). The action alternative has a net value that is "in the red" (costs exceed the value of products), due to the large number of acres identified for prescribed burning, mowing, plantation thinning, juniper removal, small tree thinning and other treatments with little or no product value.

The estimated costs of vegetation and fuels treatments are displayed in Table 3-30. The costs of the vegetation and fuel treatments were estimated based on recent treatments in projects on the Sisters Ranger District. Mechanical thinning costs were estimated for thinning/harvesting systems such as a cut-to-length and feller-buncher systems. Hand/mechanical thinning costs were estimated for hand thinning both with and without the use of a small mechanical thinning system such as an ASV or Bobcat with a shear. Hand/mechanical thinning was used for acres with very little potential for product recovery.

The volume and value of products produced is displayed in Table 3-31 by potential sawlog volume and chip/pulp volume. Sawlog volume is displayed based on the potential volume per acre. Mechanical thinning 1 (MT1) acres are where volume/acre are predicted to be greater than or equal to 0.5 mbf (thousand board feet) and are assumed to be where the value of the products harvested will generally exceed the costs to harvest them. Mechanical thinning 2 (MT2) acres are where volumes/acre are predicted to be less than 0.5 mbf and are assumed to be were the value of the products removed will be less than the costs to remove them. These assumptions related to volumes/acre are dependent on the value of the products at the time of removal and the size of the material removed.

Table 3-30. Costs of Vegetation and Fuels Treatments.

Treatment	Cost/Acre	Alternative 2	
		Acres	Cost
Dwarf Mistletoe	$550	400	$220,000
Mechanical Thinning + Fuels Clean-up	$760	1,067	$810,920

Hand/Mechanical Thinning + Fuels Clean-up	$600	816	$489,600
Prescribed Underburning	$200	1,884	$376,600
Masticate (e.g. mowing)	$125	1,884	$235,375
Total			**$2,132,495**

Table 3-31. Product Volumes and Values.

Treatments that produce Sawlogs	**Alternative 2**	
	Acres	**Acres Total Sawlog Volume (mbf*)**
Mechanical Thinning 1 (≥0.5 mbf/ac)	328	328
Mechanical Thinning 2 (<0.5mbf/ac)	739	185
Totals	**1,067**	**513**
Total Log Selling Value		**$117,990**
Treatments that produce chip/pulp	**Acres**	**Chip/Pulp Tons**
Chip/Pulp Material	1,884	9,415
Total Chip Selling Value		**$188,300**
TOTAL PRODUCT VALUE		**$306,290**

*mbf = 1,000 board feet

Table 3-32. Summary of Costs and Values.

Activity	**Alternative 2**
Total Costs	$2,132,495
Total Product Values	$306,290
Net Value	-$1,826,205

Alternative 2 is designed to enhance wildlife habitat within the project area by thinning out stands to improve forest health and allow more light to reach the forest floor increasing the amount and quality of bitter brush. Under Alternative 1 the habitat would remain in the current condition and continue to be degraded as the forest continues to become more dense and overstocked, allowing less light to reach the forest floor, and reducing the amount and quality of bitter brush.

Alternative 2 would reduce crown bulk density and ladder fuels more effectively than Alternative 1. Thus Alternative 2 would be the most effective Alternative for reducing the risk of moderate and high severity wildfire and at reducing the costs of wildfire suppression in treated stands.

Alternative 2 would create local jobs related to treating the landscape as well as supply wood products to mills in Eastern and Central Oregon and the Willamette

Valley. Alternative 1 would possibly create jobs in the event of a wildfire, which would be short term. There would be no wood products produced.

Under Alternative 2 total costs are estimated at $2,132,495 and total product values estimated at $306,290, resulting in an estimated net value of -$1,826,205. Of the 1,067 acres proposed for mechanical thinning, 31% of the acres (328) are mechanical thinning 1 (MT1), and 69% of the acres (739) are mechanical thinning 2 (MT2). Consequently, under Alternative 2, approximately 31% of the acres (MT1) are predicted to yield product values that would exceed harvest costs and approximately 69% of the acres (MT2) are predicted to yield product values that would be less than harvest costs. Alternative 1 would have no products removed for value and no treatment costs other than potential wildfire suppression costs.

Cumulative Effects

Scope of cumulative effects analysis

Analysis of cumulative effects related to forest vegetation is limited to the Lower Fly Creek Project Area, which includes the Flymon Stewardship Demo CE and the Flymon II Stewardship CE area. Vegetation treatments outside the planning area will not have a measurable impact on forest vegetation within the analysis area.

The existing condition of the Lower Fly Creek project described above has been shaped by past actions, natural disturbances such as insect outbreaks and fire, and growth of the trees themselves. Prescribed fire implemented at regular intervals (5 to 15 years) will also be considered a reasonable foreseeable future action. The fuels report describes the role of prescribed fire implemented at regular intervals as an activity to maintain the desired future condition related to fuels management.

Cumulative effects related to stand density, stand structure, and species composition

The tree thinning, together with projected future prescribed fire implemented at regular intervals, would do much to reverse the departure from historical composition, structure and density. The result would be park-like stands of ponderosa pine with scattered, large diameter, fire-tolerant Douglas-fir and incense-cedar, with scattered large western juniper in the “scabflats” of the eastern portion of the planning area. Ground cover would be bunchgrasses and forbs with scattered bitterbrush, however, more sunlight would reach the forest floor increasing the potential for forage for big game and hiding cover for upland birds, such as turkeys and quail. Regular intervals of prescribed fires would restrict the reproduction of all species of trees, especially the fire intolerant Douglas-fir, incense cedar, white fir and western juniper, and prevent the reoccurrence of the overcrowded condition that presently exists.

Most of the Lower Fly Creek planning area has been included in one or more timber sales since the first recorded timber sales in the 1960’s. The steep slopes around Fly creek are

some of the only areas that were not harvested in the past. These areas are very densely stocked. These areas will not be harvested during the Lower Fly Creek project.

The Lower Fly Creek planning area has not had any prescribed fires that were recorded. There have been multiple wildfires throughout the area of varying sizes and intensities over time. If prescribed fires were repeated frequently over time, as projected, each succeeding treatment would be expected to have low impacts on vegetation. Much of the natural regeneration would be killed directly by the fires, and occasional larger trees would either be killed directly by the fire or indirectly by insects after being weakened by fire. Over time, stands would be expected to develop into relatively open stands dominated by large trees. If that were to occur, the planning area would be more closely aligned with the historical range of variability with more single story old growth.

Fire exclusion actions over the past century have probably had a residual effect of an increased stand density, increased canopy cover, and an increase in species diversity with more incense-cedar, Douglas-fir, white fir and western juniper.

Alternative 1 No Action - Ecological Trends

No negative or beneficial cumulative effects would occur with the selection of Alternative 1. Several other vegetation management projects with similar objectives to this project have occurred on the Sisters Ranger District. These projects have created forest conditions that are resistant to adverse effects of drought, insects, and disease, and have enhanced recruitment of trees into the large-tree category by favoring growth of smaller trees. The selection of Alternative 1 would not improve forest conditions or large tree recruitment in the project area in combination with other past, ongoing, or future projects.

Alternative 2 - Proposed Action

No negative cumulative effects would occur with the selection of Alternative 2. However, there would be beneficial cumulative effects associated with the selection of Alternative 2. The other vegetation management projects that have occurred within the District have created forest conditions that are resistant to adverse effects of drought, insects, and disease as well as enhancing recruitment of trees into the large-tree category by favoring growth of dominant and co-dominant trees. The selection of Alternative 2 would improve forest conditions and large-tree recruitment on an additional 1,884 acres achieving desired forest conditions over a larger landscape.

The section below summarizes the existing condition information, along with the direct, indirect, and cumulative effects as analyzed in the Engineering Specialists Report for this project (Houchin, C. 2009). Additional information is contained in the full specialist report at the district office. A transportation analysis was completed by the interdisciplinary team (ID Team) to review the functionality of the roads and address any impacts of road to resources addressed within the project area.

Affected Environment

Table 3-33 shows the roads and road segments that are within the Lower Fly Creek Project area. There are approximately 16.63 miles of roads within the project area of which 11.55 miles are currently open to motorized use and 5.08 miles are currently closed to motor vehicle use.

Table 3-33. Roads Within Project Area

Road Segment	Miles	Current Status	Future Status
1100000	0.60	Open	Open
1100780	0.25	Open	Closed
1100930	0.50	Closed	Closed
1100940	0.60	Closed	Closed
1100950	0.85	Open	Open
1100980	0.67	Open	Closed
1129800	0.45	Open	Open
1129860	0.13	Open	Closed
	0.96	Open	Open
1129870	0.50	Open	Closed
	0.19	Open	Open
1129874	0.30	Open	Closed
1129875	0.48	Open	Closed
1129876	0.15	Open	Closed
1129877	0.63	Closed	Closed
1160000	0.12	Open	Open
1170000	0.40	Open	Open
1170400	1.03	Open	Open
	0.50	Closed	Closed
1170410	0.47	Closed	Closed
1170420	0.10	Closed	Closed
1170430	0.10	Closed	Closed
1170440	0.70	Closed	Closed
1170441	0.10	Closed	Closed
1170443	0.18	Closed	Closed
1170450	0.30	Closed	Closed
1170900	1.73	Open	Closed
	0.57	Open	Closed

Road Segment	Miles	Current Status	Future Status
	0.18	Open	Closed
1170960	0.90	Closed	Closed
2055970	1.11	Open	Open
	0.10	Open	Open
2055978	0.01	Open	Open
6400000	0.27	Open	Open
	0.10	Open	Open
6400013	0.11	Open	Open
6400014	0.20	Open	Open
6400017	0.10	Open	Closed

Table 3-34 shows the roads and road segments that are outside the Lower Fly Creek project area, but would be affected by the proposed project activities. There are approximately 22 miles of forest roads that would be used for hauling of commercial products from the project, and 4.1 miles of forest road that would be closed as a result of the proposed action.

Table 3-34. Roads Outside of Project Area Boundary

Road Segment	Miles	Current Status	Future Status	Remarks
1100000	20.75	Open	Open	Haul Route
1170000	1.20	Open	Open	Haul Route
1170900	4.10	Open	Closed	Primitive Road (outside planning area)

All of the roads within the project area are single lane, native surfaced roads. They are only maintained for high clearance vehicles during project use. Some of these road segments have received some minor spot surfacing in preparation for the 2007 Flymon and 2008 Flymon II Stewardship Projects.

The haul routes outside the project area are maintained to a higher standard for both public and commercial uses. Road 11 is the main forest arterial route though the Green Ridge area. Approximately half of its length is paved and the other half has a crushed rock surface. The 1170 road is a high use forest collector road that also has a crushed rock surface. Both of these roads are maintained for passenger car use as well as commercial traffic.

The 1170900 road is a primitive road that begins at the 1170400 road within the project area and continues beyond the project boundary on down the ridge and drops into the Fly Creek drainage before connecting with the 1170 road approximately 4.8 miles below. The lower 2.9 miles of this road provides access to private land owned by Portland General Electric Company. This is a native surfaced road on a primitive alignment. It has several sections of very steep grades (15% to 18%), and is only maintained for high clearance vehicles. The areas of the steep grades show signs of severe erosion in places, some of which are only traversable by 4 wheel drive vehicles currently. The Eyerly Fire

Roads Analysis document recommends that this road be closed in the future for resource protection.

Environmental Consequences

Alternative 1 No Action

Under the No Action Alternative, there will be no change to open road densities in the project area. Roads will continue to be managed as they currently exist.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Road side and road surface conditions would generally be improved, in the short-term, with implementation of the proposed action. All roads used for the Lower Fly Creek Stewardship Project would receive some form of road maintenance before, during, and after associated timber harvest activities. These maintenance items may include, logging out, blading, brushing, dust control, and drainage improvements.

Level 1 roads open and available for public use would decrease by 5.06 miles with implementation of the proposed action. Road 1170900 which is currently open to the public would be closed following project activities. Any roads within the project area that are currently closed, may be opened up for project use, but would be re-closed following project activities. Any user-created non-system roads within the project area will be closed off with implementation of the proposed action which identifies all closed roads in the project area. Within Table 3-29 and 3-30 displays the future status of the management of road segments associated with the proposed action.

Cumulative Effects

The aggregate section of Road 11 (from the end of the pavement to the junction of 1170) would continue to deteriorate over time. This section of road has had many timber sales hauled over it, with the most recent being the Eyerly Fire Salvage. The aggregate surface on the road is almost worn out and there has not been enough value in any recent sale to replace any surfacing on the road. This project would contribute to the decline in surface quality as there will be no available funding for road surface replacement with this project either. However, the transportation system would benefit from the proposed action, due to an overall net decrease in the road system network and decline of maintenance.

Fire Hazard

The section below summarizes the existing condition information, along with the direct, indirect and cumulative effects as analyzed in the Fire and Fuels Specialist Report for this project (Loomis, J. 2009). Additional information is contained in the full specialist report.

Introduction

Fire is a disturbance process that historically played an important role in shaping the landscape of eastside ponderosa pine forests. After a century of successful fire suppression practices, today portions of the Fly Creek Project area contain fuel loads which are moderate, increasing to high, and present a risk of moderate to high wildfire severity.

Affected Environment

The ponderosa pine forests in the Sisters Ranger District have undergone significant changes over the last 100 years. Due to past vegetation management and fire suppression, stands that were once open and park-like are now more densely stocked with small trees, they are more multi-storied, and have far fewer large fire resistant trees in the overstory than in the past. Within the two watershed assessments completed for the Sisters Ranger District, Whychus Watershed Analysis (USDA Forest Service 1998, updated 2009) and Metolius Watershed Analysis (USDA Forest Service 1996, updated 2004) found that historically and even as recently as 1950's, ponderosa pine forests in these watersheds were dominated by trees over 21" diameter. By 1998 less than 10% of forest acres were dominated by large pine. This is due to large trees being removed for timber harvest and many more small trees have grown in with the exclusion of fire and now dominate forest areas.

The condition of forested land has a direct impact to safety and protection. The dense and multiple forest fuels layers which can be found in parts of the project area increase the probability of high to extreme wildfire behavior, increase the risk of a wildfire spreading faster, increase the difficulty and danger in controlling a wildfire, and increase the danger to the public and firefighters. Not only is there a risk of a fire starting within the project area, there is also a risk of a fire starting on private lands and moving onto adjacent public lands.

Within the Lower Fly Creek project area, fire exclusion has increased the fire return interval and the expected fire intensities. The specific effects of fire exclusion were described by Agee (1993) as altering the pattern of tree cohorts, or clumped groups of even-aged trees, allowing regeneration to survive not just in openings but under mature clumps. Dog-hair thickets of young trees under older trees create competition for nutrients, stress, and reduce resilience. They also create a continuity of vertical and horizontal fuels allowing surface fires to develop into mid-level or crown fires under less severe weather conditions. At the same time that average fire intensity, due to fuel

buildup, is increasing, so that the average fire tolerance of stands has dramatically decreased.

The existing air quality in the Lower Fly Creek Project area is generally within acceptable limits with some local emission sources including occasional construction/logging equipment, vehicles, road dust, residential wood burning, wood fires, smoke from thinning slash disposal, prescribed landscape underburning and field burning. The Lower Fly Creek area is generally influenced by west/northwest winds and typically dispersal begins mid morning.

Fire Regime Condition Class

The role fire would play across a landscape in the absence of human intervention is called a "fire regime". There are five natural fire regimes which are classified based upon the average number of years between fires (fire frequency or Mean Fire Interval (MFI)) combined with the severity of the fire (the amount of vegetation replacement) and its effect on the dominant overstory vegetation. Table 3-35 gives a description of how each of the five regimes is determined. The five regimes often do not describe a specific stand or ecosystem but provides a broad overview in which management decisions can be made.

Table 3-35: Five natural fire regimes used by the Forest Service. Developed by Hardy and others (2001) and Schmidt and others (2002) and interpreted for fire and fuels management by Hann and Bunnell (2001).

Regime	Description
1	0 - 35 year frequency and low severity (most commonly associated with surface fires) to mixed severity (in which less than 75% of the dominant overstory vegetation is replaced)
2	0 - 35 year frequency and high severity (stand replacement: greater than 75 percent of the dominant overstory vegetation is replaced)
3	36 - 200+ year frequency and mixed severity
4	36 - 200+ year frequency and high severity
5	200+ year frequency and high severity

The most recent analysis for the Fly Creek area was conducted in 2007, as part of a larger assessment of 2.4 million acres by the Upper Deschutes Basin Fire Learning Network (UDBFLN), a collaborative group of federal and state agencies, local government, community groups and conservation organizations (USDA, 2007). This coarse scale analysis identifies changes to key ecosystem components such as species composition, structural stage, tree, stand age, and canopy closure. It characterizes the landscape by five "Fire Regime Groups" and three "Fire Condition Classes." A fire regime is a generalized classification of the role fire would play across a landscape – characterized by fire frequency, predictability, seasonality, intensity, duration and scale (USDA and USDI 2002).

A combination of Fire Regime and Condition Class (FRCC) measure the degree of departure from reference conditions, possibly resulting in changes to key ecosystem components, such as vegetation characteristics (species composition, structural stage, stand age, canopy closure, and mosaic pattern); fuel composition; fire frequency, severity, and pattern; and other associated disturbances, such as insect and disease mortality, grazing, and drought (Schmidt and others 2002).

Table 3-36. Condition Class Descriptions

Condition Class	Description and Potential Risks	Potential Mgmt. Strategy
Condition Class 1	▪ Fire regimes are within or near an historical range. ▪ The risk of losing key ecosystem components is low. ▪ Fire frequencies have departed from historical frequencies (either increased or decreased) by no more than one return interval. ▪ Vegetation attributes (species composition and structure) are intact and functioning within an historical range.	Maintenance with prescribe burning or managing for resource benefit is a viable option.
Condition Class 2	▪ Fire regimes have been moderately altered from their historical range. ▪ The risk of losing key ecosystem components has increased to moderate. ▪ Fire frequencies have departed (either increased or decreased) from historical frequencies by more than one return interval. This change results in moderate changes to one or more of the following: fire size, frequency, intensity, severity, or landscape patterns. ▪ Vegetation attributes have been moderately altered from their historical ranges.	A combination of treatments is needed to achieve desired condition. When appropriate, hand and mechanical treatment prior to fire could be considered.
Condition Class 3	▪ Fire regimes have been significantly altered from their historical range. ▪ The risk of losing key ecosystem components is high. ▪ Fire frequencies have departed (either increased or decreased) by multiple return intervals. This change results in dramatic changes to one or more of the following: fire size, frequency, intensity, severity, or landscape patterns. ▪ Vegetation attributes have been significantly altered from their historical ranges.	Where appropriate, these areas need high levels of restoration treatments, such as hand or mechanical treatments. These treatments may be necessary before fire is used to restore the historical fire regime.

In Table 3-36 the condition class description relates directly to fire intensities which can be analyzed using standard fuel models and are described in the effects analysis of this document. Condition Class 1 describes a condition which will support a surface fire with flame lengths 4 feet and less. Condition Class 2 describes a condition which will support

a surface fire > than 4 feet, with some torching and possible crowning. Condition Class 3 will support a surface fire > than 4 feet, torching, crowning, and stand replacing wildfire conditions.

Fire Regime & Condition Class in the Project Area

The predominant Fire Regimes in the project area are Fire Regime 1 which is characterized by high frequency, low severity fires in the ponderosa pine dominated stands. The high desert sage steppe Fire Regime 2, a high frequency and high severity regime and Fire Regime 3 in the mixed conifer stands which exhibit mixed severity and can be low frequency. Structural data places the ponderosa pine stands in the area in Condition Class 2 and places the wetter areas in a Condition Class 3 as seen with the encroachment of western juniper intermixing with once dominant mixed conifer stands. When missed fire cycles and changes in current fire severity are added, the Fire Regime Condition Class across the project area increases from 2 to 3.

The area has missed approximately five to nine natural fire cycles. These missed fire cycles create a build-up of forest fuels that can support moderate to high severity fire behavior if an unplanned ignition were to occur. Moderate concentrations of dead standing and down fuels, multi-strata structure combined with current tree densities would continue to be at risk to intense, stand replacing fire events, which could result in the loss of late and old structure, wildlife habitat cover, and consumption of large woody material and structure in riparian areas.

Natural fuel reduction treatments have been implemented within and adjacent to the project area to change condition class in ponderosa pine stands to reduce the risks from wildfire. Projects implemented around Lower Fly Creek include two Stewardship restoration projects on approximately 550 acres. Post fire salvage (Eyerly Fire 2002) adjacent to the project and portions of private land adjacent which have had some fuels reduction work completed in the past 2-4 years. Treatment included small tree thinning, lap and scatter, piling and pile burning.

Fire History

Fire history is established from fire scars and age-class evidence on trees, from plants that appear to have germinated after fire, in past fire reports from initial attack operations, and from charcoal found in the surface soil. Fire resulted from the ignitions with varying intensities and spatial complexity across the landscape. The past century has resulted in fires of larger size burning with higher intensity. Fire scars ranging from 100 to 20,000+ acres in size are evident within a five mile radius of the project area. Most recently the 2002 lightning ignited Eyerly Fire burned 20+ private structures and 23,134 acres with stand replacement severity adjacent to the project area.

Fire Risk and Values at Risk

Values at risk identified include seasonal residences, the Three Rivers Subdivision, as well as ecological, cultural, and recreational values on National Forest lands. A wildfire which starts in the project area could spread and threaten these values.

Values at risk in the project area identified by the Forest Service include public and fire fighter safety, property and developments, riparian areas associated with Fly Creek, and important old growth forests including both species and habitat.

Fuels Modification for Fire Hazard Reduction

The silvicultural prescriptions and fuels reduction treatments proposed for the Lower Fly Creek Project follow scientifically based principles of vegetation/ fuels modification designed to reduce fire behavior (Arno and Fiedler, 2005; Finney and Cohen, 2003; Mason and others 2006). These principles of fire resistant forests are summarized from Agee (2002) in Table 3-37. The project has been designed to incorporate the objectives below.

Table 3-37: Principles of fire-resilient forests (Agee, 2002)

Objective	Effect	Advantage	Concerns
Reduce surface fuels	Reduces potential flame length	Fire control easier, less torching	Surface disturbance less with fire than other techniques
Increase canopy base height	Requires longer flame length to begin torching	Less torching	Opens understory, may allow surface wind to increase
Decrease crown density	Makes independent crown fire less probable	Reduces crown fire potential	Surface wind may increase, surface fuels may be drier
Increase proportion of fire-resistant trees	Thicker bark, taller crowns, higher canopy base height	Increases survivability of trees	Removing smaller trees is economically less profitable

These principles were designed to reduce fire behavior potential, aide in the suppression of wildland fire (i.e. provide defensible space), and increase protection to valuable resources on forest lands. Following these principles will improve fire-resilience in ponderosa pine ecosystems by (in sequence); reducing surface fuels, removing ladder fuels, leaving large, fire resistant trees and increasing space between tree crowns. These conditions can be achieved with a variety of methods including; prescribed burning, mowing, and thinning.

The objective is to mow shrub concentrations to rejuvenate decadent bitterbrush and manzanita as well as to reduce ladder fuels. Mowing operations are restricted to gentle slopes with very little rock present. Thinning from below would reduce ladder fuels and prepare the site for reintroduction of low intensity prescribed fire.

Those areas managed for reduced fire behavior potential would include a number of associated desired conditions. The structures of stands desired would be where crown bulk density and the continuity of the forest canopy could not sustain a crown fire occurrence. Trees within stands would have a canopy base height well enough above shrub cover in order to reduce potential for crown fire initiation. The shrub layer would be maintained at a height that would lower flame length to below the four foot agency standard for direct attack by ground based firefighters and reduce the potential for crown fire initiation. Fuel model 8 (Andrews et.al 2005 and Finney2006) is a timbered fuel model that most exemplifies the fuel characteristics conducive to low fire behavior and successful suppression by direct attack of fire crews. Fuel model 8 would be considered the desired condition for the area. It is also a desired condition for this area that the Fire Regime Condition Class is returned to a Condition Class 1, where there is a return to a natural or historical range of variability of vegetation characteristics.

Given the existing condition, the following strategies have been developed to move toward the desired future condition and to help direct treatment types and locations:

1) Restoration of historical fire regimes in ponderosa pine ecosystems. The absence of fire over the last 100 years combined with the development of shrubs and dense thickets of regeneration in the understory has placed the ponderosa pine stands at high risk of stand replacing wildfire. Reintroduction of fire in these ponderosa pine type stands would be used as needed to achieve the desired conditions. Prescriptions would be developed for low intensity prescribed fire to start a return to historic conditions, subsequent prescribed fire entries would be conducted through time to create a fire resistant stand condition that would help defend adjacent private lands and help preserve the ponderosa pine stand type. When prescribed fire is used every 8 to 15 years, depending on fuel accumulations, these areas should regenerate ponderosa pine slowly through time as occurred historically (Agee, 1993). Prescribed burning should keep naturally regenerated western juniper in low numbers through time. Not only does prescribed fire reduce wildfire severity, but when a wildfire burns through a site previously burned under prescription, fire suppression costs are also less compared to adjacent land where fire had been excluded (Moghaddas, 2006). Mechanical shrub treatment may be used in addition to/or in lieu of burning if the shrub size and densities could cause severe scorch or mortality of residual stands.

2) Fuel reduction and breaking up the continuity of surface fuels. Areas with existing dead and down material, dense stands of trees, dense shrubs and heavy needlecast can create extremely hazardous conditions. When these conditions exist over large areas a wildfire can be extremely difficult to control. Under unfavorable weather conditions, the fire would burn until it reached an area where fuels were lighter and control tactics are more likely to be achieved.

3) Thinning to reduce crown fire susceptibility and long range spotting. Crown fires are some of the most intense wildfires and usually produce long range spotting that creates challenging control efforts. Dense stands of timber support independent crown

fires allowing fire to burn through the canopy of the trees independent of the surface fire. Torching and crowning with support of the surface fire is also a common problem during wildfires in less dense to dense stands of timber. Breaking up the connectivity of the timber canopy through thinning greatly decreases the chance of an active or passive crown fire, thus reducing long range spotting, resistance to control, and damage to the stand. By maintaining stands at crown bulk densities of <0.10 kg m^3, active or independent crown fire activity can be limited (Agee, 1996). Thinning from below, leaving dominant and co-dominant trees with thick bark and high crowns significantly changes the potential for fire to move from surface up into the tree crowns (Fitzgerald, 2002). Thinning from below most effectively alters fire behavior by reducing crown bulk density, increasing crown base height, and changing species composition to lighter crowned and fire-adapted species (Graham et al., 1999).

There are several examples on the Sisters Ranger District where fire hazards were identified and treated achieving the objectives described in Table F-3. These treatments subsequently prove to be effective during wildfire events by reducing the intensity of fire behavior, allowing fire fighters to light backfires or burn out to slow fire spread, and reduce impacts to natural resources.

The most notable examples of effective fuels treatments modifying wildfire behavior are associated with the 2002 Cache Mountain Fire and the 2007 GW Fire. Thinning, underburning and reduction of ladder fuels adjacent to the forest-urban interface boundary worked to modify fire behavior. Both wildfires approached the Black Butte Ranch community from the west, burning through stands of second growth ponderosa pine with abundant ground fuels. Fire behavior was extreme with active crowning and long range spotting. When the fire reached the treated areas it dropped out of the crowns to the ground, allowing fire fighters to safely construct control lines and protect the adjacent community. Unfortunately during the Cache Mtn. Fire two private homes were lost due to fire brands which ignited wood shake shingle roofs and wood decks with pine needle accumulations.

A third local example was the B&B fire during the summer of 2003. Fire fighters were able to safely light backfires and burn out to reduce fuels in front of the main wildfire along Road 12 in the Metolius basin. This was possible because crown densities had been reduced, canopy base heights had increased and the ground fuels had been treated. This prevented the fires from spreading west to east into Camp Sherman. Structures around Camp Tamarack, Camp Davidson and nearby summer camps were also protected by backfiring and burning out treated forest stands.

Environmental Consequences

Important Interactions

A goal of the project is to get to conditions in an open mosaic of ponderosa pine dominated forest, dominated by one or two storied stand of large trees, with smaller patches of younger trees in even age clumps. Strategically placed treatments that support the fire regime and condition class guidelines and reduce high fire behavior potential,

help to facilitate the suppression of wildfires, protect valuable resources, and allow the reintroduction of fire as a natural disturbance process.

Both natural and human caused fires will continue to occur on the landscape. The goal of forest fuels management treatments is not to preserve and eliminate the process of disturbance caused by fire but to increase the resilience of forest ecosystems to fire.

The desired structure of treated stands is a forest canopy that does not sustain a crown fire under high to extreme fire danger conditions. Aspects of this structure include reductions in: 1) canopy bulk density (the mass of available canopy fuel per canopy volume unit) and 2) fuel continuity (the horizontal and vertical spacing of fuels). Vegetation such as shrubs maintained at a height that would reduce the potential for spread of fire into the crowns of trees. In order to reduce the risk of crown fires it is recommended that residual trees need to have live crowns that are several feet above the shrub canopy. By increasing the scale of treatments on forested lands it can reduce risk of high intensity wildfire, restore, and conserve fire prone forests for future generations.

General Assumptions
Environmental effects are based on the following assumptions:

- Lightning will remain a source of potential ignitions.
- Population growth and increased use of National Forest lands will result in the potential of more human caused fires.
- An increase in average tree diameter of the stand reduces fire severity. Larger trees have thicker bark and are more resistant to flame scorch from surface fuels. The more acres thinned, the greater the average diameter of remaining trees.
- Silvicultural treatments will shift stand composition towards more fire resistant species.
- Treatments of surface fuels generated from silvicultural treatments will prevent an increase in fire severity. Activity fuels treatments follow thinning treatments.
- Treatment of natural surface fuels will reduce fire severity.

Issue: Improve forest health, sustainability, resiliency and promote the development of old growth forest stands and large trees by reducing the uncharacteristically high levels of competing live vegetation and reintroducing the more natural role of low intensity ground fire.

MEASURE: The number of acres moved from high intensity wildfire fuel conditions to moderate or low intensity wildfire fuel conditions.

Issue: Remove western juniper by thinning stands from below to reduce stand density, promote desired stand condition and allow growth of grasses, shrubs as well as aiding the development of Late Old Structure (LOS).

MEASURE: The number of acres treated through a combination of mowing, thinning and burning to reduce the encroachment of western juniper and rejuvenate grass and shrub component for browse.

Fire Behavior and Fuel Modeling

Wildfire susceptibility is defined and discussed in terms of the hazard and the risk of a wildfire as it relates to fuel types and arrangements. Hazard relates to the availability of fuels to sustain the fire and the amount of loading, arrangement and continuity of fuels through the area. The changes that occur in the loading, arrangement or continuity of the fuels change the predicted fire behavior and associated fire effects. The risk of fire occurrences relates to the probability that an ignition could occur under conditions that will result in a wildfire. These changes are modeled in the effects analysis using Fuel Models and calculated through fire modeling programs called BEHAVE (Andrews et. al 2005) and FlamMap (Finney 2006).

In addition to the professional judgment of fuels specialists and the most up to date scientific data available, state of the art modeling was used to facilitate a more specific comparison of alternatives as the comparison relates to actual acres on the ground. FlamMap (Finney 2006), a fire behavior mapping and analysis program that computes fire behavior characteristics (rates of spread, flamelength, crown fire potential, etc.), was used to determine the existing stand condition's potential fire behavior. Remote sensing satellite imagery from 2004 was analyzed in the computer model under specific fuel moisture conditions. The data inputs necessary for FlamMap include aspect, slope, elevation, fuel model, canopy height, canopy base height, crown bulk density, and crown class. The fuel moisture conditions used were those representing the 97th percentile fuel moistures for summer conditions from the Colgate RAWS weather station.

Fuel Models are a scientific way to assess forest fuel loading and potential fire behavior. The prediction of fire behavior has become more valuable for controlling fire and for assessing potential fire damage to resources. Each fuel model is described by the fuel load and the ratio of surface area to volume for each size class. In the effects analysis, 1-hour fuel moisture content is used as an input to represent grass and needle fuels as they are the number one carrier of fire due to a greater surface area to volume ratio. Fuel load and depth are significant fuel properties for predicting whether a fire will be ignited, its rate of spread and its intensity.

The collections of fuel properties that have become known as fuel models can be organized into four groups: grass, shrub, timber, and slash models.

The 13 Standard Fuel Models (FM) include:

FM's 1-3 grass fuels
FM's 4-7 shrub fuels
FM's 8-10 timber fuels
FM's 11-13 slash fuels

Five of these fuel models are used in this effects analysis (FM 2, 6, 8, 9, and 10).

Fuel Model 2 (581 ac) - Fire spread is primary through the herbaceous fuels, either curing out or dead. These are surface fires where the herbaceous material, in addition to litter and dead-down stem wood from the open shrub or timber overstory, contribute to the fire intensity. Open shrub lands and pine stands or western juniper stands that cover one-third to two-thirds of the area may generally fit this model; such stands may include clumps of fuels that generate higher intensities and that may produce firebrands.

Fuel Model 6 (742 ac)- Fires carry through the shrub layer where foliage is more flammable than fuel model 5, but this requires moderate winds, greater than 8 mph at mid-flame height. Fire will drop to the ground at low wind speeds or at openings in the stand. The shrubs are older, but not as tall as shrub types of fuel model 4, nor do they contain as much fuel as fuel model 4. This fuel model considers a broad range of shrub conditions and is more prominent in the western juniper dominated unit 15.

Fuel Model 8 (59 ac) - Slow-burning ground fires with low flame lengths are generally the case, although the fire may encounter an occasional “jackpot” or heavy fuel concentration that can flare up. Only under severe weather conditions involving high temperatures, low humidity, and high winds do the fuels pose a fire hazard. Closed canopy stands of short-needle conifers or hardwoods that have leafed out support fire in the compact litter layer. This layer is mainly needles, leaves, and occasionally twigs because little undergrowth is present in the stand. Representative conifer types are Douglas fir, aspen and lodgepole pine.

Fuel Model 9 (468 acres) - Fires run through the surface litter faster than model 8 and have longer flame length. Both long-needle conifer stands and hardwood stands are typical. Closed stands of long-needle pine like ponderosa are grouped in this model. Concentrations of down-dead woody material will contribute to possible torching out of trees, spotting, and crowning.

Fuel Model 10 (34 ac) - The fires burn in the surface fuels with greater fire intensity than the other timber litter models. Dead-down fuels include greater quantities of 3 inch or larger limbwood resulting from over maturity or natural events that create a large load of dead material on the forest floor. Crowning out, spotting, and torching of individual trees is more frequent in this fuel profile, leading to potential fire control difficulties. Any forest type may be considered if heavy down material is present; examples are insect or disease-ridden stands, wind-thrown stands, overmature stands with deadfall, and aged light thinning or partial-cut slash.

A quantitative basis for rating fire danger and predicting fire behavior became possible with the development of mathematical fire behavior models using Rothermels spread model in a program called BEHAVE. The mathematical models require descriptions of fuel properties as inputs to calculations of fire danger indices or fire behavior potential.

Project effects are analyzed using BEHAVE. Fire intensities likely to be encountered at the fireline are modeled in rates of spread, flame length and scorch height in relation to 1-

hour fuel moistures. The fire behavior estimations are for the peak period of the fire season when wildfires pose greater control problems for fire fighters and its impact to land resources.

Modeling Constraints and Limitations

Constraints of BEHAVE, are that it can only model two separate fuel models at once. There is uncertainty with all modeling exercises, the results are best used to compare the relative effects of the alternatives, rather than as an indicator of absolute effects. FlamMap also has limitations, winds speed and fuel moisture is held constant for the duration of each simulation, spotting is not factored when predicting fire spread and projection, and ignitions are randomly selected across the landscape.

Analysis Measures

> **Issue:** Improve forest health, sustainability, resiliency and promote the development of old growth forest stands and large trees by reducing the uncharacteristically high levels of competing live vegetation and reintroducing the more natural role of low intensity ground fire.
>
> *MEASURE: The number of acres moved from high intensity wildfire fuel conditions to moderate or low intensity wildfire fuel conditions.*
>
> **Issue:** Remove western juniper by thinning stands from below to reduce stand density, promote desired stand condition and allow growth of grasses, shrubs as well as aiding the development of Late Old Structure (LOS).
>
> *MEASURE: The number of acres treated through a combination of mowing, thinning and burning to reduce the encroachment of western juniper and rejuvenate grass and shrub component for browse.*

Alternative 1. No Action

Ecological Trends

Under this alternative current management strategies would continue. Trees would be removed if they restricted motorized travel along open or administrative use forest roads. Fuels would follow the current trend of a condition class 2 converting to 3, and condition class 3 continuing the degradation process with more ladder fuels and continuous canopy cover development. Fires would continue to be suppressed as long as firefighter safety is not compromised. Fire regime condition classes would continue to depart from their natural regime, and species composition would change over time. Forest users, seasonal homes along the Metolius arm of Lake Billy Chinook and residents of Three Rivers Subdivision will remain at risk due to unsafe egress and escape routes. Goals and desired conditions stated in the Project Initiation Letter (PIL) would not be achieved.

Past forest fuels treatments (investments) such as small tree thinning, slash pile burning and prescribed underburning have reduced fuels in some areas but condition class would begin to deviate from historic levels and stands would become a higher risk to large fire events.

Expected Fire Behavior

Fire behavior for the existing condition of the Flymon Planning area has been predicted by using a number of state of the art tools. Remote sensing satellite imagery from 2004 was analyzed in the FlamMap computer model under specific weather conditions. The 97th percentile weather conditions and wind conditions used can be referenced in 3-38. Table 3-39 shows the conditions/parameters under which fire behavior would be rated low, moderate and high for each of the following fire behavior indicators; flame length, rate of spread and fire type.

Table 3-38. 97th Percentile fuel moisture and wind conditions used for data input into FlamMap for Existing Condition Colgate RAWS (352620) 97th Percentile Fuel Moistures:

1 hr	10 hr	100 hr	Herb	Woody	Wind	1000 hr	Temp	RH	Pk wind
5	6	11	30	60	11	13	97	10	11

Winds:

windspeed of 11 miles per hour (average gust at Colgate)
azimuth of 290 degrees (most common azimuth of winds for Colgate RAWS during summer months)

Foliar moisture content: 100 percent

Table 3-39. Fire behavior condition ratings and the associated parameters by indicator

Fire Behavior Conditions	LOW	MODERATE	HIGH
Flame Length	0-4 ft	4-8 ft	8 ft +
Rate of Spread	0-5 chains/hr	5-15 chains/hr	15+ chains/hr
Fire Type	Surface	Passive Crown Fire	Active Crown Fire

The fire behavior condition ratings shown in Table 3-39 for flame length and rate of spread are determined based on Fire Behavior Characteristics Charts found in the Appendix B of the NWCG Fireline Handbook (1993). Fire Behavior Characteristics Charts are charts used by firefighters to determine a fire's resistance to control and spread rates. Condition ratings for fire type correspond with the potential for a crown fire. A low rating is for areas where a surface fire potential exists with no potential for either type of crown fire. A moderate rating is for areas where a passive crown fire (a surface fire with individual tree torching) may exist. A high rating is for areas where the

potential for an active crown fire (a fire involving the crowns of trees with support from a surface fire) exists.

Table 3-40 shows the predicted fire behavior of existing conditions in acres for the Flymon Planning Area using the parameters and indicators shown in Table 3-39.

Table 3-40. Existing condition predicted fire behavior

Fire Behavior	Existing Condition					
	Low		Moderate		High	
	Acres	Percent	Acres	Percent	Acres	Percent
Flame Length (ft)	1056	24	1936	44	1408	32
Rate of Spread (ch/hr)	1364	31	2464	56	572	13
Fire Type	1276	29	1804	41	1320	30

Table 3-40 shows that the percentage of acres of low fire behavior potential versus moderate or high potential varies greatly depending on which fire behavior attribute is being considered. Given the complex consideration for each of the data inputs and their relationships with each other (i.e. how a sheltered, fuel model 9 behaves on a south aspect of 30% slope, versus how that same fuel model, but unsheltered, behaves on a west aspect of 5% slope), differing results for each of the fire behavior conditions can be expected. When considering the resistance to control an oncoming wildfire, flamelength is considered. If stopping the fire is a concern, assuming resistance to control is conducive to suppression, then rate of spread is the consideration. If the concern is for fire in the canopy, fire type is the fire behavior condition to consider.

The result of predicted fire in the existing condition is that the majority of the project area approximately (60-75%) would have an intense, surface fire with frequent torching that could not be safely or effectively be suppressed by firefighting resources.

Heavy smoke would be generated on the day of the fire; haze would be expected for 4 to 6 days. In this particular analysis area, smoke would generally be transported north and east into the Fly Creek drainage and into the Lake Billy Chinook recreation area. Residents of Three Rivers Subdivision may be impacted for an extended period of time.

BEHAVE modeling evaluated the forest with and without a shrub fuel model since both conditions can be found within the project area. The project area was represented by two timber fuel models (FM 9 & FM 10). Areas where bitterbrush shrubs exist in connection with the timber crown base were represented by FM 6 & FM 10.

<u>Interpretation of BEHAVE Modeling of the existing forest with a shrub layer</u>

1) Rate of Fire Spread - With typical summer fuel moistures a wildfire would spread between 75 to 85 ch/hr (approximately 1 mile per hour) with as little as a 6 mph midflame wind. With higher afternoon winds, typically 10 mph (with higher gusts) fire would spread even more. (Does not including spotting contributing to fire spread).

2) Surface Flame Length – With typical summer fuel moistures wildfire flame lengths would be between 5 to 7 feet with as little as a 4 mph midflame wind. With higher afternoon winds, typically 10 mph (with higher gusts) flame lengths would increase to 8 to 11 feet.
3) Fire Scorch Height – With typical summer fuel moistures, scorch heights would be between 30 to 40 feet in as little as a 4 mph midflame wind. With higher afternoon winds, typically 10 mph (with higher gusts) scorch heights would increase to 50 to 70 feet.

Spread rate expressed in chains per hour ch/hr. 1 chain = 66 feet 80 chains = 1 mile

These results indicate a high risk of torching and crown fire initiation where crown base heights are at 30 ft. or less. Projected flame lengths combined with projected rates of spread would not be conducive to ground based crew suppression efforts if midflame wind speeds are > than 4 mph. The type of fire behavior would require mechanized equipment and aerial support to achieve fire containment and control.

Interpretation of BEHAVE Modeling of the existing forest with a shrub understory

1) Rate of Fire Spread - With typical summer fuel moistures a wildfire would spread between 15 to 20 ch/hr with as little as a 6 mph midflame wind. With higher afternoon winds, typically 10 mph (with higher gusts) fire would spread from 35 to 40 ch/hr.
2) Surface Flame Length – With typical summer fuels moistures wildfire flame lengths would be between 5 to 7 feet with as little as a 4 mph midflame wind. With higher afternoon winds, typically 10 mph (with higher gusts) flame lengths would increase to 8 to 11 feet.
3) Fire Scorch Height – With typical summer fuel moistures, scorch height would be between 30 to 50 feet in as little as a 4 mph midflame wind. With higher afternoon winds, typically 10 mph (with higher gusts) scorch height would increase to 40 to 70 feet.

These results indicate a high risk of torching and crown fire initiation where crown base heights are at 30 ft. or less. Projected flame lengths combined with projected rates of spread would not be conducive to ground based crew suppression efforts if midflame wind speeds are > than 4 mph. This type of fire behavior would require mechanized equipment and aerial support to achieve fire containment and control.

Conclusion For Alternative 1

Modeling indicates a high potential for crown fire initiation on 1,320 acres (30%) of the project area if no action is taken (Table 3-36). Fuels would follow the current trend of a condition class 3, with more ladder fuels and result in continuous canopy cover. Fire regime condition classes would continue to depart from their natural regime, and species composition would change over time. Current forest fuel conditions are moderate to high intensity and indicate there is an elevated wildfire risk to forests and riparian area in the project area. The goals and desired conditions in the Forest Plan would not be achieved.

Alternative 2. Proposed Action

Direct and Indirect Effects

This alternative will thin concentrations of small and medium diameter trees to decrease the connection from the younger trees crown base height to the older trees crown base height. This space between tree crowns will decrease torching and crowning as well as increase growing space for the larger diameter trees. Low canopy base heights and surface fire intensity are the primary contributors to torching and crown fire initiation.

Precommercial thinning, slash disposal and prescribed underburning will further reduce fuels to decrease rate of spread, flame length and duff mound build up and reduce high intensity fire behavior to lower intensities, more typical under a Condition Class 1.

Thinning treatments reduce canopy cover and may result: in increased wind speeds, higher temperatures, and lower humidity for a given time and place compared to no action. This lowers fine dead fuel moisture, which is the amount of moisture in grasses and pine needles. Lowering fine dead fuel moisture will facilitate the spread of low-intensity surface fire, such as a prescribed fire, and will help maintain low levels of surface fuels and ladder fuels and decrease the probability of crown fire.

Mowing shrub concentrations around the base of desirable trees will decrease the forest floor fuel connection to the crowns by reducing small trees and brush (ladder fuels). By reducing ladder fuels, mowing facilitates the reintroduction of prescribed fire and mitigates the effects of smoke on air quality during prescribed fires. By reducing shrubs mowing will also temporarily reduce wildlife hiding cover and browse quality; however, regenerating shrubs will be more vigorous and palatable. Mowing leaves behind ground organic mulch and generally produces little visual impacts.

Riparian treatments under this alternative in the Lower Fly Creek project would allow removal of trees and brush to help facilitate the use of prescribed fire. Fuels reduction along the creek, along with thinning in other Riparian Habitat Conservation Areas, will promote regeneration of fire dependent species such as ponderosa pine, riparian aspen and willows and reduce the potential for damage from higher intensity wildfire.

Prescribed burning would remove primarily fine fuels (< 3 inches in diameter) and with varied prescription conditions will create a mosaic of effects. This reintroduction of fire would reduce competition for nutrients and water by killing some undergrowth and will increase short term nutrient cycling. Prescribed fire will result in a charred appearance of lower tree boles and shrub skeletons for 1 to 3 years post burning. Scorch heights will result in a red or brown color to the lower limbs and needles of remaining trees, these effects will gradually disappear within a 1 to 3 year period. If prescribed fire is designed to thin or kill small trees, the area would have pockets of dead residual trees. Prescribed burning would allow bare soils to promote the regeneration of some species that have evolved in a fire-dependent ecosystem.

Interpretation of BEHAVE Modeling of a thinned forest without a shrub layer

1) Rate of Fire Spread - With typical summer fuel moistures a wildfire would spread between 4.9 to 7.5 chains per hour with a 4 mph midflame wind. With higher afternoon winds, typically 10 mph (with higher gusts) fire would spread from 21.1 to 32.6 chains per hour.
2) Surface Flame Length – With typical summer fuels moistures wildfire flame lengths would be between 2.1 to 2.9 feet with a 4 mph midflame wind. With higher afternoon winds, typically 10 mph (with higher gusts) flame lengths would increase to 4.2 to 5.7 feet.
3) Fire Scorch Height – With typical summer fuel moistures, scorch heights would be between 7 to 13 feet with a 4 mph midflame wind. With higher afternoon winds, typically 10 mph (with higher gusts) scorch heights would increase to 11 to 22 feet.

These results indicate a low risk of torching and crown fire initiation where crown base heights are at 25 ft. or less. Projected flame length combined with projected rates of spread are conducive to hand crew suppression efforts if wind speeds are < than 10 mph. This type of fire behavior would not necessarily require mechanized equipment and aerial support to achieve fire containment and control.

Cumulative Effects for Alternative 2

This cumulative effects analysis considers the past, present and reasonably foreseeable future actions of vegetation management to the fire regime and condition class of the Lower Fly Creek watershed. Past, present, and future foreseeable actions and their effects include logging and forest fuel treatments that have occurred since fire suppression policy began during the early 1900's to about ten years in the future. Two ongoing projects, the Flymon Stewardship Demo CE and Flymon II Stewardship CE, are vegetation treatments associated with the project area and will not have a measurable impact due to the small scope and scale of these projects on forest vegetation within the project area. Continued fuels treatment on private lands adjacent is also considered a reasonable foreseeable future action, this will not have a measurable impact on the vegetation within the Fly Creek project.

The existing condition of the Lower Fly Creek project described above has been shaped by past actions, natural disturbances such as insect outbreaks and fire, and growth of the trees themselves. Prescribed fire implemented at regular intervals (5 to 15 years) will also be considered a reasonable foreseeable future action.

There is uncertainty about what will occur with climate change in the future. One scenario may be that fires seasons start earlier and last longer. Modeled parameters would likely not change for extreme fire hazard conditions.

Conclusion for Alternative 2

Professional judgment and the most up to date scientific data available indicate that the 1,884 treated acres will move high intensity wildfire fuel conditions to low intensity

wildfire fuels conditions under Alternative 2. Riparian areas and aspen areas would move from a high to moderate fuel conditions. Alternative 2 will best modify the forest fuel profile because it will allow for more thinning in old growth forest areas and more riparian treatment which will significantly reduce torching and crowning within the project area, it will reduce the risk of sustaining a crown fire if one is initiated outside the project area. This alternative will also favor fire dependent species such as ponderosa pine and reduce the encroachment of western juniper. A combination of mowing and underburning will reduce decadence and rejuvenate grass, forbs and shrubs for palatable forage. This alternative will result in a trend toward Condition Class 1, however to reach Condition Class 1 it will require a series of maintenance underburns at 5-15 year intervals.

Flymon units 1 and 2 combined with the Fly Creek units will reduce the risk of active crown fire by approximately 60% within the project area. Stands adjacent to the projects will also be subjected to less risk as fires actively burning from treated areas will be less intense. Crown fire initiation will be dropped substantially as a result of the treatment sequence.

The continuity of fuels will be broken up; excessive fuel buildup, ladder fuel profiles and closed canopies will be managed as to allow for the option of full suppression tactics or modified suppression tactics for the purposes of managing for resource benefit.

Risk of undesired fire behavior will be reduced to adjacent land owners; Ponderosa Timber and Cattle Company, PGE and Three Rivers subdivision. Active management would provide an opportunity to make a defensible stand on private lands.

There are no anticipated negative cumulative effects, but rather beneficial effects when considered with other landscape treatments to reduce the forest fuel loads and intensity of wildfire in the project vicinity. This alternative best meets the goals and desired conditions described in the purpose and need.

Other Effects

Quality-Clean Air Act

Alternative 1. No Action

Ecological Trends

In the past, large fires have impacted the community of Three Rivers northeast of the project and Lake Billy Chinook recreation area north of the project area.

Without fuels reduction treatments wildfires will eventually burn in the project area. Negative effects on air quality resulting from a wildfire are expected to be far greater than that from prescribed burning. Analysis of potential air quality impacts in Oregon, Washington and Idaho has found that wildfire impacts would be significantly greater in

magnitude than prescribed burning impacts over the same area. This analysis concluded that wildfires reduced visibility substantially more than prescribed burning. This was due to wildfires typically consuming more forest fuel per acre burned than prescribed fire. Analysis also concluded that predicted concentrations or particulate matter from prescribed fires would be substantially lower than that from wildfires due to: 1) higher fuel moisture levels during management ignited prescribed fire, 2) better smoke dispersion conditions existed during prescribed fires in the spring and fall, than typical conditions during summer wildfires, and 3) prescribed fires are dispersed across the landscape spatially and temporally, rather than concentrated in a few locations.

Drift smoke from a wildfire could affect recreationists and the adjacent community of Three Rivers subdivision, summer homes on the Metolius arm as well as other high use recreation areas at Lake Billy Chinook by reducing visibility and views of the surrounding forest and mountains. Visibility could be reduced from the normal 20+ miles to less than 3 to 5 miles. This impact could last weeks or months during wildfire season (typically June thru September).

Alternative 2. Proposed Action

Direct, Indirect, and Cumulative Effects

Prescribed fire would be conducted in compliance with National Ambient Air Quality Standards and under the Oregon Smoke Management Plan regulations and restrictions to track smoke produced and monitor emissions. The policy of the plan is to improve the management of prescribed burning as a forest management practice; and to minimize emissions from prescribed burning and be consistent with air quality standards. There is a need to meet standards for air quality in adjacent Class 1 Airsheds, which includes all wildernesses. Burning would only be conducted when prevailing and predicted wind patterns would result in negligible effects to the Sisters, Madras, Culver and the Mount Jefferson Wilderness Class 1 Airshed. Since prevailing winds within the project area are out of the west northwest and away from the wilderness, prescribed burning is not expected to result in an incursion in the Class 1 Airshed.

Potential impacts of prescribed fire smoke include visibility of smoke and potential health affects of small air borne particles. Heavy smoke would be generated on the day of the prescribed burn, haze is expected for 2 to 4 days following ignition. In this particular analysis area, smoke would generally be transported south and east and possibly to some extent into the Lake Billy Chinook drainage or across the Crooked River National Grassland flats into the Madras/Culver basin. Drift smoke from a prescribed fire could affect recreationists and the community of Three Rivers subdivision by reducing visibility and views of the surrounding forest and mountains. Visibility could be reduced from the normal 20+ miles to less than 3 to 5 miles. This impact could last from a few hours to several days from prescribed fire. Due to the location of the project area and local weather patterns, smoke from prescribed fire would not affect Class I wilderness areas or urban Special Protection Zones. The nearest Class I wilderness is the Mount Jefferson Wilderness, 15 miles to the west; the nearest Special Protection Zones are Redmond 20 miles to the east and Bend, 45 miles to the southeast. Prescribed fire

operations would be avoided during persistent inversion conditions, which would increase the potential for smoke pooling in valleys. Impact from smoke could affect individual dwellings in the Three Rivers Subdivision, and would be short-term.

Implementation of the action alternative, based on the mitigation measures included to reduce emissions and to disperse smoke during favorable conditions, is expected to protect air quality in Three Rivers and adjacent communities while having no visible effects to the Mount Jefferson Wilderness area. Compared to Alternative 1, fuels treatments included with the action alternative would limit potential wildfire size per occurrence and emissions produced.

Smoke from wildfires within the project area would impact the communities of Three Rivers subdivision and Lake Billy Chinook; because the smoke would be a result of wildfire it is not likely to occur under conducive smoke dispersion conditions particulate matter generated would be much greater in a wildfire scenario Table 3-41. The Lake Billy Chinook (Cove Palisades State Park) could also be adversely impacted by smoke when tourism and recreation are at their highest.

Table 3-41. Estimated smoke emissions from a wildfire under extreme conditions compared to prescribed fire conditions

Fire condition	Pounds PM_{10}/Acre Fuel Consumed	Pounds $PM_{2.5}$/Acre Fuel Consumed	Avg. consumption %
Wildfire	491-874	415-740	64
Prescribed Fire	259-514	215-438	40

Cumulative Effects for Alternative 2

This analysis considers the past, present and reasonably foreseeable future impacts to air quality within the Fly Creek area and the Mount Jefferson Wilderness Class 1 Airshed. Past, present, and future foreseeable actions and their effects include forest fuel treatments and wildfires that have occurred since fire suppression policy began during the early 1900's to about ten years in the future. Reasonably foreseeable future actions include continued fuels treatment projects on the Crooked River National Grassland, additional treatment on private land and potential vegetation projects on the north half of the Sisters Ranger District.

The cumulative effect on air quality from prescribed burning included in Alternative 2 is zero. Because of the nature of smoke, past smoke producing events including wildfires do not cumulatively impact air quality when the project area is burned by prescribed fire. Current air quality in the area is excellent with no point sources of air contamination nearby. As stated above, burning would be conducted in compliance with National Ambient Air Quality Standards and Oregon Department of Environmental Quality regulations and restrictions to ensure no cumulative effects on air quality.

Because of the goal to restore the fire regime and condition class in the project area, prescribed fire would likely need to occur every 5 to 15 years although the actual frequency is speculative and not foreseeable. Future burning in this project or in adjacent

projects would be subject to the same restrictions, requirements and regulations as discussed above and would not have an additive negative effect to air quality within Central Oregon communities.

OTHER DISCLOSURES

Civil Rights and Environmental Justice

See earlier discussion of consultation and the involvement on the project of Native American Tribes. There have been no issues or concerns raised with adverse effects to Native American Tribes.

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

Environmental Justice means that, to the extent practical and permitted by law, all populations are provided the opportunity to comment before decisions are made and are allowed to share in the benefits of government programs and activities affecting human health and the environment.

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. The action alternatives would have no disproportionately high or adverse effects to minority or disadvantaged groups qualifying under the environmental justice order. Scoping and widely circulated media articles have raised no issues or concerns associated with the principles of environmental justice. The action alternatives do not have a disproportionately high and adverse human health effects, high or adverse environmental effects, substantial environmental hazard or effects to differential patterns of consumption of natural resources. All interested parties will continue to be involved with commenting on the project and the decision making process.

Congressionally Designated Areas

No congressionally designated areas such as Wild and Scenic Rivers 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.

Prime Farm and Forest Lands and Wetlands

The Secretary of Agriculture issued Memorandum 1827 which is intended to protect prime farm lands and range lands. The project area does not contain any prime farmlands or rangelands. Prime forestland is not applicable to lands within the National Forest System. National Forest System lands would be managed with consideration of the

impacts on adjacent private lands. Prime forestlands on adjacent private lands would benefit indirectly from a decreased risk of impacts from wildfire. There would be no direct, indirect, or cumulative adverse effects to these resources and thus are in compliance with the Farmland Protection Act and Departmental Regulation 9500-3, "Land Use Policy."

Potential effects to wetlands are extensively discussed in the Hydrology Section of this analysis. The analysis concluded there are no negative impacts of the action alternatives to wetlands.

Compliance with Other Polices, Plans Jurisdictions

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.

Implementation of Alternative 1 (No Action), Alternative 2 (Proposed Acton), 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. Effects meet or exceed state water and air quality standards.

Irretrievable and Irreversible Commitment of Resources

NEPA requires that environmental analysis include identification of "…any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented." Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the use of these resources have on future generations. No significant irreversible or irretrievable commitment of resources would occur under Alternative 2 (Proposed Action) or Alternative 3.

> Irreversible: Those resources that have been lost forever, such as the extinction of a species or the removal of mined ore. The proposed activities would result in a commitment of rock for road maintenance.
>
> Irretrievable: Those resources that is lost for a period of time, such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of way or road.

CHAPTER 4. CONSULTATION AND COORDINATION

Preparers and Contributors

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

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APPENDIX A – CONSISTENCY WITH CURRENT LAWS AND MANAGEMENT DIRECTION

Current Laws and Management Direction

The action Alternative meets all the applicable standards and guidelines in the Deschutes National Forest Land and Resource Management Plan (LRMP) as amended by the Inland Native Fish Strategy (INFISH) and the Regional Forester Amendment #2 – Revised Continuation of Interim Direction Establishing Riparian, Ecosystem, and Wildlife Standards for Timber Sales (or the "Eastside Screens"). Then entire project is within Management Area 7 under the Deschutes LRMP. The following standards and guidelines are applicable to the project:

Deschutes National Forest Land and Resource Management Plan

The Deschutes National Forest Land and Resource Management Plan provides guidance for management activities. It establishes goals, objectives, and standards and guidelines for each specific management area on the Forest, as well as Forest-wide standards and guidelines. The project occurs within Management Area 7 Mule Deer, Management Area 8 General Forest, and Management Area 20 associated standards and guidelines are described in Chapter 4 of the plan.

M7-5 Even and uneven-aged management will be applied and may include precommercial and commercial thinning. Stocking levels will be based on site-specific conditions A crown cover greater than 40 percent with trees 30 feet high is recommended for thermal cover.

Relatively low site productivity for tree-growth, coupled with recent cycles of drought, increase the risk of insect-pest epidemics killing or severely damaging tree-stands valuable for cover. Thus, tree canopy-cover conditions for optimum thermal protection may need to be compromised somewhat in order to moderate the risk of future catastrophic pine beetle damage. Canopy cover should be managed at the highest percentage that will maintain healthy stand conditions with a low risk of catastrophic damage due to insects or disease. As a minimum canopy cover must be 40 percent, but a greater canopy cover percentage is preferred

M7-6 Prescribed burning is recommended for site preparation where soil conditions and fuels permit.

M7-7 Silvicultural prescriptions will be based on the Timber Management standards/guidelines and Deer Habitat objectives.

M7-10 Habitat management will be designed to provide a mosaic of forested conditions which incorporates the concepts of escape and hiding cover, thermal cover, travel corridors, visual screens, and harassment potential.

M7-13 A crown cover greater than 40 percent with trees 30 feet tall is recommended for thermal cover.

M7-14 Forage conditions will be maintained or improved with emphasis on increasing the variety of plants available for forage and a mixture of age classes of shrubs. Variety in areas which are dominated by poor vigor shrubs will be created. Species will be established so that a variety of shrubs, grasses, and forbs are available.

Inland Native Fish Strategy - INFISH (1995)

The Inland Native Fish Strategy (USDA Forest Service 1995) provides interim direction to protect habitat and populations of resident native fish. These standards replace direction on riparian area management in the Eastside Screens. Portions of the watersheds where riparian dependent resources receive primary emphasis are called Riparian Habitat Conservation Areas (RHCA's) and management activities in these areas are subject to specific standards and guidelines. Riparian Habitat Conservation Areas include traditional riparian corridors, wetlands, intermittent headwater streams, and other areas where proper ecological functioning is crucial to maintenance of the stream's water, sediment, woody debris, and nutrient delivery systems. Specific Riparian Management Objectives from INFISH are found in the Fish and Hydrology sections of this document.

INFISH standards prohibit timber harvest, including firewood cutting in Riparian Habitat Conservation Areas, however they allow the application of silvicultural practices in Riparian Habitat Conservation Areas to acquire desired vegetation characteristics where needed to attain Riparian Habitat Management Objectives or to mitigate damaging effects from catastrophic events such as fire, flooding, volcanic, wind, or insect damage. Practices must be applied in a manner that does not retard attainment of Riparian Habitat Management Objectives and that avoids adverse effects on inland native fish (TM-1).

INFISH standards also require fuel treatment strategies, practices, and actions including prescribed burning be designed so as to not prevent the attainment of Riparian Habitat Management Objectives, and to minimize disturbance of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuel management actions are needed (FM-1 and FM-4).

Regional Forester Amendment #2–Revised Continuation of Interim Management Direction Establishing Riparian, Ecosystem, and Wildlife Standards for Timber Sales (Eastside Screens)

In August 1993, the Regional Forester issued a letter providing direction to National Forests on the eastside of the Cascade Mountains on retaining old-growth attributes at the local scale and moving toward the historic range of variability (the range of forest conditions likely to have occurred before European settlement) across the landscape. This direction was called "Interim Management Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales, Regional Forester's Forest plan Amendment", and became known as the "Eastside Screens". The screens limit certain

types of activities in watersheds where old growth forests are now less common than the historic range of variability.

A decision notice issued in May 1994 amended all eastside Forest plans to include this direction. The May 1994 decision notice was revised in 1995 and was called "Revised: Interim Management Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales, Regional Forester's Forest Plan Amendment #2", and has continued to be known as the "Eastside Screens". Since the 1995 revision, there have been several letters of clarification from the Regional Office regarding the eastside screens.

The Eastside Screens are intended to maintain management options for the future. More detailed discussion on project consistency with the screens can be found in the Forest Vegetation and Wildlife sections of this document.

Regional Invasive Plant EIS and Manual Direction

Forest Service Manual (FSM) direction requires that Noxious Weed (now termed Invasive Plants) 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). The project risk assessment can be found in project file (Pajutee, 2009).

The Region 6 Invasive Plant FEIS Record of Decision (USDA 2005) provides a list of prevention practices to be applied at the project level. In October 2004, Forests in Region 6 were directed to develop local invasive plant prevention practices and the Deschutes and Ochoco National Forest have developed practices for local situations (USDA, 2006). Particularly relevant to this project would be the requirements for pre-project inventories, rapid detection and monitoring, minimizing ground disturbance, requiring clean equipment. (see Project Design Features section).

Clean Water Act

The State of Oregon, as directed by the Clean Water Act (CWA) and the Environmental Protection Agency, is responsible for the protection of rivers and other bodies of water in the public interest. To show that water quality is being protected, states are required by the CWA to adopt water quality standards which must be approved by the Environmental Protection Agency. Best Management Practices (BMP) and state-wide management plans are a requirement of the CWA and are used to meet water quality standards. Water bodies that do not meet the State Standards for water quality are identified on the State of Oregon 303(d) list for water temperature exceeds above the state standards. Fly creek is not a 303(d) listed stream.

Applicable Laws and Executive Orders

The following additional laws and executive orders, with implementing regulations as appropriated, apply to the analysis and implementation of the Lower Fly Creek Project.

American Antiquities Act of 1906
Migratory Bird Act of 1918
National Historic Preservation Act of 1966 (as amended)
National Environmental Policy Act (NEPA) of 1969 (as amended)
Endangered Species Act (ESA) of 1973 (as amended)
Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974 (as amended)
National Forest Management Act (NFMA) of 1976 (as amended)
Clean Water Act (CWA) of 1977 and 1982 (as amended)
Executive Order 13186 (migratory birds)
Executive Order 13112 (invasive plants)
Bald and Golden Eagle Protection Act of 1940 (as amended)
Federal Noxious Weed Control Act of 1974 (as amended)
American Indian Religious Protection Act of 1980
Archaeological Resource Protection Act of 1980
Executive Order 11593 (cultural resources)
Executive Order 11988 (flood plains)
Executive Order 11990 (wetlands)
Executive Order 12898 (environmental justice)