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Shasta-Trinity
National Forest

Shasta McCloud
Management Unit

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Final Environmental Impact Statement

Pilgrim Vegetation Management Project

Elk Flat in the Pilgrim Vegetation Management Project Area

Pilgrim Vegetation Management Project
Final Environmental Impact Statement

Siskiyou County, California

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Abstract: The Environmental Impact Statement considers four alternatives in detail. Alternative 4 is the no action alternative. Alternative 1, the Preferred Alternative, would restore forest health and ecosystem functions by:

- commercial thinning and sanitation harvest on approximately 3,100 acres of overstocked coniferous stands
- sanitation and salvage harvest on approximately 10 acres of knobcone pine
- regenerate approximately 415 acres of diseased and insect infested stands; 15% green tree retention will not be met on approximately 255 of these acres because there are not enough disease-free trees to meet this standard. All regeneration units will be replanted with healthy conifer seedlings
- releasing approximately 20 acres of aspen by removing competing conifers,
- restoring approximately 275 acres of dry meadows by removal of encroaching conifer trees
- underburning approximately 200 acres of natural and activity fuels
- mechanically piling and burning approximately 700 acres of activity fuels
- closing approximately 10 miles of roads to reduce maintenance costs
- decommissioning approximately 2 miles of roads not needed for future management
- reconstructing one road-stream crossing
- construct approximately 0.3 miles of new road needed for present and future management.

Alternative 2 is the same as Alternative 1 except that on approximately 535 acres of proposed thinning/sanitation, canopy closure would be maintained at 60% on average. Alternative 3 is the same as Alternative 1 except that on approximately 415 acres of regeneration harvest, 15% of the area would be retained in trees that are generally the largest and/or oldest trees in the stands even though they are diseased.

Summary

The Shasta Trinity National Forest proposes to restore forest health and ecosystem functions by:

- commercial thinning and sanitation harvest on approximately 3,100 acres of overstocked coniferous stands
- sanitation and salvage harvest on approximately 10 acres of knobcone pine
- regenerate approximately 415 acres of diseased and insect infested stands; 15% green tree retention will not be met on approximately 255 of these acres because there are not enough disease-free trees to meet this standard. All regeneration units will be replanted with healthy conifer seedlings
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The area affected by the proposal includes a portion of the McCloud Flats approximately 6 miles northeast of the town of McCloud, California.

This action is needed because an interdisciplinary team identified several circumstances where the desired conditions described in the *Shasta Trinity National Forest Land and Resource Management Plan*[1] (Forest Plan) differ from the existing condition within the assessment area. Within the project area overstocked stands, insect killed and infested trees and root disease areas are preventing attainment of Forest Plan objectives for forest health, wildlife habitat, and timber growth/yield for matrix and riparian reserve lands. In some areas fuel ladders and surface fuel accumulations exceed Forest Plan standards. Aspen, oak, willow and dry meadow habitat are being lost due to competition with conifers and fire exclusion. There is a higher than desired open road density.

The Notice of Intent (NOI) to prepare this environmental impact statement was published in the Federal Register on February 14, 2005. The NOI asked for public comment on the proposal from February 14 to March 14, 2005. In addition, the agency published new releases in the *Redding Record Searchlight* on February 14, 2005 and the *Mount Shasta Herald* on February 16, 2005. Letters, including a copy of the Notice of Intent and a map of the proposed action, were sent to four environmental groups known to be interested in vegetation management projects on the unit and one private landowner with property adjacent to the project area. This project has also been listed in the *Shasta-Trinity Schedule of Proposed Actions* (SOPA) since January 2004.

[1] USDA Forest Service 1995. *Shasta Trinity National Forest Land and Resource Management Plan*.

The unit has met with both the Winnemem Wintu and Pit River Tribes and presented them each with a copy of the Pilgrim Proposed Action map. Additional public scoping was initiated with a public scoping notice in the *Mount Shasta Herald* and *Record Searchlight* newspapers, on September 21 and 22, 2005 respectively, to request public comment on a proposed non-significant Forest Plan amendment for the green tree retention standard; about 255 acres of the regeneration units would not meet the 15% green tree retention standard due to extensive root disease. In addition, letters requesting comments on the proposed non-significant Forest Plan amendment were mailed to those previously contacted about the action, those persons or groups that expressed interest in the project, and additional persons/groups that may be affected by the project (e.g. permittees, user groups).

The Forest invited the public on two field visits to the project area. Invitations for a field tour on June 25, 2005 were mailed to eight persons or groups that expressed interest in the project (letter dated June 16, 2005). No members of the public turned out for the June field tour. A notice was published in the *Mount Shasta Herald* newspaper on November 2, 2005, inviting the public on a field tour of the project area on November 15, 2005. Additionally, invitations were mailed to persons or groups that expressed interest in the project (letter dated November 1, 2005). Two interested citizens, a timber industry member, California Fish and Game, and the U.S. Fish and Wildlife Service participated in the November tour. Comments made during the tour were supportive of the proposed action. An email was received the day after the tour from a person who could not attend.

Comments received during scoping are found in Appendix B of this document.

As a result of scoping two significant issues were identified:

1. The proposed action could adversely impact critical habitat for the northern spotted owl, including dispersal habitat and forage habitat, by reducing crown closure and harvesting trees greater than 20 inches in diameter at breast height, and by removing and fragmenting habitat in stands to be regenerated. These actions would also reduce habitat for the northern goshawk and other old-growth dependent species, including the late-successional group of management indicator species.
2. The proposed action could adversely impact snag-dependent management indicator species by harvesting existing snags, diseased trees and potential future snags over 20 inches in diameter at breast height.

These issues led the agency to develop alternatives to the proposed action. Alternative 2 would maintain an average 60% canopy closure in all thinning areas where feasible (approximately 535 acres). Alternative 3 would retain 15% of the largest and oldest trees in the regeneration units (approximately 415 acres) even though some of the trees left to meet the 15% retention standard are diseased and would perpetuate root disease in these stands. All other actions for Alternatives 2 and 3 are the same as Alternative 1.

Distribution of the Draft Environmental Impact Statement:

The Notice of Availability of the Pilgrim Vegetation Management Project Draft Environmental Impacts Statement (DEIS) was published in the Federal Register on June 23, 2006. The Legal Notice for Comment was published in the Redding Record Searchlight on June 28, 2006. Copies of the DEIS were mailed to the Federal, State and Local agencies and the publics listed in Chapter 4 of the DEIS on June 19, 2006. The comment period for the DEIS ended on August 7, 2006. Timely comments were received from three environmental groups, one local government agency, one timber company, one tribal group and one individual. A summary of comments received and the Forest Service responses is found in Appendix K.

Major conclusions

Direct, indirect, and cumulative effects are addressed for each resource area potentially affected by the project. As a result of this analysis, the following conclusions were drawn.

Approximately 670 acres of low quality Northern Spotted Owl dispersal Habitat within Critical Habitat Unit CA-2 will be temporarily removed and about 840 acres of low quality dispersal habitat will be temporarily degraded. No nesting, roosting or foraging habitat for the Northern Spotted Owl would be affected. Northern Spotted Owl may be affected but is not likely to be adversely affected. The project area is considered poor habitat for Northern Spotted Owls and none have been found based on surveys and observations over the last fifteen years.

Twenty-one openings totaling approximately 415 acres and ranging in size from 5 to 40 acres would be created on the landscape. These openings would be the result of removing dead and dying trees suffering from insect infestation and root disease. Removal of these diseased trees will remove the disease vector and aid in breaking the disease cycle. Reforestation of these areas will be with a mix of conifer tree species.

Approximately 130 acres of commercial forestland will be dedicated to landings, main skid trails and permanent road construction.

Beneficial effects from the project to forest health include development of open pine stands stocked at sustainable densities that are more resistant to insects, disease and catastrophic wildland fire. Riparian plant species, aspen and oaks will be more abundant and sustainable. Riparian uplands will support healthier trees and contribute to meeting the Aquatic Conservation Strategy Objectives. Acres of open dry meadows will increase and be more representative of historic conditions.

The three action alternatives will provide timber products that will benefit the local and regional economy.

Based upon the effects of the alternatives and comment from the public on the DEIS, the responsible official (Forest Supervisor) will decide whether to approve the Proposed Action or an alternative design that would move the area toward desired conditions, or to not implement the project at this time.

Changes Made to the Final Environmental Impact Statement

The following changes were made to the Final Environmental Impact Statement, Based on comments received on the Draft Environmental Impact Statement and marking done to-date:

- Unit 208 has changed from 40 acres of thinning/sanitation to 40 acres of GTR meeting the 15 percent retention guideline. This increased the acres of regeneration harvest but did not change the effects, since these acres were already part of the 670 acres of Spotted Owl dispersal habitat considered removed.
- The effects to T&E Species were revised to show some minor effects to the Northern Spotted Owl.
- The MIS Section was revised to better meet the forest and regional standards.
- A Purposed and Need Section was added for Road Management.
- The definition of thinning was refined to include removing some dominant and co-dominant trees if needed to meet the desired stocking.
- Public Safety was added as a Design Criteria in the Alternative Section.
- The estimation of snags retained after harvest was increased based on marking to-date that showed none of the existing snags are suitable for harvest.
- Survey information for Goshawks and Pine Martens was included.
- Additional reasons are given in the Hydrology Section for not using the Equivalent Road Acres method for cumulative watershed impacts.
- The Best Management Practices Annual Monitoring results for the past three years were added to the Hydrology Section.
- Adverse effects of No Action were added to the section on Unavoidable Adverse Effects.
- Specific wording and an analysis of the proposed forest plan amendment was added to Chapter 3.
- An Alternative 7 was added to the section on Alternatives Considered but Eliminated from Detailed Study.

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Chapter 1: Purpose of and Need for Action

Document Structure

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

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

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Mount Shasta District Office in Mount Shasta, California. Throughout the analysis, these documents are referred to and incorporated by reference in support of information described.

Footnotes are used throughout the analysis to cite referenced material as well as to provide further information, supporting information, or clarifications.

Introduction

Over the last decade the Forest Service has been monitoring the incidence of black stain and annosus root disease on the McCloud Flats through establishment of plots and field and aerial surveys. In the last three years the incidence of Western Pine Beetle has also been observed and tracked, resulting in a number of salvage sales to reduce long-term ground fuel accumulations and increased fire hazard. The Pilgrim project area has been a known root disease activity zone for several decades and the spread of the disease has become more prevalent in recent years.

As a result of this monitoring, the Shasta-Trinity National Forest proposes vegetation management on approximately 3,800 acres within an 8,500-acre assessment area with the Pilgrim Vegetation Management Project. Project activities were designed to address declining forest health in areas of root disease and overstocking; loss of aspens, willows, oaks, and dry meadows; and increasing fuel loads. The project is about 6 miles northeast of McCloud, California, on the Shasta-McCloud Management Unit (Township 40 North, Range 1 West, Sections 2-5, 7-10, 14-23, 26 and 27; Township 41 North, Range 1 West, Sections 26, 27, and 31-35; and Township 40 North, Range 2 West, Section 12 Mount Diablo Meridian). Please see the attached maps.

Dynamics of the project area

This landscape was shaped by geologic processes (e.g. volcanic eruptions and mudflows) that sometimes occurred at intervals shorter than the maximum lifespan of the trees occupying the areas. Repeated volcanic activity prevented the long-term formation of a mature soil profile, favoring ponderosa pine, shrub, and herbaceous vegetation.

Wildfires were frequent (every 5-15 years), low intensity surface fires. These low intensity fires consumed small conifers and other material, maintaining an open forest stand. Recurrent fires stimulated the bunch grasses.

Early accounts of the area include descriptions of open pine stands. Early explorers describe a large expanse of “desert” or dry meadow in the central McCloud Flats.

Early logging (circa 1885) in the flats removed most of the trees, mainly large old pines. A study in 1907 showed that only 2% of the original vegetation remained in the area after railroad logging. Livestock grazing was unregulated during that time, reducing grasses.

Fire suppression and other practices since then have contributed to conditions departed from the natural disturbance regimes.

(Paraphrased from the *McCloud Flats Ecosystem Analysis* [USDA Forest Service 1995] and November 15, 2005 Field Tour)

Purpose and Need

The need for action was determined by comparing existing conditions in the field with the desired future condition for Management Areas 2 and 3 as described in the *Shasta-Trinity National Forest Land and Resource Management Plan*[2] (Forest Plan) on pages 4-80 to 81 and 4-84 to 85. Existing conditions were identified from extensive field reviews of the project area, computer modeling of wildfire behavior/effects, and interdisciplinary planning.

The majority of the project (93%) is within the matrix land allocation as described in the Forest Plan[3]. The remainder is within the Riparian Reserve land allocation[4]. The project

[2] USDA Forest Service, 1995.
[3] Forest Plan, page 4- 61.
[4] Forest Plan, page 4-53.

area is also located within Designated Critical Habitat for the northern spotted owl.

The interdisciplinary team identified several resource conditions where the desired conditions described in the Forest Plan differ from the existing condition in the planning area. These conditions provide the basis for the proposed action.

These conditions are briefly discussed below. A detailed explanation of the existing and desired conditions relative to the purpose and need are described at the end of this section.

- Overstocked stands, insect infested trees and root disease areas prevent attainment of forest health, wildlife habitat, and timber growth/yield Forest Plan objectives in matrix lands.
- In areas where fuel ladders and surface fuel accumulations exceed Forest Plan standards, the potential for catastrophic fire[5] exists.
- Where trees are overstocked, suffering root disease, and/or fuel levels are increasing from tree mortality in Riparian Reserves, the loss of the forest overstory trees diminishes potential woody debris recruitment for in-stream habitat features needed to detain annual runoff.
- Aspen, oak, willows and dry meadow habitat are being lost due to competition with conifers and fire exclusion.
- High road density with some user created roads that are not needed for forest management.

As a result of the comparison of existing and desired conditions, the following main purposes were identified for the project:

- Improve forest health, growth, and sustainability in matrix and riparian reserves.
- Reduce surface and ladder fuels so that wildfires in forest stands burn mainly with low intensity, without significant watershed impacts or habitat loss.
- Reduce the potential for catastrophic loss of overstory trees from fire, root disease, or insects by improving forest health and reducing fuels to maintain a source of woody debris recruitment for in-stream habitat features within Riparian Reserves.
- Maintain and enhance aspen, oaks, and dry meadow/open pine savannah forest types/plant communities.
- Reduce road density by decommissioning and closing roads not needed for forest management on a regular basis. The next section describes more specifically desired and existing conditions for the area and the needed for action.

[5] Catastrophic and stand replacing are used interchangeably and as used in this analysis mean tree mortality at the stand level through flame contact or radiant heat to tree crowns killing more than 70% of the live crown or intense surface fire that kills the cambium or roots, killing the tree.

Improve Forest Health/Growth

Existing Condition

Each stand within the project area was field examined by a Certified Silviculturist to determine current stand attributes including age, site class, basal area, mortality levels, presence of root disease and stand density. The Northern Province Pathologist, Pete Angwin and Northern Province Entomologist, Dave Schultz were also involved in field examinations to determine the extent and type of root diseases present in the stands proposed for regeneration harvest. Their site specific recommendations were then incorporated into the silvicultural prescriptions[6].

Elevations in the project area range from about 3,800 to 4,000 feet elevation and slopes are generally flat. The project area contains primarily 75-110 year old ponderosa pine (*Pinus ponderosa*) stands and scattered pine plantations, but other conifer species are present including white fir (*Abies concolor*), incense-cedar (*Calocedrus decurrens*), a small stand of knobcone pine (*Pinus attenuata*), and occasionally Douglas-fir (*Pseudotsuga menziesii*) or sugar pine (*Pinus lambertiana*). The most common historical disturbance event was low intensity frequent fires, which maintained open stands of ponderosa pine.

The stands proposed for treatment have been experiencing ponderosa pine mortality from bark beetles in the last three years, as a consequence of root diseases, drought and, overdense growing conditions for the site (overstocking).

Blackstain root disease (*Leptographium wageneri*) infection centers have been recognized in densely stocked ponderosa pine stands in the project area since the early 1970s, and annosus root disease (*Heterobasidion annosum*) centers since 1980.[7] Recurrent drought or less than normal precipitation cycles have occurred in the McCloud Flats area about every 10 years since 1960[8]. During these periods of low precipitation, infected trees incur additional stress. Susceptibility to bark beetle attacks and mortality increases. The resultant mortality areas scattered throughout the project area range in size from approximately ¼ to 5 acres.

Approximately 785 acres of younger forest areas (25-45 year old pine plantations)[9] are overstocked with tree densities ranging from 300 to 400 stems (trees) per acre. Tree diameters in these stands range from approximately 4 - 16” at diameter breast height.

[6] Stand Record Cards in Project File
[7] Freeman, Wilfred, *Biological Evaluation of Tree Mortality on McCloud Flats*, Forest Insect and Disease Management, May, 1977
[8] Dave Schultz, Northern Province Entomologist, Personal Correspondence, August 2005.
[9] Units: All or portions of 3, 4, 5, 23, 24, 25, 30, 67, 68 (C14), 68 (C15), 69,127, 128, 129, 240, 452, 2901, 2902, 3003. Identified as Biomass on the Alternative 1 map.

Approximately 2,235 acres of 75-110 year old pine stands within the proposed thinning areas[10] range from approximately 180-260 square feet per acre of basal area in overstocked areas with corresponding stand density indices in the overstory ranging from 288-416. These stands exceed the maximum stocking levels of 150 square feet/acre of basal area and stand density indices of 230 recommended by research scientists for resistance to insect infestations[11]. These stands are not meeting the Forest Plan objectives regarding resistance to insects and disease or growth. These stands are also experiencing bark beetle mortality as a result of scattered root disease centers, overstocking, and periodic drought.

Root diseases in the Pilgrim Project area

Two types of root disease are affecting pines in the project area including annosus and blackstain. About 3,000 acres have scattered pockets of root disease are in the Pilgrim Creek Snowmobile Park vicinity alone, the majority in the project area. Annosus affects pine species and incense-cedar. A separate variety affects white and red fir. The strain of blackstain in the project area affects only pine species. A separate strain affects Douglas-fir.

Root diseases are caused by pathogenic fungi that interfere with a tree's ability to take up water and nutrients. In addition to killing a tree, root disease can result in growth reduction and increased tree stress that allow insects, primarily bark beetles, to attack and kill trees.

A healthy tree produces abundant resin that pitches out attacking beetles. When trees are moisture stressed, they cannot produce sufficient resin to resist insect attack. Conditions that results in excessive demand for moisture (such as tree crowding) or that reduces the ability of the roots to supply water to the tree (such as root disease) can cause moisture stress and increase susceptibility to bark beetle attack.

Root diseases can spread when healthy pine roots come into contact with inoculum in infected roots or stumps. Mortality can continue as root-to-root contact is made with adjacent healthy trees, creating ever widening pockets of mortality. Infection centers enlarge on the margin at an average annual rate of 2 to 5 feet per year.

Overland infection for annosum is through spores produced by the fungus, which occupy freshly cut stump surfaces. The disease colonizes the stump and major lateral roots where it may remain for 50 years depending on site conditions. Blackstain differs from annosum. Even though the fungus spreads rapidly through the root systems of living trees it does not survive in roots after the tree dies. It survives for a few years at the most in dead tissue.

(Paraphrased from the *Silvicultural Report*, October 14, 2005)

Approximately 40 acres are occupied with 150 year-old mature pine and white fir trees with an understory layer of 50-to-100-year-old white fir/ponderosa pine[12]. Stand densities in areas of overstocking range from 180 to 240 square feet/acre.

Approximately 10 acres are occupied with 70-to-80-year-old dead and dying knobcone pine[13,14], with scattered ponderosa pine and incense-cedar. A manzanita/chinquapin understory

[10] Units: All or portions of 1, 2, 4, 146, 213, 266, 324, 402, 403, 404, 405, 406, 409, 416, 417, 426, 427, 432, 433, 434, 435, 436, 441, 449, 450, 451, 454, 455, 457, 462. Identified as thinning on the Alternative 1 map. All or portions of 207, 208, 230, 231, 423, 424, 425, 443, 444, 447, 448, 463, 464, 467, 502. Identified as thinning/sanitation on the Alternative 1 map.

[11] Oliver and Uzho, 1997. *Maximum Stand densities for Ponderosa pine and red fir and white fir in Northern California*, pg 62-63.

[12] Units: 421, 422, 431.

(2-3 feet tall) occupies most of the stand. There is an increasing potential over time for high intensity wildfire as dead and down knobcone pine continues to accumulate in areas of dense manzanita/chinquapin understory vegetation.

Approximately 415 acres of primarily 95-110 year-old ponderosa pine[15] are experiencing substantial and accelerated tree mortality from disease and associated insect attack. Pockets of dead trees, up to 40 trees per acre in areas, range in size from 1 to 5 acres. Ponderosa pine trees in these stands are infected with blackstain and/or annosus root disease. Bark beetles (e.g. western pine beetle) are killing overstory pine trees weakened by these diseases. Field review in June 2005 showed that the stands are continuing to succumb to western pine beetle attacks, even in root-disease infected areas that were previously thinned (1990)[16] and recently (2005) salvaged. As a result, few healthy or live overstory ponderosa pine trees remain in several of the stands.

Most of the live overstory pine in these stands are exhibiting signs of root disease and are expected to die within 2 to 10 years[17]. Healthy white fir saplings and poles, as well as ponderosa pine saplings and poles (currently exhibiting gall rust disease and likely infected with root disease), comprise the tree understory. Ponderosa pine commonly regenerates in openings in this area. Existing root-disease infected trees will continue to infect these establishing pine trees[18]. Photos 1 and 2 in Appendix A illustrate the condition of these stands.

Desired Condition

Forest stands are healthy and vigorous, consistent with the ecosystem needs of other resources[19]. The natural role of fire, insects and disease, and other components that have a key role in the ecosystem are recognized[20]. Recognizing these ecological processes, the forest is dynamic but resilient to rapid changes in condition, and sustainable over time.

In stands within Management Prescription VIII, tree mortality is minimized within the context of the matrix standards and guidelines[21]. This means that conifer stands should ideally have scattered mortality adequate to meet snag guidelines of 2 snags[22] per acre, but should not have large-scale mortality. Younger stands should have minimal levels of mortality until the average diameter at breast height exceeds 15 inches, the minimum diameter favored by cavity

[13] Knobcone pine is a short-lived tree species. *Botanical and Ecological Characteristics, Knobcone Pine* Pages 1-3.
[14] Unit 407. Identified as knobcone pine sanitation on the Alternative 1 map.
[15] Units: 308, 408, 419, 420, 438, 439, 440, 442, 445, 446. Identified as regeneration harvest on the Alternative 1 map.
[16] Past thinnings retained higher basal areas than are prescribed by research for maintaining healthy pine stands
[17] D. Shultz, Entomologist, Region 5 Forest Service.
[18] Blackstain and annosus root diseases are primary spread by root-to-root contact. Dead trees can continue to serve as vectors for disease spread to healthy trees in the case of annosus. The strains of blackstain and/or annosus that infect pine do not infect white fir.
[19] Forest Plan, p. 4-5
[20] Forest Plan, page 4-80
[21] Forest Plan, p. 4-67
[22] Forest Plan, p. 4-62 refers to an average of 1.5 snags/acre greater than 15 in diameter and 20 feet high. The IDT recommended an average of 2 snags/acre for this project, with the same size criteria minimum.

nesters. The stocking (tree density) of healthy conifer stands is at a level that will allow residual trees to receive full overhead sunlight, and partial sunlight lower in the canopy. A sustained yield of timber and other wood products is available to help support the economic structure of local communities and supply regional and national needs[23].

In stands within Management Prescription VI, maintenance and enhancement of habitat for early and mid-seral stage dependent species (big and small game, upland game birds, and non-game) is emphasized. This generally means that tree densities are relatively low, encouraging greater amounts of understory cover/forage ratios. The landscape within this is a mosaic of openings of early seral stage plants and trees and open mature stands often containing multiple understory layers of trees and shrubs.

Pine stands with basal area stocking of 150 square feet per acre or lower, and Stand Density Indices less than 230, are less susceptible to bark beetles[24], more resilient to natural disturbance processes, and more sustainable over the landscape. Pole size natural stands and plantations are open and average 70 to 110 stems per acre[25].

Actions Needed

- Reduce existing forest stand densities in Prescription VIII areas to levels appropriate for ponderosa pine stands (approximately 100-150 square feet of basal area in thinning/thinning-sanitation[26] areas and approximately 20-25 foot spacing in plantations and biomass areas). This will reduce competition for limited moisture and improve the ability of trees to withstand drought conditions and insect attack in the future. Reduced stocking will improve tree growth and vigor.
- Reduce existing forest stand densities in Prescription VI lands to achieve stocking levels that will allow for the growth of shrubs and forage for early and mid-seral stage dependent species (approximately 100-120 square feet of basal area in thinning/thinning sanitation areas and approximately 20-25 foot spacing in plantations and biomass areas).
- In mature pine/mixed conifer stands thin to maintain and enhance the large tree component in these stands (thin to approximately 140-160 square feet of basal area).
- Remove dead/dying knobcone pine and existing dead and down woody material to reduce current and future fuel accumulations and to reestablish healthy stands by replanting the area with a mix conifer species appropriate to the site.
- Reduce the spread of root disease centers by harvesting dead or dying trees weakened by root disease. Re-establish healthier stands by replanting with a mix of conifer species adapted to the site.

[23] Forest Plan, 4-5
[24] Oliver and Uzho, 1997. *Maximum Stand densities for Ponderosa pine and red fir and white fir in Northern California*, pg 62-63.
[25] Oliver, W. *Growth of Ponderosa Pine Thinned to Different Stocking Levels in Northern California*, USDA Forest Service Research Paper PSW-147, 1979
[26] Sanitation is removal of unhealthy trees that pose a risk to the health of the existing stand

Reduce Surface and Ladder Fuels

Existing Condition

The Hazard/Risk Analysis for McCloud Ranger District shows the Pilgrim project area in a moderate fire hazard rating[27] and a high fire risk category[28]. The current fire regime[29] is one of moderate to high intensity at infrequent intervals and generally characterizes fast spreading, high intensity fires under worst case scenarios[30], which substantially depart from the historical regime.

Understory tree conditions create a fuel ladder from the ground into the forest canopy in areas within pine plantations and pine stands, including the mature pine stands. Fuel ladders, combined with accumulations of surface fuels (in some areas 20-40 tons per acre) throughout the area, have increased the risk of stand-replacing wildfire, where this occurs. Concentrations of surface fuels have developed in areas that have western pine beetle- and root disease -related conifer mortality and the knobcone pine stand. Fuel loadings in areas of conifer mortality range from 45 to 50 tons per acre[31]. Units treated in the last 5-14 years not experiencing accelerated deterioration have fuel loadings ranging from 5-30 tons per acre.

If a fire were to occur under 90th percentile (severe) fire weather conditions, the majority of the project area would exhibit flame lengths of over 6 feet from surface fuels alone with rates of fire spread over 700 feet per hour (11 chains per hour)[32]. With flames lengths from 4 to 8 feet, fires are too intense for direct attack at the head of the fire by firefighters with hand-tools. Hand-line cannot be relied on to hold the fire[33]. Uncontrolled wild fire may lead to a stand-replacing event in many units[34].

Desired Condition

The combination of surface, ladder, and crown fuels result in predicted fire behavior that is not likely to destroy forest stands[35]. Stand understories are open with less ingrowth particularly in stands on sites where wildfire plays a key role in stand development[36]. Fuel loadings average approximately 5 to 10 tons per acre[37] so that fire flame lengths with 90th percentile fire weather conditions do not exceed 1.5 to 2 feet.

Crown fire initiation

The initiation of a crown fire is a function of surface fire intensity and paramaters of the tree crown (surface fuel loadings, tree densities, and the distance between surface fuels and the live tree crown). It is the combination of these elements that contribute to expected fire behavior and wildfire effects on a stand.

[27] Vegetation condition and the contribution to fire behavior.
[28] Potential for ignition based on historical records for area; 1.5 fires per thousand acres per decade.
[29] A fire regime is a generalized description of the role fire plays in an ecosystem (Skinner and Agee, Hans and Brunell et al).
[30] Based on District historical records dating back approximately 100 years.
[31] BehavePlus, Version 3.0, modeling.
[32] BehavePlus, Version 3.0, modeling.
[33] *NWCG Fireline handbook.*
[34] Behave Plus, Version 3.0, modeling.
[35] Forest Plan, pages 4-81 and 4-85.
[36] Forest Plan, pages 4-80 and 4-84.
[37] Forest Plan, page 4-67, Appendix G-12.

At this level of intensity, uncontrolled wildfire would likely not be a catastrophic stand-replacing event. Treatments would replicate the natural role of fire in the ecosystem[38] (mainly low intensity, frequent surface fires).

Actions Needed

Reduce fuel ladders and to reduce excess surface fuels to 5-10 tons/acre so that the likelihood of uncontrolled wildfire is reduced and does not become a catastrophic stand-replacing event.

Prevent Catastrophic Loss of Forest Overstory Trees in Riparian Reserves

Existing Condition

Within treatment units, some areas within riparian reserves are overstocked and/or suffering root disease, which is leading to tree mortality and loss of the overstory trees. Overstory trees are potential woody debris recruitment source within Riparian Reserves. In areas within reserves, fuel levels are increasing or will increase from tree mortality, threatening the loss of forest overstory and woody debris recruitment for in-stream habitat features needed to detain annual runoff. Approximately 230 acres of Riparian Reserve occur within treatment units[39].

Desired Condition

Forest conditions in riparian reserves are sustainable for the site, including resilience to natural ecological processes[40], such as wildfire, drought, insects, and disease. Basal area and fuel levels conditions would be the same as the uplands, described previously. Forest overstory trees are maintained to provide woody debris recruitment to streams[41]. Intermittent streams receive natural woody debris recruitment at a rate that maintains in-stream habitat features within Riparian Reserves that are needed to detain annual runoff.

Actions Needed

Reduce stand densities and the spread of root disease to improve forest health conditions and reduce potential fuels loads, to maintain persistence of overstory forested stands (basal area and fuel levels conditions would be the same as the uplands).

[38] Forest Plan p. 4-18.
[39] Units 23, 68, 128, 129, 230, 240, 305, 308, 401, 402, 406, 411, 412, 424,425, 426, 427, 431, 449, 450, 451, 454, 457, 463.
[40] Forest Plan, page 4-53 and 4-59.
[41] Forest Plan, page 4-53 and 4-59.

Maintain Hardwoods and Dry Meadows

Existing Condition

The unique forest types and plant communities in the project area are quaking aspen (*Populus tremuloides*), California black oak (*Quercus kelloggii*), Willows (*Salix* spp.) and historic dry meadows/open pine savannahs (Elk and Coonrod flats). Aspen occurs as scattered groups of cloned individuals from a common root. Oak occurs as very scattered individual trees. Willows occur occasionally along some stream channels. Aspen willow and oak occurrence has declined over time, mainly due to conifer encroachment and competition[42]. Approximately 20 acres of aspen stands[43] are identified within the assessment area that have suppressed growth and are at risk of being lost because of competition with adjacent conifer trees. Scattered pockets of black oak and willow throughout the project area are being overtopped by conifers and are being lost from competition with adjacent conifers.

Historic dry meadows are being encroached with dense thickets of conifer trees[44]. These dry meadows have been reduced to a small proportion of their historic occurrence. Aerial photo interpretation using photos from 1944 to 1998 show a reduction of the meadow areas of both Elk Flat and Coonrod Flat. In 1944, Elk Flat was about 900 acres and by 1998 the meadow had decreased to about 400 acres. Similarly, Coonrod Flat was about 1,300 acres in 1944, and by 1998 the meadow area had decreased to 200 acres[45].

Desired Condition

Unique hardwood and dry meadow/open pine savannah plant communities are progressing toward or occur similar to their historic niche and contribute to the biological diversity of the area[46]. Oaks are healthy and seedlings are evident. Aspens are healthy and vigorous and new clones are establishing. Dry meadows and pine savanna are open, similar to historic conditions, and provide habitat for early seral stage wildlife[47]. Fire is reintroduced. In addition this type is classified as fuel model 2, and has low anticipated fire intensity.

Actions Needed

Maintain and improve the vigor of any existing aspen groups, and any oak trees, by reducing conifer encroachment. Remove competing conifers from around identified aspen stands to allow for improved health and vigor of the aspen (measured by an increase in sprouting) and provide room for aspen stands to expand. The very limited aspen component of this area is valuable for

[42] *McCloud Flats Ecosystem Analysis*, page 25.
[43] Unit 902 and scattered small aspen areas. Identified as Aspen Release on the Alternative 1 map.
[44] Units 401, 458, 459, 460. Identified as Dry Meadow Restoration on the Alternative 1 map.
[45] Mangels, Francis; Wildlife Biologist, "*Elk Flat and Coonrod Flat, Analysis of Ecological Succession and Recommendations for Management Report*" January 2002
[46] Forest Plan page 4-4, 4-6, 4-66, L-8.
[47] Forest Plan, page 4-81.

wildlife forage and general diversity. There is a need to remove competing conifers from around black oaks to reestablish the vigor of the black oak.

Restore dry meadow and open pine savannah systems to more historic conditions. Remove dense conifers from historic dry meadows at Coonrod Flat and Elk Flat to reestablish and maintain their open dry meadow and pine savannah character.

Road Management

Existing Condition

Currently within the Pilgrim Project Assessment Area there are about 51 miles of classified road about 4 miles of unclassified low standard roads. Together, these roads equate to a relatively high road density of about 4.1 miles per square mile.

There are some roads that may affect a traditional cultural gathering site at Coonrod Flat.

There some areas identified for harvest that were beyond the normal maximum ¼ mile skid distance.

There are several road crossings that are contributing sediment to intermittent streams.

Desired Condition

Retain roads on the forest transportation system that are needed for future activities such as forest health, timber management, recreation, fire protection, recreation management, mining, wildlife and range.[48] Analyze non-inventoried (unclassified) roads to determine whether they should be added to the transportation system or obliterated as time and funding allows.

Actions Needed

A Roads Analysis completed as part of the planning process for this project recommended:

- Close approximately 10 miles of roads not needed on a regular basis for management activities to reduce maintenance costs.
- Decommission approximately 2 miles of roads not needed for future management.
- Construct approximately 0.3 miles of road to facilitate timber management.
- Reconstruct one stream crossing to reduce sediment delivery.

Proposed Action Summary

The actions listed below are proposed by the Shasta-Trinity National Forest to meet the purpose and need. Please refer to the Alternative 1 map for locations.

- commercial thinning and sanitation harvest on approximately 3,100 acres of overstocked coniferous stands (2235 acres of existing forests, 785 acres of plantations and 40 acres of mature pine stands)
- sanitation and salvage harvest on approximately 10 acres of knobcone pine

[48] Forest Plan, page 4-17

- regenerating approximately 415 acres of diseased and insect infested stands; 15% green tree retention will not be met on approximately 255 of these acres because there are not enough disease-free trees to meet this standard. All regeneration units will be replanted with healthy conifer seedlings
- releasing approximately 20 acres of aspen and oaks by removing competing conifers,
- restoring approximately 275 acres of dry meadows by removal of encroaching conifer trees
- underburning approximately 200 acres of natural and activity fuels
- mechanically piling and burning approximately 700 acres of activity fuels
- closing approximately 10 miles of roads to reduce maintenance,
- decommissioning approximately 2 miles of roads not needed for future management
- reconstructing one road-stream crossing and
- construct approximately 0.3 miles of new road needed for present and future management.

The proposed action is described in more detail in Chapter 2 under Alternative 1.

Decision Framework

The Forest Supervisor will decide whether to implement the proposed action as described, select an alternative action that meets the purpose and need, or take no action at this time. A non-significant Forest Plan amendment regarding the green-tree retention standard and guideline[49] is part of this decision to address deteriorating forest conditions in large areas of dead and dying trees in root disease centers.

Forest Plan Direction

The project is guided by management direction found in the *Shasta-Trinity Land and Resource Management Plan*, which incorporated the *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (Northwest Forest Plan[50], as amended[51]). Management direction for the Forest includes four

[49] To retain patches and single trees of at least 15% of the largest, oldest live trees, decadent or leaning trees, and hard snags of each regeneration unit. These elements should be protected (retained) for multiple rotations to provide support for those organisms that require old forests. *Shasta-Trinity National Forest Land and Resource Management Plan*, page 4-61.
[50] USDI Bureau of Land Management and USDA Forest Service, 1994.
[51] Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standard and Guidelines on January 12, 2001 (USDA Forest Service and USDI Bureau of Land Management 2001), the *Record of Decision To Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines* on March 22, 2004 (USDA Forest Service and USDI Bureau of Land Management 2004), and the *Record of Decision Amending Resource Management Plans for Seven Bureau of Land Management Districts and Land and Resource Management Plans for Nineteen National Forests Within the Range of the Northern Spotted Owl* on March 22, 2004 (USDA Forest Service and USDI Bureau of Land Management 2004a). The latter two Record of Decisions became effective April 21, 2004.
[51] The *Record of Decision to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines* is under litigation filed on April 13, 2004 in the Western District of Washington.

integrated levels: 1) Forest-wide direction, 2) Land allocations and standards and guides from the Northwest Forest Plan, 3) Management Prescription direction, and 4) Management Area direction.

Ninty-three percent of the National Forest lands within the 8,500-acre Pilgrim assessment area are designated as Matrix in the Forest Plan[52]. Matrix lands are further defined by management prescriptions. Approximately 80% of the matrix lands are within prescription VIII, Commercial Wood Products Emphasis[53]. Approximately 13% is within prescription VI, Wildlife Habitat Management[54]. Both of these prescriptions provide for timber and road management. Prescription VIII lands emphasizes intensive timber management[55]. Prescription VI lands permit modified timber management in order to achieve wildlife habitat objectives primarily for species dependent on early and mid-seral stages[56]. The assessment area is within the McCloud Flats (Management Area 2) and Mount Shasta (Management Area 3) Management Areas.

Approximately 7% of the National Forest lands within the assessment area are within the Riparian Reserve designation[57]. Approximately 600 acres of Riparian Reserve are found along Ash Creek, Trout Creek, Swamp Creek, Pilgrim Creek and Dry Creek within the assessment area. The Forest Plan standards and guidelines for timber management in Riparian Reserves allow for the application of salvage and silvicultural practices in Riparian Reserves when they are needed to control catastrophic events, control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives[58].

The area was evaluated for management needs in the *McCloud Flats Ecosystem Analysis*[59]. This analysis recommended opportunities for management of timber and roads within the project assessment area. Pertinent recommendations include "maintaining a steady flow of wood products through commercial thinning and salvage to maintain forest health and biodiversity,"[60] and harvest and regeneration where stands are substantially damaged or endangered by root diseases or insect-caused mortality.[61] This analysis also recommended salvage and thinning activities in Riparian Reserves if conducted with consideration toward achieving the objectives of the Aquatic Conservation Strategy[62].

The assessment area is within a Critical Habitat Unit (CA-2) for the Northern Spotted Owl. The Northwest Forest Plan recognized that forest management would occur within Critical Habitat[63]. The U.S. Fish and Wildlife Service was consulted during project development[64].

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[52] Forest Plan, page 4- 61.
[53] Forest Plan, page 4-67
[54] Forest Plan, page 4-66
[55] Forest Plan, page L-6
[56] Forest Plan, page L-7
[57] Forest Plan, page 4-53.
[58] Forest Plan, page 4-54
[59] McCloud Flats Ecosystem Analysis, September 1995.
[60] McCloud Flats Ecosystem Analysis, September 1995, page 88
[61] McCloud Flats Ecosystem Analysis, September 1995, page 88
[62] (Flats Ecosystem Analysis, 1995; last amended February 2004)
[63] McCloud Flats Ecosystem Analysis, September 1995, p. 19. Northwest Forest Plan, p. A-3.
[64] *Biological Assessment*, November 2005.

The *McCloud Flats Ecosystem Analysis* evaluated the Critical Habitat Unit, consistent with Northwest Forest Plan direction[65]. The value of critical habitat was described as low because of the high fragmentation and natural features (lava reefs, dry open flats and sinks) that limit dispersal[66]. It described the potential value of the Critical Habitat Unit as moderate to low because some land will not provide forest with the crown canopy needed for owl dispersal (coarse soils and lava reefs do not support 40% canopy forest, root disease centers near Mud Creek continually open up the canopy of trees through tree mortality).

Public Involvement/ Issue Identification

This project has been listed in the *Shasta-Trinity Schedule of Proposed Actions* (SOPA) since January 2004. The Notice of Intent (NOI) to prepare an environmental impact statement was published in the Federal Register on February 14, 2005. The NOI asked for public comment on the proposal from February 14 to March 14, 2005. In addition, as part of the public involvement process, the agency published new releases in the *Redding Record Searchlight* on February 14, 2005 and the *Mount Shasta Herald* on February 16, 2005. Letters, including a copy of the Notice of Intent and a map of the proposed action, were sent to four environmental groups known to be interested in vegetation management projects on the unit and one private landowner with property adjacent to the project area. Eleven written responses and two telephone responses were received. (See Appendix B for Response to Comments and Issue Identification).

The unit has met with both the Winnemem Wintu and Pit River Tribes and presented them each with a copy of the Pilgrim Proposed Action map. Some tribal members visited the project area in the spring and summer of 2005.

Biologists with the U.S. Fish and Wildlife Service (Red Bluff Field Office) visited the Project area twice in October 2004 and discussed the proposed actions with the team.

Additional public scoping was initiated with a public scoping notice in the *Mount Shasta Herald* and *Record Searchlight* newspapers, on September 21 and 22, 2005 respectively, to request public comment on a proposed non-significant Forest Plan amendment for the green tree retention standard[67] because many regeneration harvest stands would not meet the 15% green tree retention standard. Letters requesting comments on the proposed amendment were mailed to those previously contacted about the action, those persons or groups that expressed interest in the project, and additional persons/groups that may be affected by the project (e.g. permittees, user groups). Three letters and one telephone call were received as a result of this scoping.(See Appendix B for a summary of these comments)

The Forest invited the public on two field visits to the project area. Invitations for a field tour on June 25, 2005 were mailed to eight persons or groups that expressed interest in the project (letter dated June 16, 2005). No members of the public turned out for the June field tour. A notice was published in the *Mount Shasta Herald* newspaper on November 2, 2005, inviting the public

[65] USDI Bureau of Land Management and USDA Forest Service, 1994. p. A-3.
[66] McCloud Flats Ecosystem Analysis, September, 1995.
[67] Forest Plan pages 4-61 and 4-62.

on a field tour of the project area on November 15, 2005. Additionally, invitations were mailed to persons or groups that expressed interest in the project (letter dated November 1, 2005). Two interested citizens, a timber industry member, California Fish and Game, and the U.S. Fish and Wildlife Service participated in the November tour. Comments made during the tour were supportive of the proposed action. An email was received the day after the tour from a person who could not attend.

Public scoping is integral to the environmental analysis process. Comments in response to scoping are used to determine the range of actions, alternatives, and impacts to be considered in an analysis, as well as to identify significant issues related to a proposed action. Issues are points of discussion, dispute, or debate about the environmental effects of proposed actions. Using the comments from the public the interdisciplinary team and District Ranger identified two significant issues. A list of comments, issue determination, and response to comments can be found in Appendix B.

Significant Issues

1. The proposed action could adversely impact critical habitat for the northern spotted owl, including dispersal habitat and forage habitat, by reducing crown closure and harvesting trees greater than 20 inches in diameter at breast height, and by removing and fragmenting habitat in stands to be regenerated. These actions would also reduce habitat for the northern goshawk and other old-growth dependent species, including the late-successional group of management indicator species.

Unit of measure

Acres of dispersal and forage habitat degraded. Acres of habitat removed. Acres of forest resistant to insect attack over time.

2. The proposed action could adversely impact snag-dependent management indicator species by harvesting existing snags, diseased trees and potential future snags over 20 inches in diameter at breast height.

Unit of measure

Estimated snags/acre removed (compared to remaining snags) and estimated snag recruitment.

Distribution of the Draft Environmental Impact Statement

The Notice of Availability of the Pilgrim Vegetation Management Project Draft Environmental Impacts Statement was published in the Federal Register on June 23, 2006. The Legal Notice for Comment was published in the Redding Record Searchlight on June 28, 2006. Copies of the DEIS were mailed to the Federal, State and Local agencies and the publics listed in Chapter 4 of the DEIS on June 19, 2006. The comment period for the DEIS ended on August 7, 2006. Timely comments were received from three environmental groups, one local government agency, one

timber company, one tribal group and one individual. A summary of comments received and the Forest Service responses is found in Appendix K.

Chapter 2: Alternatives

Introduction

This chapter describes and compares the alternatives considered for the Pilgrim Vegetation Management Project. It describes alternatives considered in detail and those eliminated from detailed study. Reasonable alternatives were explored and objectively evaluated as well as those alternatives eliminated from detailed study (40 CFR 1502.14). The end of this chapter presents the alternatives in tabular format so that the alternatives and their environmental impacts can be readily compared.

Alternatives Considered in Detail

Alternative 1: Preferred Alternative

Vegetation management is proposed on approximately 3,800 acres within an 8,500-acre assessment area. Forest Service crews, service contracts, and/or commercial timber sales may implement these actions.

All timber harvest would use feller/bunchers and and chainsaws to cut trees designated for removal and whole tree ground skidding to landings. At the landings, cut trees are either chipped and removed or cut to sawlog lengths and removed. Sporax will be applied to all stumps 14” and larger within four hours of being cut unless weather conditions delay application. Harvest operations will take from 2 to 3 years to complete, with possible contract extensions if deemed appropriate.

Following completion of all timber sale contract requirements and close of the contract, subsequent actions can take place. Regeneration harvest units will be evaluated for the need to pile and burn residual slash. After any necessary site preparation, conifer seedlings will be hand planted at about 300 trees per acre. Planted seedlings will consist of Ponderosa pine in open areas and a mix of species in more shaded areas. Areas that were thinned will be evaluated for meeting fuel loading standards and cleared of any excessive slash and woody debris if necessary. Underburning and proposed road closures and decommissioning would also occur from 1 to two years after the close of the timber sale contract.

This alternative is responsive to the Purpose and Need for Action. If approved, the actions are proposed to begin within one year of issuing the decision for this project.

All acreage figures are estimates that are generally plus or minus 10%. Acreages have been refined during the planning process and may again change slightly as field layout is completed. Please refer to the Alternative 1 maps for locations and treatments. Refer to Appendices C and D for a unit-by-unit and road-by-road summary of activities. Stand specific prescriptions are part of the project record.

Forest Health/Growth Management

Biomass Thinning

On approximately 785 acres of 25-45 year old pine stands, thin to a spacing of approximately 20-25 feet. About 90% of these stands are older plantations. The resulting product will be primarily wood chips. About 25 of the 785 acres are within Riparian Reserves.

Thinning

On approximately 1,200 acres of 75-95 year old pine stands, remove trees that are recently dead or dying from insects, root disease and/or drought. In remaining overstocked areas thin to a density of approximately 120-150 square feet per acre basal area. Regeneration needs due to past and present tree mortality will be evaluated post harvest and if necessary areas larger than 1 acre in size would be planted. Thinning will remove trees in all size and crown classes with emphasis on removal of suppressed and intermediate crown class trees. Some dominant and codominant crown class trees may be removed to attain the prescribed basal area.
About 55 of the 1,200 acres to be thinned are within Riparian Reserves.

Thinning/Sanitation

On approximately 1,035 acres of 75-110 year old pine stands which are currently experiencing more mortality than the "thinning" stands, remove trees that are recently dead or dying from insects, root disease and/or drought and then thin any remaining overstocked areas to a density of approximately 100-120 square feet per acre basal area. Regeneration needs due to past and present tree mortality will be evaluated post harvest and if necessary areas larger than 1 acre in size would be planted.

The thinning/sanitation prescriptions include the removal of predominantly suppressed and intermediate crown class trees and diseased or damaged trees to concentrate growth on the residual trees and decrease competition for resources. The objective is to concentrate growth on the residual trees in the stand with the best ability to respond to less competition. These trees have larger crowns and a greater capacity to photosynthesize and increase crown size as more light reaches the full crown. Some dominant and codominant crown class trees may be removed to attain the prescribed basal area.

About 65 of the 1,035 acres are within Riparian Reserves.

Mature Stand Thin

On approximately 40 acres, thin two-storied stands (50 to 100 year old fir/pine and 150 year old pine/white fir) to reduce understory ladder fuels , inter-tree competition, and maintain older trees, especially pines. About 6 acres of the 40 acres are within Riparian Reserves. See Residual Fuels/reintroduction of fire below for underburning in these stands.

Knobcone Sanitation

Remove dead and dying knobcone pine on approximately 10 acres. Tractor pile and burn residual slash and brush and re-plant with ponderosa pine and incense-cedar.

Regeneration Harvest

Harvest and re-plant approximately 415 acres of 95-110 year old Ponderosa pine stands suffering from root disease and bark beetle mortality. Diseased trees that have chlorotic foliage, ragged and fading crowns, poor needle retention and/or evidence of successful insect attacks will be removed. If available, retain 15 percent of healthy and full crowned overstory trees. All species other than pine will be favored as leave trees as their long term viability will be greater. Retention areas should include the largest, oldest (where available) and healthiest live trees, decadent or leaning trees and hard snags occurring in the unit. Leave all healthy white fir, incense-cedar, sugar pine, Douglas-fir and black oak. Tractor pile (brush rake) and burn residual slash. Re-plant with mixed species in shaded areas, ponderosa pine in open areas.

In pine stands where there are few healthy or live overstory pine trees, the Forest Service is not able to meet the Forest Plan green-tree retention standard and guideline to retain patches and single trees of at least 15% of the largest, oldest live trees, decadent or leaning trees, and hard snags within each regeneration unit if all of the diseased trees are removed[68,69]. Currently, this condition exists on about 255 acres. In these stands, a site-specific (this project), non-significant Forest Plan amendment is proposed. This amendment would allow the Forest Service to deviate from the 15% green tree retention minimum where there are not enough healthy pine trees to meet that standard.

For Pilgrim Vegetation Management Project regeneration harvest treatment units 14-408,419,420,438,439,440 & ,442, 15-208, 16-461 & 466, 8-411,412,413,41 & ,415 the largest healthiest ponderosa pine trees and all other conifer species will be retained. To adequately control the annosus and black stain root infection, less than15 percent of the area associated with these cutting units can be retained. These stands will retain between 5 and 10 percent of the healthiest commercial size trees for the green tree retention standard.
Specific measures for green tree retention and snag retention follow. These measures are to be applied to the treatment units listed above for implementation of this project, only. Upon completing the Project the 1995 Forest Plan standard and guide will apply to these treatment units.

1. Retain healthy green trees up to 15 percent of the area associated with each cutting unit (stand). It is estimated the less than 15 percent of the area will be retained due to existing mortality and treatment needs to control the root disease.

[68] Forest Plan, page 4-61.
[69] These elements should be protected (retained) for multiple rotations to provide support for those organisms that require old forests (*Shasta-Trinity National Forest Land and Resource Management Plan*, page 4-61). Root diseased pine trees are not expected to persist more than about 2-10 years as living trees, and about 5-10 years as standing snags (D. Schultz, Entomologist, Region 5, Forest Service).

2. Trees will be retained as individuals and patches where feasible to meet project objectives.
3. As a minimum, snags will be retained within these harvest units at 2.0 per acre or more greater than 15 inches in diameter and 20 feet in height.

About 55 of the 415 acres are within Riparian Reserves. About 6 acres of these 55 acres will not meet the 15 percent retention standard.

Forest Fuels Management

Activity Fuels

Up to 700 acres of slash resulting from timber sale activity will be treated post harvest by piling and burning or burning slash concentrations ("jackpot" burning).

Reintroduction of fire

Underburning is proposed on approximately 200 acres in areas of units, 421, 422 (mature thinning stands) and 401,458, 459, and 460 (dry meadow restoration stands).

Fuel Ladders

All thinning prescriptions are designed to remove the ladder of continuous fuels by thinning smaller trees.

Hardwood Management

Release aspen from conifer competition on approximately 20 acres by removing conifers within 100-150 feet of aspen. Remove competing conifers from within 30 to 50 feet of black oaks where they are found in harvest units.

Dry Meadow Restoration

On approximately 275 acres of historic dry meadow areas, remove small diameter (4-14[70] inch in diameter at breast height) conifers and thin the remaining overstory trees to 80 square feet/acre of basal area to restore the openness of these dry meadow areas. About 22 acres of the 275 acres are within Riparian Reserves. See also Residual fuels/reintroduction of fire above for underburning in the dry meadow units.

Road Management[71]

Following harvest and fuels treatments approximately 10 miles of existing roads will be closed with either guardrail barricades or earth berms[72]. An additional 2 miles of existing roads will be

[70] 1-4" material will be left in place and either lopped and scattered or burned for incorporation into the soil.
[71] As recommended in the Pilgrim Project Roads Analysis of April, 2005
[72] About 6.8 miles of classified (roads part of the inventoried forest road system that have road maintenance and traffic service levels assigned to them) roads and 3.3 miles of unclassified roads (low standard roads, often built by forest users, not part of the official forest road system).

decommissioned and removed from the forest road system[73]. Approximately 0.3 miles of new road construction will be needed to reduce skidding distance in one harvest unit (15-443). Short lengths of temporary spur road may be constructed to minimize skidding distances (See Proposed Road Activities Map and Appendix D).

Alternative 2: Proposed Action modified to retain an average 60% canopy cover

This alternative is responsive to significant issue 1 by retaining greater canopy closure (average 60%), where possible, for retention of dispersal habitat for the Northern Spotted Owl and other species needing higher canopy closure. Sixty percent canopy closure for this issue is defined as 200 square feet per acre basal area.

This alternative proposes the same actions as Alternative 1, with the following exceptions:

On approximately 535 acres[74], thin to retain a density of 200 square feet per acre basal area, which approximates 60% canopy cover. Removal of trees that are dead or dying from insects, root disease and/or drought is still proposed, as long as an average 60% canopy closure is retained.

Please refer to the Alternative 2 map for treatment locations.

Alternative 3: Proposed Action modified to maintain 15% green tree retention in regeneration harvest units

This alternative is responsive to Forest Plan direction to retain patches and single trees of at least 15% of area with, to the extent possible, the largest, oldest live trees, decadent or leaning trees, and hard snags of each regeneration unit[75, 76]. It is also responsive to an alternative suggested by the public that requested the Forest Service meet the 15% green tree retention standard and guideline. This alternative proposes the same actions as Alternative 1, with the following exceptions:

Instead of harvesting and re-planting 415 acres of 95-110 year old ponderosa pine stands suffering from root disease and bark beetle mortality and removing all diseased trees that have chlorotic foliage, ragged and fading crowns, poor needle retention and/or evidence of successful insect attacks (stands that were proposed for regeneration harvest in Alternative 1), the following is proposed:

Regeneration Harvest with 15% green tree retention

Harvest and re-plant approximately 415 acres of 95-110 year old Ponderosa pine stands suffering from root disease and bark beetle mortality. Retain at least 15% of the area associated with each cutting unit (stand) in patches and single trees of the largest, oldest live trees, decadent or leaning

[73] About 0.8 miles of classified and 1.3 miles of unclassified road.
[74] Areas above 60% canopy closure now.
[75] Forest Plan, page 4-61.
[76] These elements should be protected (retained) for multiple rotations to provide support for those organisms that require old forests (Forest Plan, page 4-61).

trees, and hard snags(to the extent possible). Removal of diseased trees that have chlorotic foliage, ragged and fading crowns, poor needle retention and/or evidence of successful insect attacks is still proposed, as long as at least 15% of the largest, oldest live trees, decadent or leaning trees, and hard snags are retained to the extent possible. Leave all healthy white fir, incense-cedar, sugar pine, Douglas-fir and black oak. Tractor pile (brush rake) and burn residual slash. Re-plant with mixed species in shaded areas, and ponderosa pine in open areas.

Please refer to the Alternative 3 map for treatment locations.

Alternative 4: No Action

This alternative would result in none of the proposed management activities being implemented within the project area at this time. Conditions would remain as described in the affected environment section of this document. The analysis of the no action alternative provides reviewers a baseline to compare the magnitude of environmental effects of the action alternatives.

This alternative is responsive to the 20-inch diameter limit on tree removal and canopy cover retention as discussed in significant issues 1 and 2.

Table 1. Summarizes actions and acres or miles listed for each alternative

Activity	Alternative			
	1 (approx. units)	2 (approx. units)	3 (approx. units)	4 (approx. units)
Biomass Thinning Acres	785	785	785	0
Standard Thinning Acres	1200	700	1200	0
Thinning/Sanitation Acres	1035	1000	1035	0
Thinning to retain average 60% canopy closure Acres	0	535	0	0
Mature Stand Thinning Acres	40	40	40	0
Knobcone Sanitation Acres	10	10	10	0
Regeneration harvest Acres	415	415	415	0
Meet 15% GTR Standard	160	160	415	0
Fuels Treatment Acres - underburn	200	200	200	0
Fuel Treatment Acres – tractor pile and burn/burn slash concentrations	700	700	700	0
Aspen Release Acres	20	20	20	0
Dry Meadow Restoration Acres	275	275	275	0
Road Closure Miles	10	10	10	0
Road Decommissioning Miles	2.0	2.0	2.0	0
New Road Construction Miles	0.3	0.3	0.3	0
Temporary Road Construction Miles	0.5	0.5	0.5	0

* (See Appendix C for Treatment Acres by Unit and Type)

Design Criteria Common to All Action Alternatives

The interdisciplinary team identified the following design criteria to minimize or eliminate potential environmental effects. Standard operating procedures, like protection of land survey monuments, are not listed here, as they are routine administrative practices. The following design criteria are common to all action alternatives:

1. Wildlife and wildlife habitat

- Retain, where feasible[77], an average of 2 to 3 snags per acre meeting the minimum requirements of 15 inches in diameter at breast height and at least 20 feet in height.
- Maintain, where feasible, an average 5 tons per acres of coarse woody debris, a portion of which is in the form of 4 to 6 logs per acre meeting minimum requirements of over 10 feet long at the largest available diameter.

[77] Where snags or logs of this size exist and except for instances where snags must be felled for safety.

2. Soils resources

- Where compaction exceeds threshold, described in the soils report, landings and skid trails (within approximately 200 feet of landings) will be treated with a tractor and winged subsoiling device to increase soil porosity.

3. Protection of water quality

- Implement all Best Management Practices (Appendix E).
- Exclude skidding equipment for 20 feet extending outward from the stream bank or inner gorge in all Riparian Reserves. Minimize soil disturbance in Riparian Reserves by requiring directional felling and minimizing turning of harvest equipment.
- When watering roads for dust abatement, adhere to the following rules:[78] Allow drafting from creeks provided that sufficient water quantity and quality is maintained to support associated wildlife species and riparian values. Never allow drafting to remove more than 50 percent of any stream discharge at the time of drafting. Establish alternative water sources when drafting needs would remove more than 50 percent of any stream discharge.

4. Visual Quality Objectives

- New landings will be located out of sight of Pilgrim Creek road where ever possible.
- All tree stumps within 150 feet of Pilgrim Creek Road and the Snowmobile Park will be cut to leave a tree stump height no greater than 6 inches. If a landscape feature obstructs the view between the road and the 150-foot boundary, treat the stumps only to the feature. Remove slash within 150 feet of the Snowmobile Park.

5. Noxious Weeds

- The Standard B Provision, Equipment Cleaning, will be included in all contracts.
- Heavily disturbed soils (e.g. landings, main skid trails) will be seeded with native grass and forb seeds to discourage occupation by noxious weeds.
- Old landings that will be used for this project and are known to have populations of bull thistle will be cleared prior to flowering, generally July, to reduce the spread of seed by equipment.
- Annual weed monitoring of the project area will be conducted for three seasons after project completion. Monitoring and hand pulling will be done concurrently.

6. Insects and Disease

- All cut stumps over 14 inches in diameter and larger will be treated with Sporax within four hours of stump creation to prevent the spread of root disease. Application of Sporax will follow all State and Federal rules and regulations as they apply to pesticides (See Appendix J, Borax Report for the Pilgrim Project). Sporax will be not be applied within 20 feet of running water.

[78] Forest Plan, page 4-25.

7. Recreation Facilities in Unit 421

- Do not allow skidding across paved surfaces to prevent damage to the edge of the asphalt surface unless no other route is available.
- Do not allow landings within 250 feet of any improvement on the north side of the parking area for visual purposes. Existing landings on the north side of the parking lot from previous sales can be utilized.
- Designate a landing on the south side of the parking lot to minimize skidding across paved surfaces. An opening on the southwest corner of the storage/utility building is recommended. Access to this landing can be by utilizing the paved drive on the west end of the building. Minimize the size of this landing to retain as much of the existing stand/trees.
- Close the Snowmobile Park to public access for safety during operations in this unit[79].
- Utilize a "cut tree designation" in this unit to further minimize visual effects of the harvesting component of this project.
- Have the unit recreation staff review the designation of trees to be removed with the unit silviculturist to ensure that all trees that are hazardous to the public will be removed and that adequate spacing for snow removal operations is achieved.
- Protected improvements that need to be noted in the contract are all obvious pre-existing facilities associated with the snowmobile park facility including asphalt surface. Three other improvements that need protection are: 1) the drain line for the utility/storage shed at the snowmobile park, 2) traffic counter lines and box at the exit of the snowmobile park and 3) traffic counter lines and box in Unit 226. The unit recreation staff needs to be consulted for locating these improvements.

8. Winter recreation

- Winter snow plowing will not occur on FA-19 or FA-13 north of the intersection of FA-19 and FA-13 to minimize impacts to winter recreation opportunities.

9. Air quality

- All burning will be consistent with the provisions of the Siskiyou County Air Pollution Control District rules and regulations through the permit process[80].
- Dust abatement will be required where necessary to prevent the loss of road and landing surface material.

[79] Coordinate with the unit recreation staff for notification of the public. Do not allow camping by contractor personnel or equipment storage at the snowpark unless the park is closed for activity to this unit.
[80] A smoke management plan will be submitted to Siskiyou County Air Pollution Control District with the project burn plan. Upon approval of the smoke management plan, the County would issue a burn permit

10. Botanical diversity

- Where tractor piling for site preparation or slash piling, a brush rake method would be used to minimize disturbance by allowing soil fines to remain on site and to minimize disturbance to understory plants.
- Conifer seedlings would be hand scalped of grass and brush at years 2 and 3 and rototilled only if necessary for gopher control to minimize disturbance to the understory vegetation. Seedling stocking and survival surveys would indicate if gopher damage was a direct cause of seedling mortality.
- Trees (or segments of trees) would be taken to landings with limbs and tops attached then delimbed in the landings (sometimes called "whole tree logging" or "limbing after skidding") as much as possible to minimize the need for additional slash treatment and disturbance to understory vegetation[81]. See also Fuels, below.
- Units will be monitored post-harvest by the unit fuels officer to determine fuels treatment needs, to minimize the need for tractor piling and disturbance to understory vegetation.

11. Fuels

- Trees (or segments of trees) would be taken to landings with limbs and tops attached and then delimbed in the landings to minimize activity-generated slash and the need for additional slash treatment (piling, burning)[82]. This project would utilize materials (e.g. biomass) as much as possible that is traditionally lopped, scattered, and burned, to reduce the need for fuel treatments.

12. Range

- Protect the Bartle Cattle Allotment buried waterline.

13. Heritage Resources

- Known sites will be flagged by the unit archaeologist and protected during harvest operations.

14. Public Safety

- Warning signs will be placed along the Pilgrim Creek Road to make the public aware of logging trucks entering the roadway.
- Signs will be placed in and around the Pilgrim Creek Snowmobile Park alerting the public to the presence of Sporax on cut stumps immediately after its application.
- Signs will be placed along the Pilgrim Creek Road during all prescribed burning to alert the public of possible smoke and fire in the area.

[81] Note that dead trees create more slash than green trees due to breakage, even with whole tree yarding.
[82] Note that dead trees create more slash than green trees due to breakage, even with whole tree yarding.

Monitoring

Implementation Monitoring

- During timber marking the unit silviculturist and/or project planner will review tree marking to ensure the guidelines in the stand specific silvicultural prescriptions are met and that unit boundaries are correctly located with the specified stream buffers.
- Following timber marking the unit archaeologist will inspect all archaeological sites to ensure they have been adequately protected.
- Following marking of Unit 421 the unit recreation specialist will review the marking to ensure all facilities will be protected and hazard trees have been designated.
- The assigned timber sale administrator will visit the project area as needed during harvest operations to ensure compliance with the terms of the timber sale contract.
- During site clearing for planting and fuels treatment the unit soil scientist and assigned contracting officer's representative will visit the operation to ensure soil quality standards are being met with regard to retention of organic matter and large woody debris.
- During tree planting the assigned contracting officer's representative will daily inspect a sample of the trees planted to ensure contract standards are being met.
- Following tree planting the area will have survival exams at year 1, 3 and 5 to ensure adequate stocking of the areas.

Alternatives Considered but Eliminated from Detailed Study

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received in response to the Proposed Action provided suggestions for alternative methods of action. Some of these alternatives may have been outside the scope of the purpose and need, duplicate other alternatives considered in detail, or determined to be components that would cause unnecessary environmental harm. Alternative 5 was developed in response to the 20-inch diameter limit described in significant issues 1 and 2. Alternative 6 combined two alternatives suggested by the public (a shaded fuel break alternative and restoration alternative), which had similar themes of action. Alternative 7 was suggested by a local resource agency to insure the existing root disease would not spread to adjoining stands. These alternatives were considered, but dismissed from detailed consideration for reasons summarized below.

Alternative 5

- **No harvest of trees over 20 inches in diameter (Significant Issue 1)**

This alternative was not considered in detail because it would not meet the purpose and need. Retaining all trees 20 inches in diameter and larger would leave many stands or areas of stands overstocked at levels above the recommended 150 square foot/acre basal area needed to decrease susceptibility to bark beetle infestations. Leaving these areas at these levels would continue the

high susceptibility to further density and insect related mortality, therefore not meeting the purpose and need for forest health/growth objectives. It would also prevent the removal of dead/dying and infected/infested trees that are greater than 20 inches in diameter, most of which are the larger and older pine trees in regeneration harvest areas, and pockets in thinning stands. These trees are continuing the spread of root disease[83] to other pine trees of all ages and sizes. Tree mortality has accelerated within the project area over the last several years[84], contributing to large areas of dead trees.

Alternative 6

- **Retain an average 60% canopy closure, maintain all old and large trees, 20 inch diameter limit on tree removal, reduce fire hazard, retain all large logs, snags, and trees with wildlife characteristics, no thinning in riparian areas or meadows, no new road construction (Significant Issues 1 &2)**

This alternative was not considered in detail for several reasons. Many requested actions are already a part of proposed actions. (e.g. reduce fire hazard and thinning while, retaining the healthiest and mostly the largest trees). Retaining an average 60% canopy closure is part of Alternative 2. A diameter limit was not considered in detail for the same reasons as Alternative 5.

Refraining from thinning in riparian reserves does not meet the purpose and need of preventing catastrophic loss of forest overstory (from stand replacing fire or epidemic levels of insect and disease infestations that are killing stands), to maintain a source of woody debris recruitment for in-stream habitat features within Riparian Reserves. The Forest Plan Standards and Guidelines for timber management in Riparian Reserves allow for the application of salvage and silvicultural practices in Riparian Reserves when they are needed to control catastrophic events, control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives[85]. A field review of the unit by the project hydrologist indicated that the unit could be harvested without impacts to water quality or riparian and aquatic resources. Maintaining the current overstocking and fuel accumulations in riparian reserves would continue the susceptibility of the reserve areas to overstory tree loss from fire, insects and disease.

Refraining from thinning in dry meadows does not meet the purpose and need of restoring the dry meadow/pine savannah systems, which have decreased in size over the last century from the lack of wildfire and subsequent encroachment by conifers[86]. Functioning dry meadow/pine savannah systems provide diverse and important habitat for wildlife as well as a natural fuel break.

[83] Blackstain and annosus root diseases are primarily spread by root-to-root contact. Dead trees can continue to serve as vectors for disease spread to healthy trees in the case of annosus.
[84] 2004 and 2005 Insect Mortality Flight.
[85] Forest Plan, page 4-54
[86] Pers. comm. D. Fleming, Silviculturist and F. Mangels, Wildlife and Range Biologist.

Refraining from constructing new logging roads was not considered in detail because of the concern that there would be resource damage to soils from excessive skidding distances with numerous repeated trips, without 0.3 miles of new road and temporary spur access. Placing landings where the skidding distance can be minimized, and temporary spurs to these landings will reduce detrimental soil compaction and displacement that results from the high volume of repeated skidding that would occur with this alternative.

Grazing, drought, and climate change actions are outside the scope of the purpose and need. Where appropriate, the cumulative effects are described in chapter 3.

Alternative 7

- **This alternative was suggested by a commenting resource agency and would remove all ponderosa pine from the regeneration units to insure the existing root disease does not spread to adjoining stands.**

This proposal arose from a concern that trees that are retained may be infected with black stain but are not exhibiting any signs of the disease. If the trees were infected, they would cause the disease vector to persist in the newly established stand.

This proposal was not considered as a viable option because:

- There is a high probability that the existing prescription in the Proposed Action will be sufficient to control the root disease in these stands.
- Replanting with a mix of species will insure that the stands remain forested even if the blackstain persists.
- It would be difficult to defend cutting a tree that appeared to be perfectly healthy and free of disease when that tree could be contributing to meeting the 15% green tree retention standard.

Alternatives to Borax

See Appendix J, Borax Report for the Pilgrim Project, for consideration of alternatives to borax and its effectiveness.

Comparison of Alternatives

Table 2 provides a brief summary of the environmental impacts of the alternatives in comparative format. In this table, alternatives are compared by significant issue, responsiveness to the purpose and need, consistency with Forest Plan standards and guidelines, and resource effects. Chapter 3 forms the scientific and analytical basis for this comparison of effects and describes effects in detail.

Table 2. Comparison of alternatives.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Improve forest health	Approximately 3500 acres meets objectives for healthy growing conditions, lower incidence/risk of insect attacks and disease.	Approximately 3000 acres meets objectives for healthy growing conditions, lower incidence/risk of insect attacks and disease.	Approximately 3200 acres meets objectives for healthy growing conditions, lower incidence/risk of insect attacks and disease.	0 acres meets objectives for healthy growing conditions, lower incidence/risk of insect attacks and disease.
Reduce fuels (% fuel models, FM, and flame lengths, in feet, in treatment areas)	FM 2 - 18 % FM 8 - 82 % FM 10 - 0 % Percent Treated acres & flame length: 18% < 8.5' 82% < 1.4'	FM 2 -18 % FM 8 - 68 % FM 10 - 14 % Percent Treated acres and flame length: 18% < 8.5' 68% < 1.4' 14% > 6.2'	FM 2 - 18 % FM 8 - 75 % FM 10 - 7 % Percent Treated acres and flame length: 18% < 8.5' 75% < 1.4' 7% > 6.2'	FM 2 - 5 % FM 8 - 3 % FM 10 - 92 % Some acres transition to FM 12. Percent Untreated and flame length: 5% < 8.5' 3% < 1.4' 92% > 6.2'
Acres of reduced chance of crown fire	Approximately 3500 acres	Approximately 2900 acres	Approximatley 3100 acres	0 acres
Fuel Loading and annual accumulations	5-10 tons/ac on all treated acres .6 to 3 tons/ac/yr	5-10 tons/ac on all treated acres .6 to 3 tons/ac/yr	5-10 tons/ac on all treated acres .6 to 3 tons/ac/yr	45-50 tons per acre on about 400 acres within 5 years and up to 70 tons per acre in 10 years. 5-30 tons per acre on about 3400 acres 3 to 5 tons/ac/yr on about 3100 acres
Reduce catastrophic loss of overstory trees (woody recruitment) in Riparian Reserves	Risk of catastrophic tree loss reduced on approximately 230 acres in riparian reserves.	Risk of catastrophic tree loss reduced on approximately 135 acres in riparian reserves.	Risk of catastrophic tree loss reduced on approximately 175 acres in riparian reserves.	Risk reduced on 0 acres
Maintain/enhance hardwoods and dry meadows	20 acres of aspen, all oaks, 275 acres of dry meadow enhanced	20 acres of aspen, all oaks, 275 acres of dry meadow enhanced	20 acres of aspen, all oaks, 275 acres of dry meadow enhanced	Eventual loss of aspen and further reduction of dry meadow acres

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Impacts to northern spotted owl critical habitat (CH), including dispersal and foraging habitat **(Significant Issue 1)**	Temporary loss of Approximately 670 acres of low quality dispersal habitat. Approximattely 840 acres of low quality dispersal habitat degraded. 1,250 acres of capable (potential) habitat improved in the long term. not likely to destroy or adversely modify designated critical habitat for the Northern Spotted Owl. Increased resilience to insect infestation on approximately 3500 acres of treated habitat	Temporary loss of Approximately 640 acres of low quality dispersal habitat. Approximattely 275 acres of low quality dispersal habitat degraded. 1,250 acres of capable (potential) habitat improved in the long term. not likely to destroy or adversely modify designated critical habitat for the Northern Spotted Owl. Increased resilience to insect infestation on approximately 3,000 acres of treated habitat	Temporary loss of Approximately 670 acres of low quality dispersal habitat. Approximattely 840 acres of low quality dispersal habitat degraded. 1,250 acres of capable (potential) habitat improved in the long term. not likely to destroy or adversely modify designated critical habitat for the Northern Spotted Owl. Increased resilience to insect infestation on approximately 3200 acres of treated habitat.	Continued fragmentation of low quality NSO dispersal habitat from root disease and insect infestations. Continued spread of root disease centers and insect infestation areas and loss of habitat.
Impacts to the Northern Spotted Owl **(Significant Issue 1)**	May affect, but is not likely to adversely affect the Northern Spotted Owl.	May affect, but is not likely to adversely affect the Northern Spotted Owl.	May affect, but is not likely to adversely affect the Northern Spotted Owl.	May affect, but is not likely to adversely affect the Northern Spotted Owl.
Impacts to old-growth dependant species, including late-successional associated MIS (Significant Issue 1)	Old growth trees will be retained[87]. Increased resilience to insect infestation and fire on approx. 40 old-growth acres. No effect to population trend of Red-Breasted Nuthatch a late-successional MIS species	Old growth trees will be retained. Increased resilience to insect infestation and fire on approx. 40 old-growth acres. No effect to population trend of Red-Breasted Nuthatch, a late-successional MIS species	Old growth trees will be retained. Increased resilience to insect infestation and fire on approx. 40 old-growth acres. No effect to population trend of Red-Breasted Nuthatch, a late-successional MIS species	Approximately 40 old-growth acres with greater hazard of loss from insect infestation and/or wildland fire. No effect to population trend of Red-Breasted Nuthatch, a late-successional MIS species
Impacts to snag-associated MIS **(Significant Issue 2)**	maintains an average of 2-3 snags per acre. Meets/exceeds Forest Plan guides.	maintains an average of 2-3 snags per acre. Meets/exceeds Forest Plan guides.	maintains an average of 2-3 snags per acre. Meets/exceeds Forest Plan guides.	Retains all snags at a density of about 3 to 4 per acre. Increase in fuel loading at above normal rates.

[87] These trees will generally be greater than 150 years and display old growth characteristics such as large limbs, deeply furrowed bark, flattened tops and/or decadence. These trees generally stand well above the general conifer canopy and usually are > 36" in diameter at breast height.

	Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**
Impacts to snag recruitment (Significant Issue 2)	snag recruitment at about 1-3 trees per acre over 10 years on 3100 thinned acres. Accelerates development of larger size trees and snags. Snag recruitment limited on about 415 acres for 50-80 years (retention trees may provide some recruitment).	snag recruitment at 1-3 trees per acre over 10 years on 2,565 acres. Accelerates development of larger size trees and snags. Snag recruitment estimated to approximate 20 trees per acre over the next 10 years on 535 acres. Snag recruitment limited on about 415 acres for 50-80 years (retention trees may provide some recruitment).	snag recruitment at about 1-3 trees per acre over 10 years on 3100 acres. Accelerates development of larger size trees and snags. Snag recruitment limited in regenerated areas similar to Alternative 1 except more retention trees (which are diseased and likely to die and create snags) with this alternative.	Maintains snag recruitment at about 10 to 20 trees per acre per decade. Increase in fuel loading to above desired conditions.
Open road density	About 3.4 mi rd/sq mi	About 3.4 mi rd/sq mi	About 3.4 mi rd/sq mi	About 4.1 mi rd/sqmi
Estimated Volume	50-54 CCF	44-48 CCF	50-54 CCF	0 CCF
Present Net Value	Approximately $4.3 million	Approximately $3.3 million	Approximately $4.3 million	$0
Est. Jobs Created, direct and indirect	750-810	660-720	750-810	Some indirect jobs from recreation uses

Chapter 3 - Affected Environment and Environmental Consequences

This chapter describes aspects of the environment likely to be affected by the proposed action and alternatives. Also described are the environmental effects (direct, indirect, and cumulative) that would result from undertaking the proposed action or alternatives. Together, these descriptions form the scientific and analytical basis for the comparison of effects displayed at the end of Chapter 2.

This chapter is organized into several sections: available information, information related to cumulative effects - past, present, and reasonably foreseeable future actions, aspects of the environment likely to be affected by the alternatives and expected effects (including significant-issue related effects and achievement of purpose and need), short-term uses and long-term productivity of the human environment, unavoidable adverse effects, irreversible and irretrievable commitments of resources, energy/natural depletable resources, urban quality/historic and cultural resources/built environment, and legal and regulatory compliance.

The planning record for the Pilgrim Vegetation Management Project Draft Environmental Impact Statement includes project-specific information, including resource reports and results of other field investigations. Individual reports, input, and analysis from the record are summarized and referenced in this chapter. Some reports are included in the appendices. These reports are incorporated by reference. The planning record is located at the Mount Shasta Ranger District office.

Available Information

Much of the Forest resource data resides in an electronic database formatted for a geographic information system (GIS). The Forest uses GIS software to assist in the analyses of these data. GIS data is available in tabular (numerical) format, and as plots displaying data in map format. Knowledge about many of the relationships and conditions of wildlife, fish, forests, jobs, and communities is evolving as research continues. The ecology, inventory, and management of a large forest area is a complex and ever-developing science. However, the basic data and central relationships are sufficiently well established in the respective sciences for the deciding official to make a reasoned choice among the alternatives, and to adequately assess and disclose the possible adverse environmental consequences.

Past, present, and reasonably foreseeable future actions

According to the Council on Environmental Quality (CEQ) NEPA regulations, “cumulative impact” is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions (4 CFR 1508.7). In determining cumulative effects, the effects of the past and present and future actions listed in

Appendix F were added to the direct and indirect effects of the proposed action and alternatives. Relevant boundaries and projects assessed for cumulative effects vary by resource and by overlap of effects in time and space.

Most resources used the 8th order watershed as described in Appendix F. This cumulative effects area was used because it encompasses an area of the McCloud Flats that has very similar topography, soils, hydrology and vegetation types.

The larger fifth order watersheds were consider but discounted as the cumulative effects bounded area because they encompass are much larger area (about 260,000 acres) that included mountainous terrain with very different soil types, vegetation and hydrologic function. These larger watersheds also include about half the Mt. Shasta Wilderness, which would dilute some effects.

The temporal scale for cumulative effects to all resource is from 1996 to two years into the future (2009) when out year projects have been well enough defined to generally assess their impacts. Planted areas are established and well stocked within five years.[88] Plantations on the McCloud Flats usually have reached a height of 4-5 feet within 10 years, allowing regeneration of adjoining stands, if they have reached maturity.

Aspects of the environment likely to be affected by the alternatives & expected effects

Alternative 4 is presented first in each topic to describe the trend associated with continuation of the present condition (no action).

Forest Health[89]

Affected Environment

Please refer back to the purpose and need in chapter 1 for affected environment specific to the stands proposed for treatment. Over the last 3 years, the McCloud Flats has experienced numerous areas of insect outbreak (e.g. Edson Creek, Elk Flat, Ash Sink). The outbreaks were aggravated by the presence of root disease that weaken a tree's ability to take up water and nutrients, periodic droughts and over dense growing conditions in pine stands (that cause tree stress as the trees compete for nutrients, sunlight, and water). Areas of infestation, and subsequent tree mortality, increased in size from 5 to 125 acres within a few years for one area in the absence of any treatments.

[88] Based on 5th year survival surveys of plantations on the McCloud Flats
[89] Paraphrased from the *Final Silvicultural Report for DEIS Pilgrim Vegetation Management Project*, October 14, 2005, as updated by discussion with the author, and from information shared at the November 15, 2005 field tour of the area.

Western pine beetle outbreaks

These beetles usually breed in and kill scattered, overmature, slow-growing, decadent, or diseased or weakened trees. This is a normal, ecological process – the way a forest matures and replaces itself.

Several conditions affect outbreaks. The availability of phloem and inner bark is key to influencing outbreaks. Most trees are too healthy or too weak to provide the material for beetle numbers to increase. Healthy trees can withstand many attacks before the beetles successfully attack, establish a brood, and new adult beetles emerge; weak are easily killed, but provide food sources for relatively few beetles. However, when trees undergo sudden and severe moisture stress, they cannot produce sufficient resin flow to resist attack. In these trees, almost all attacking beetles can succeed and reproduce many times their number of offspring, increasing the beetle population to outbreak levels. Any condition that results in excessive demand for moisture (e.g. tree crowding or competing vegetation) or any condition that reduces the ability of the roots to supply water to the tree (e.g. root disease, drought, mechanical root damage) can cause moisture stress and increase susceptibility to successful attack by western pine beetle.

Thinning dense stands is an effective silvicultural prevention method. Substantially reducing stocking densities relieves competition and stress among the remaining trees, decreasing susceptibility to successful bark beetle attack.

Pine-beetle induced tree mortality

Attacking adult beetles carry spores of blue-staining fungus. As the beetles chew their way through the bark, the spores of this fungus become dislodged. In trees attacked early or midsummer, it takes only a few weeks for the fungus to invade and block the vessels of the inner bark and sapwood. Once blocked, the foliage begins to fade and generally within a year, dies and turns red. In trees attacked later in the summer or fall, the fungus develops more slowly and and the canopy does not fade until the next spring.

(Summarized/excerpted from DeMars, C.J. and BH Roettgering, 1982. *Western Pine Beetle.* Forest Insect and Disease Leaflet 1. USDA Forest Service.)

Environmental Consequences

Alternative 4 - No Action

Direct and Indirect Effects (Forest Health)

Numerous areas within each stand would continue to exceed recommended stocking levels for the site (with stocking levels ranging from 180-260 square feet of basal area per acre in overstocked areas and corresponding SDI[90] levels from 288 to 416). These are included in the 3,100 acres identified with overstocked stands (biomass thinning, thinning, thinning/sanitation, mature stand

[90] Stand Density Index (SDI). Measure of stocking for even aged stands which compares the number of trees per acre of a certain average diameter with the average number of trees present in fully stocked stands of the same diameter. It is relatively independent of site quality and age.

thinning areas on the Alternative 1 map). These levels are 20% to 73% above the recommended level of 150 square feet per acre and are above the 230 recommended SDI level. Without treatment, stocking densities in these stands will continue to increase over time resulting in loss of diameter growth and increased competition between individual trees for moisture and nutrients. As both basal area/acre and associated SDI indices continue to rise above the recommended levels for resistance to insects, more mortality will occur at potential rates of approximately 6 to 20 times compared to thinned stands (tree mortality of 20 trees per acre over 10 years for the unthinned control plot versus 1-3 trees per acre over 10 years for stands thinned to 100-140 square feet per acre basal area)[91].

In areas affected with root disease (regeneration harvest areas, but also root disease areas in thinning and thinning/sanitation stands) all live, diseased trees will be left in the stands. Leaving these trees would continue the root disease cycle within these stands and to adjacent stands as root diseases can spread underground when healthy pine roots come into contact with inoculum in infected roots or stumps. A wave or pulse of mortality would be expected after every period of below-normal precipitation. Tree mortality would continue as root-to-root contact is made with adjacent healthy trees, creating ever widening dead tree pockets at a rate of 2-5 feet/year.

Tree mortality will slow in areas infected with black stain root disease if sunlight begins to reach the soil. If standing and snapped dead trees remain on the site, the dead material may cast enough shade to allow the black stain pathogen to remain active. Tree densities in stands with black stain root disease may drop far below the density that would result from thinning. Tree mortality from annosus root disease in pine will continue as this fungus spreading from root-to-root in the living trees, and remains active as a saprophyte in the stumps of dead trees. The disease centers will slowly spread until they hit barriers such as creeks, or rock outcrops, or non-hosts. Naturally regenerated pine seedlings in sites with either active black stain root disease or annosus root disease are likely to become infected and perpetuate the disease cycle on the site. There will be regular tree mortality and an accumulation of fuel on the sites for the foreseeable future[92].

In addition, low vigor ponderosa pine trees suffering from root disease will continue to deteriorate and be susceptible to bark beetle attacks, resulting in additional mortality and subsequent openings. Retaining these sources of insect infestation and disease increases the risk of spread to other stands within the assessment area.

Trees in the knobcone stand are dying rapidly and there is an increasing potential over time for high intensity wildfire to occur as dead and down knobcone pine continue to accumulate in areas of dense manzanita/chinquapin.

[91] Fiddler, G.O., D.R. Hart, T.A. Fiddler, P.M. McDonald. 1989. *Thinning decreases mortality and increases growth of ponderosa pine in northeastern California*. USDA For. Serv. Res. Paper PSW-194. page 5. This research showed tree mortality of 20 trees per acre/10 years for the unthinned control plot versus 1-3 trees per acre/10 years for stands thinned to 100-140 square feet/acre.
[92] D. Shultz, Entomologist, Region 5 Forest Service, Personal Correspondence, August 2005.

With no action, conifers would continue to encroach on aspens and oaks, continuing the trend of hardwood loss. The aspen stands located in California are on the periphery of its distribution, which makes them important to maintain[93].

Aerial photo interpretation, using photos from 1944 to 1998, shows a reduction of 500 acres of meadow in Elk Flat and 1,100 acres of meadow in Coonrod Flat due to Ponderosa pine in-growth[94]. This trend of meadow loss is expected to continue.

Alternative 4 would forego opportunities for improvements to timber stand health and growth; in addition, no timber volume (yield) would be provided toward sustained yield objectives. With no action, no acres would be moved to a stand density condition allowing for lower insect, disease, and mortality levels. The desired future condition of the timber resource as identified in the Forest Plan for the project area is to minimize mortality within the context of the matrix standards and guidelines…[95] and also to develop forest stands that are resistant to epidemic insect or disease attack[96]. Therefore, Alternative 4 would not achieve these management goals as described in the Forest Plan.

Cumulative Effects (Forest Health)

For forest health cumulative effects the bounded area is the Pilgrim Assessment Area. This is an appropriate area since effects outside this area do not notably influence the presence of disease and insect infestations within the area. The time frame for forest health cumulative effects is approximately 10 years, since most stands in the McCloud Flats are entered for some type of timber harvest at 10 to 15 year intervals.

Past harvest within and adjacent to the project area over the last decade focused on thinning from below, with an objective of retaining higher canopy closures (45%-60%) in pine stands for wildlife habitat objectives. Salvaging in areas of heavy pine mortality also occurred along with some regeneration harvest located primarily in dead and dying lodgepole/knobcone stands. Regeneration cutting in areas of known ponderosa pine root disease centers was avoided.

Past thinning to retain 45%-60% canopy closure has little to no effect on reducing the spread of blackstain and/or annosus root disease. Consequently, root disease centers that existed 10 years ago are still in existence today and have expanded 2-5 feet a year for a total of approximately 40 feet.

In the absence of fire and any other management in openings that were created by black stain root disease, natural tree regeneration becomes infected and the disease spreads outwards like ripples caused by throwing a stone into a pool of water. This has resulted in additional trees being affected by root disease and a subsequent increase in susceptibility to drought and insect related mortality. Both the black stain and the annosus root disease centers act as refugia for bark beetles

[93] In the last 100-150 years aspen in the western United States has declined 50-96%. Bartos, Dale, Aspen Ecology and Management Field Meeting Notes, Modoc National Forest, August 6, 1998.
[94] Mangels, Francis; Wildlife Biologist, "*Elk Flat and Coonrod Flat, Analysis of Ecological Succession and Recommendations for Management Report*" January 2002
[95] Forest Plan, p. 4-67
[96] Forest Plan, p. 4-5, p. 4-82

during periods of favorable precipitation. A ready source of bark beetles is maintained on site, and they are able to take advantage of weakened trees when soil moisture is less available. During extended droughts, western pine beetle, mountain pine beetle and red turpentine beetle will build up enough to cause extensive ponderosa pine mortality in the vicinity of the root disease centers. Mortality commonly continues for a year or two after precipitation returns to normal and the final stocking of live trees is lower than what would result from thinning. This scenario was repeated after the 1975-77 drought, 1987-91 drought and most recently from 2001-2005 on the Flats[97].

Alternative 1 - Preferred Alternative

Direct and Indirect Effects (Forest Health)

Thinning prescriptions in Alternative 1 would reduce the tree densities on about 3,100 acres of overstocked ponderosa pine stands. Removing recently dead and dying pine trees in pockets associated with root diseases in these stands will reduce disease vectors by removing the disease host. Sanitation would remove most of the mortality of the next 5 years while still maintaining existing mature stands.

Thinning would retain basal area at levels recommended for ponderosa pine stands, about 100-150 square feet of basal area in older stands, with an average of about 120 square feet per acre, and approximately 20 to 25 foot spacing in the younger stands[98]. Corresponding stand density indices[99] would range from approximately 171 to 192. These stand density index values are below the 230 stand density index value recommended for resistance to bark beetle attacks. Stocking levels are expected to remain at or below the recommended levels for bark beetle resiliency for 20 years after treatment[100].

After treatment, these stands would meet the project purpose and need for healthier growing conditions by reducing inter-tree competition for resources. Research demonstrates that thinning helps reduce the incidence of pest damage to a stand[101]. Less competition increases the health and vigor of the remaining trees resulting in a reduction of risk to bark beetle attack. The growth rates

[97] D. Shultz, Entomologist, Region 5 Forest Service, Personal Correspondence, October 2005.
[98] Biomass thinning in plantations.
[99] Based on an average leave basal area of 120 square feet/acre and overstory layer average stand diameters.
[100] Based on expected growth rates for this project area which included Forest Vegetation Simulation modeling runs based on inventory plot data from the project area, Region 5 Growth Studies within the project area and appropriate yield tables (Dunning, D., and L.H. Reineke. 1933. *Preliminary Yield Tables for Second-Growth Stands in the California Pine Region.* USDA, Washington D.C. Technical Bulletin 354 23 p.)
[101] Cochran, P.H. and James W. Barrett. 1995. *Growth and mortality of ponderosa pine poles thinned to various densities in the Blue Mountains of Oregon*. Res.Pap. PNW-RP-483. Portland OR:U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 27 p.
Oliver, William W. 1995. *Is Self-Thinning in Ponderosa Pine Ruled by Dendroctonus Bark Beetles?* Pages 213-218 in Lane G. Eskew, ed. Forest Health Through Silviculture-Proceedings of the 1995 National Silviculture Workshop. USDA For. Serv. Gen. Tech. Rpt.RM-GTR-267.
Sartwell, Charles and R.E. Stevens. 1975. *Mountain Pine Beetle in Ponderosa Pine- Prospects for silvicultural control in second growth stands.* J. of Forestry

would be greater for the residual trees[102] and less mortality would lead to lower dead fuel levels[103]. The thinned stands will be more open, similar to historic conditions, at densities shown to be sustainable with increased resilience to bark beetle attacks for approximately 20 years.

Studies indicate that thinning to 100-140 square feet per acre of basal area reduced tree mortality 86 to 95% as compared to unthinned stands and growth increased 338 to 638%[104]. At this level of thinning, tree mortality is expected to be about 1-3 trees per acre over 10 years[105]. Thinning directly reduces the host resource base (excess trees) that support beetle populations and reduces competition among leave trees for water and nutrients, which improves their resilience to future bark beetle attacks[106].

Removing dying trees and all diseased overstory pine trees in regeneration areas will remove the disease vectors (blackstain and/or annosus infected trees), aiding in breaking the disease cycle[107]. Removing all diseased overstory trees to break the disease cycle is based on research recommendations[108] and observations of plantations originating in the 1980's and early 1990's in the Pilgrim and Edson Creek vicinity which were established in areas with a history or root disease. In these plantations, that have had all of the diseased overstory pine removed and were then reforested, these actions have resulted in plantations stocked at the Region's recommended densities of 125 to 150 trees/acre well distributed over the stand area with only spotty mortality (< 2 acres in size) resulting from older annosus disease centers.

Re-planting with a species mix of healthy, rapidly growing seedlings, will enhance species diversity. Ponderosa pine will be planted in open areas and mixed species in shaded areas. It is expected that the larger stumps infected with annosus will decompose before the planted pine trees get big enough to have large root systems that would perpetuate the disease on the site. Reducing the spread of root disease and establishing healthy stands in regeneration harvest areas would meet the purpose and need as well as Forest Plan direction for healthy forest stands[109].

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[102] Fiddler, G.O., D.R. Hart, T.A. Fiddler, P.M. McDonald. 1989. *Thinning decreases mortality and increases growth of ponderosa pine in northeastern California*. USDA Forest Service Research Paper PSW-194, p. 5.
[103] *Fuels Specialist Report*, November 25, 2005.
[104] Fiddler, G.O., D.R. Hart, T.A. Fiddler, P.M. McDonald. 1989. *Thinning decreases mortality and increases growth of ponderosa pine in northeastern California*. USDA Forest Service Research Paper PSW-194, p. 5.
[105] Dead trees will be a variety of sizes and may not be greater than 15 inches in diameter.
[106] Goyer, R., Wagner, S 1997. Current and proposed technologies for bark beetle management. Journal of Forestry, p. 29-32.
[107] Based on research recommendations (Schmitt, Parmeter and Kliejunas, Annosus Root Disease of Western Conifers, Forest Insect and Disease Leaflet 172, Revised 2000) and observations of plantations established in areas with a history of root disease originating in the 1980's and 1990s in the Pilgrim and Edson Creek vicinity (Dave Schultz, Forest Entomologist, Personal Correspondence, September 2005).
[108] Hessburg, Goheen and Bega, Black Stain Root Disease of Conifers, Forest Insect and Disease Leaflet 145, 1995
[108] Freeman, Wilfred , *Biological Evaluation of Tree Mortality on McCloud Flats*, Forest Insect and Disease Management, May, 1977
[108] Freeman, Wilfred, *Biological Evaluation in the Pilgrim Creek Area*, Forest Insect and Disease Management, January 1980
[108] Dave Schultz, Forest Entomologist, Input for Edson Sale (Report No. 04-02) page 6, March 2004
[109] Forest Plan 4-5, 4-67, and 4-80.

About 160 acres[110] of 415 acres are expected to meet or exceed the 15% green tree retention guideline with a combination of disease-free overstory ponderosa pine and other mixed conifer species. The remaining 255 acres will retain healthy, sustainable trees (e.g. white fir, incense cedar), but may not meet the 15% guideline because these trees are generally smaller than the trees being removed and there are not enough healthy disease-free overstory ponderosa pine in the affected stands to meet the minimum 15% retention guideline. The healthy, sustainable trees are the most likely to persist and contribute to forested habitat, which is consistent with the intent of the guideline (to provide older forest habitat elements in a new stand indefinitely)[111]. Therefore this alternative will achieve the overall forest health objective but not always meet the 15% green tree retention guideline in these particular stands.

Sanitation of knobcone on 10 acres would achieve Forest Plan goals for forest health by removing the dead and dying knobcone pine and re-planting with ponderosa pine and incense cedar as these species are more sustainable for the site, will live longer, and have a higher value for wildlife habitat[112].

Releasing aspen and black oaks, by removing encroaching conifers in 20 acres of aspen patches and around isolated willows and black oaks, would achieve the Forest Plan goal of emphasizing management of hardwoods including aspen where they exist[113, 114] by reducing competition for resources, primarily sunlight[115]. Monitoring of mechanical treatments on the Lassen National Forest indicate there is a significant increase in total number of aspen stems in treated stands compared to controls[116].

Removing small diameter conifers (which are a result of pine in growth) and thinning to a wide spacing in the overstory trees in historically dry meadow areas will restore the open dry meadow conditions that previously existed in this area. It will also achieve the Forest Plan goal of maintaining and enhancing dry meadow (early seral stage)/open pine savannah forest types/plant communities[117]. Underburning in the dry meadows/pine savannah type areas will help to restore and maintain the historical open conditions that are described in the purpose and need by reducing the current amount of pine seedling and sapling encroachment. Underburning in the mature stand areas will benefit the stimulation of understory vegetation and will have no effect on residual tree/stand health as long as the fire intensity is kept at a low level.

Sporax ($Na_2B_4O_7 10H_2O$, Sodium tetraborate decahydrate) is used as a registered pesticide (fungicide) for forestry to prevent the spread of annosus root disease[118]. As such, Sporax is

[110] Unit 305, 308,445, 446, 453, and 456.
[111] Forest Plan, page 4-61.
[112] *Silvics of North America*, Volume 1 Conifers Ag Handbook 654, Dec. 1990. p. 413-424.
[113] Forest Plan, page 4-14 & 4-82
[114] Effectiveness monitoring results for treated and non-treated aspen stands from 1999 to 2003 was conducted on the Eagle Lake Ranger District, Lassen National Forest. Jones, Bobette et al, "*Aspen Restoration through Mechanical Removal of Conifers in Northeast California*" (Abstract, 2003)
[115] Sheppard, W.D. 2003. Factors to Consider to Enhance and Expand Aspen.
[116] Jones, Bobette et al "*Aspen Restoration through Mechanical Removal of Conifers in Northeast California*" (Abstract, 2003).
[117] Forest Plan, pages 4-14 & 4-81
[118] Wilber-Ellis Sporax, EPA registration number 2935-501.

applied to freshly-cut stump surfaces at a rate of approximately one pound per 50 square feet of stump surface. For this project, it is estimated that about 1 pound of Sporax per acre would be applied in thinning prescription stands and about 1-2 pounds of Sporax in regeneration harvest stands[119]. Sporax will be applied to cut stumps fourteen inches in diameter and greater on approximately 3800 acres of harvest units.[120]

Potential toxicity of Sporax and boron to mammals, birds, fish, amphibians, and terrestrial and aquatic invertebrates and fungi is discussed in Dost and others as well as several other publications[121]. The literature indicates that there are potential risks to humans and the environment from borax application. Sporax is highly toxic to the eye and is readily absorbed through abraded skin[122]. The Forest Service discusses any pesticide use, including cautions about proper handling of Sporax for personal and environmental protection (e.g. wear protective equipment when applying borax, keep away from water sources) with purchasers/operators prior to application in accordance with regulations to minimize the potential for this risk.

Sporax is considered practically nontoxic to fish, aquatic invertebrate animals, and birds, as well as relatively nontoxic to bees[123]. At high concentrations, Sporax is toxic to plants[124]. Measurements of soil, plants and litter at distances up to 5 meters from stumps at various times after application do not indicate treatment-related increases in boron content[125]. Existing data indicate that adverse effects of forest uses of Sporax on wildlife or livestock are improbable and borax should be expected to have no effect on surrounding plants, invertebrates, or microorganisms[126].

Because of formulations, and methods and location of treatment, as well as observance of laws and safety procedures required to protect humans, non-target species, and resources, exposure levels to the public would be low and the probability of human health and environmental problems from Sorax use would be highly unlikely.

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[119] D. Fleming (District Silviculturist) and G. Steel (Sale Administrator).
[120] Schmitt, Craig L., John R. Parmeter, and John T. Kliejunas. 2000. Annosus Root Disease of Western Conifers. Forest Insect and Disease Leaflet 172. US Department of Agriculture, Forest Service, page 8.
[121] Dost, F.N., Norris, L. and C. Glassman, 1996. *Assessment of human health and environmental risks associated with the use of borax for cut stump treatment.* Unpublished, prepared for USDA Forest Service Regions 5 and 6. National Pesticide Telecommunications Network (National Pesticide Information Center), 2001. Boric Acid (Technical Fact Sheet). http://npic.orst.edu/factsheets/borictech.pdf. U.S. Environmental Protection Agency, Prevention, Pesticides, and Toxic Substances. 1993. *Reregistration Eligibility Decision Document: Boric Acid*; EPA 738-F-93-006. *Human Health and Risk Assessment for Borax (Sporax)*, USDA Forest Service, February 24, 2006.
[122] U.S. Environmental Protection Agency, Prevention, Pesticides, and Toxic Substances. 1993. *Reregistration Eligibility Decision Document: Boric Acid*; EPA 738-F-93-006.
[123] U.S. Environmental Protection Agency, Prevention, Pesticides, and Toxic Substances. 1993. *Reregistration Eligibility Decision Document: Boric Acid*; EPA 738-F-93-006.
[124] National Pesticide Telecommunications Network (National Pesticide Information Center), 2001. Boric Acid (Technical Fact Sheet).
[125] Dost, F.N., Norris, L. and C. Glassman, 1996. *Assessment of human health and environmental risks associated with the use of borax for cut stump treatment.* Unpublished, prepared for USDA Forest Service Regions 5 and 6.
[126] Dost, F.N., Norris, L. and C. Glassman, 1996. *Assessment of human health and environmental risks associated with the use of borax for cut stump treatment.* Unpublished, prepared for USDA Forest Service Regions 5 and 6.

Cumulative Effects (Forest Health)

Timber harvest in the last 10 years within the cumulative effects bounded area has been about 220 acres of salvage of dead trees for western pine beetle infestations, about 1,400 acres of commercial thinning of natural stands and plantations.

Past thinning to retain 45%-60% canopy closure (180 to 220 square feet of basal area) has had little to no effect on reducing the spread of blackstain and/or annosus root disease. Consequently, root disease centers that existed 10 years ago are still in existence today and have expanded 2-5 feet a year for a total of approximately 40 feet.

Past salvage and the Alternative 1 will/have treated about 600 acres of trees that are dead and dying from root disease and Western Pine Beetle infestation. These areas will be reforested with a mix of conifer tree species and will be within forest standards for coarse woody debris and fuel loadings.

Past regeneration harvest has converted approximately 200 acres of knobcone and lodgepole pine stands to Ponderosa pine plantations. This alternative will convert approximately 10 acres of Knobcone pine to a Ponderosa pine plantation.

The cumulative effects for commercial thinning and biomass thinning are the same as described in direct and indirect effects as past thinning has not appreciably improved forest health due to the continued effects of root disease from higher stand densities that were retained.

Alternative 2 - Proposed Action modified to retain 60% canopy cover

Direct and Indirect Effects (Forest Health)

The effects of Alternative 2 are the same as Alternative 1 except that all thinning units (where possible) would be kept at 60% crown closure which is defined as a leave basal area of 200 square feet/acre. Approximately 535 acres of the 3100 total thinning acres would be thinned to the 200 square feet/acre density under this alternative. A stand density of 200 square feet per acre is 33% above the recommended level of 150 square feet/acre. Tree mortality at this basal area is expected to be about the same as no action, or about 20 trees per acre over 10 years.

Oliver's research using stand density index has shown that stands with stand density indices greater than 230 are in the zone of imminent mortality from bark beetles[127]. Corresponding stand density indices[128] for the proposed thinning to 200 sqft/acre range from 285 to 320. These stand density index values are well above the 230 stand density index value recommended for resistance to bark beetle attacks.

Thinning to 60% crown closure is not a sustainable density for pine stands when the stated purpose and need for the project is forest health. Maintaining this level of stocking would continue the trend of stressed trees, decreased tree vigor, slow or stagnating tree growth and risk to epidemic bark beetle infestation.

[127] Oliver, William W. 1995. *Is Self-Thinning in Ponderosa Pine Ruled by Dendroctonus Bark Beetles?*
[128] Based on an average leave basal area of 200 square feet/acre and average overstory stand diameters.

There would be somewhat less Sporax applied on these 535 as a greater number of trees would be retained at 200 square feet of basal area per acre as compared to 100-150 square feet per acre.

Cumulative Effects, Alternative 2 (Forest Health)

The cumulative effects would be the same as Alternative 1 except that this alternative would contribute approximately 535 acres less toward improving forest health with regards to stand susceptibility to insects, disease, and other ecological processes.

Alternative 3 - Proposed Action modified to maintain 15% green tree retention in regeneration harvest units

Direct and Indirect Effects (Forest Health)

The effects of Alternative 3 are the same as Alternative 1 except for approximately 255 acres of regeneration harvest stands where some live, root-diseased trees are retained to meet the Forest Plan 15% green tree retention guideline.

Leaving up to 15% live, root diseased pine trees on approximately 255 acres of the regeneration harvest stands would continue the root disease cycle within these stands and to adjacent stands as root diseases can spread underground when healthy pine roots come into contact with inoculum in infected roots or stumps. Mortality can continue as root-to-root contact is made with adjacent healthy trees, creating ever widening pockets of mortality at a rate of 2 to 5 feet per year.

Approximately 6 to12 diseased pine trees per acre would be left to achieve the 15% retention requirement[129]. If the area has black stain root disease in pine, the treatment will slow the progression of the disease, but it will still be present. Ponderosa pine that seeds in naturally could also be affected[130]. If the area is infected with annosus root disease, then leaving living pine trees will perpetuate the disease on the site. The infected pine trees will live for varying amounts of time, and any seedling roots that touch the roots of the overstory trees will become infected. The stumps will also remain infected, although they tend to rot out on the Flats within about 15 years. Previous experience has shown that leaving pine trees in an annosus root disease center has resulted in mortality that lingered for at least 30 years in the Pilgrim area[131]. The new plantations would be 20-40 percent unstocked as a result of continued root disease[132].

Alternative 3 would be consistent with the 1995 Forest Plan 15% green tree retention guidelines on all 415 regeneration harvest acres, but would not meet the purpose and need or Forest Plan direction for healthy forest stands[133] on those acres because diseased trees would be

[129] Forest Plan Final Environmental Impact Statement, pVIII-10.
[130] D. Shultz, Entomologist, Region 5 Forest Service, Personal Correspondence, September, 2005.
[131] D. Shultz, Entomologist, Region 5 Forest Service, Personal Correspondence, September, 2005.
[132] If each of 6-12 overstory trees results in a hole in the plantation of 0.05 acres, then 12-25% of the new plantation would be unstocked. Leaving Douglas-fir or white fir overstory trees should have no effect on either annosus root disease, or black stain root disease. D. Shultz, Entomologist, Region 5 Forest Service, Personal Correspondence, September 2005.
[133] Forest Plan 4-5, 4-67, and 4-80.

retained, providing a disease vector to newly planted seedlings. In addition, the retained (diseased) overstory trees would not meet the intent of the 15% green tree retention guideline (to be retained indefinitely) because most of the live overstory pines showing signs of root disease are expected to die within 2 to 10 years and fall over within about 5-10 years[134].

There would be slightly less Sporax applied on 255 acres of regeneration harvest stands due to the 15% green tree retention standard being met with this alternative.

Cumulative Effects, Alternative 3 (Forest Health)

The cumulative effects would be the same as Alternative 1 except that this alternative would contribute approximately 255 acres less toward improving forest health with regards to root disease and tree mortality. Leaving these diseased overstory trees will increase the risk of root disease spread to other stands within the assessment area.

Vegetation Diversity

Affected Environment

The project area is located within two 5th order watersheds[135], Ash Creek and Upper McCloud River. Most of the project (about 75%) is within the Ash Creek watershed. Vegetation typing data combined with calculations to account for growth and harvest[136] in these watersheds was used to determine seral stage and vegetation diversity and the percent late successional forest in each watershed.

Vegetation types in the project area are typical of the southern Cascades and the McCloud Flats Area. Conifers species are typically, in order of abundance, Ponderosa pine, White fir and Incense cedar, with minor amounts of Douglas fir and Sugar pine. Within the larger 5th order watersheds Red fir occurs on the upper slopes of Mt. Shasta, generally above 6000 feet elevation. Brush species (greenleaf manzanita, whitethorn ceanothus, bitterbrush) and Knobcone pine are scattered throughout the watersheds and often are the result of past wildland fires. Barren areas are present on the slopes of Mt. Shasta above timberline, generally above 7500 feet elevation.

Commercial forest land for this analysis is defined as timber stands capable of growing at a minimum 20 cubic feet per acre per year and capable of developing late seral characteristics.

Definitions for Late-successional stages found on page 4-15 or the Forest Plan. Late successional forests are forest in its mature and/or old growth stages. Mature stands are those which the annual growth rate has peaked[137].

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[134] Dave Schultz, Region 5 Entomologist. Keen, F.P. 1955. The rate of natural falling of beetle-killed ponderosa pine snags. Journal of Forestry 53 (10): 720-723. Dahms, W. 1949. How long do ponderosa pine snags stand? RN-57. Pacific Northwest Research and Experiment Station.
[135] Forest Plan page 4-63 describes assessment of late-successional forest at the 5th field watershed scale.
[136] Forest Plan (1975/1980) data with 1990 and 1995 updates for plantations. Not grown. Calculations were made to account for growth. Timber harvest since 1996 included in calculations. See the vegetation diversity calculations in the project file.
[137] *Report of the Forest Ecosystem Management Assessment Team, July, 1993,* Glossary

The desired condition is to have a diversity of plants at all ecosystem scales[138] and a minimum of 5 percent of each successional stage, including both suitable and unsuitable timber lands[139]. Also, there should be a minimum of 15 percent late successional forest within each fifth field watershed[140]. Currently the Ash Creek Watershed has approximately 29% late successional forest and the Upper McCloud Watershed has approximately 23 % late successional forest. Both watersheds are below the minimum requirements for the successional stages 1 (grass, forbes and seedlings), 4a (large trees with open canopy of 10-39 percent) and 4c-older (multilayer large trees generally over 180 years of age and 70 percent or greater canopy closure).

Table 3. Vegetation Type Diversity, Ash Creek Watershed

Vegetation Type	Acres	Percent of National Forest Lands (NFSL) or Commercial Forest Lands (CFL)
Ponderosa Pine	22,200	40%NFSL, 53%CFL
Red Fir	12,000	21%NFSL, 28%CFL
White Fir	7,200	13%NFSL, 17%CFL
Mixed Conifer	1,000	2%NFSL, 2%CFL
Brush, Knobcone, lodgepole & whitebark pine	9,000	16%NFSL
Barren and early seral plants	4,600	8%NFSL
Totals	56,000NFSL 42,400CFL	100% 100% NFSL CFL

Table 4. Seral Stage Diversity, Ash Creek Watershed

Seral Stages	Acres	Percent of CFL
1	800	Not CFL, 1% of NFSL
2	12,600 (7400 CFL)	18
3a	8400	20
3b-c	13,900	33
4a**	1,000	2
4b-c**	10,500	25
4c older**	800	2
Total	42,800 CFL	100

** Late Successional Forest

[138] Forest Plan, page 4-4
[139] Forest Plan page 4-14
[140] Forest Plan, page 4-63

Table 5. Vegetation Type Diversity, Upper McCloud Watershed

Vegetation Type	Acres	Percent of National Forest Lands (NFSL) or Commercial Forest Lands (CFL)
Ponderosa Pine	30,800	50%NFSL, 56%CFL
Red Fir	2,400	4%NFSL, 5%CFL
White Fir	13,100	21%NFSL, 24%CFL
Mixed Conifer	8,400	14%NFSL, 15%CFL
Brush & Knobcone	3,600	6%NFSL
Barren and early seral plants	3,000	5%NFSL
Totals	61,300NFSL 54,700CFL	100% 100%

Table 6. Seral Stage Diversity, Upper McCloud Watershed

Seral Stages	Acres	Percent of CFL
1	200	Not CFL, .3% of NFSL
2	10,100 (8400 CFL)	15
3a	16,600	30
3b-c	17,100	31
4a**	600	1
4b-c**	11,800	22
4c older**	200	.3
Total	54,700 CFL	~100

** Late Successional Forest

Vegetation Trends

Railroad logging in the early 1900's removed almost all the old-growth forests within the McCloud Flats Area. Subsequent wildland fires at 10 year intervals resulted in brushfields, Knobcone pine stands and open Ponderosa pine stands. Timber harvest in the 1970's and 80's focused on regeneration of understocked and mature stands and conversion of some brushfields and Knobcone pine stands to Ponderosa Pine. Timber harvest in the 1990's to the present time has focused on thinning of overstocked stands and conversion of some Knobcone and Lodgepole pine stands to Ponderosa Pine. Comparing aerial photos from 1944, 1975 and 2003 (see Photo Gallery), there is a trend of increasing stocking of natural conifer stands and dry meadow areas and increasing acres of late seral forest. Seral stage diversity (outside of root disease and insect mortality areas) is moving toward more closed canopy, mature forests influenced by the exclusion of large scale wildland fires and the emphasis on stand thinning in the last decade. Vegetation type has shifted somewhat toward more Ponderosa pine as reforestation of brushfields and

harvested stands emphasize this species, which historically has been the dominant species on the McCloud Flats and in the project area.

Alternative 4 - No Action

Direct and Indirect Effects (Vegetation Diversity)

Successional stage diversity will change with the potential loss of about 415 acres of late successional stands (approximately 305 acres in the Upper McCloud Watershed and 110 acres in the Ash Creek Watershed) due to existing insect and disease infestations. This loss would be significant if it caused the percent of late successional forest to fall below 15 percent of the capable land in each of the two fifth field watersheds affected. The actual acres lost would depend on future weather conditions and rate of spread for root disease centers and insect infestations. This potential loss would be a reduction of about 0.5 percent of the late-successional forest in the Upper McCloud Watershed and about 0.2 percent of the Ash Creek Watershed. There would be a corresponding increase in the acres of early successional forest in these watersheds.

Cumulative Effects (Vegetation Diversity)

Cumulative effects for vegetation diversity are bounded by the two fifth field watershed as described in the Affected Environment Section above. This bounding is based on Forest Plan direction for assessing the existing percent of late successional forests and effects of the proposed actions on those successional stages.

Within the last decade approximately 1,000 acres of regeneration harvest and salvage have occurred in the two fifth field watersheds on National Forest lands. A majority of this harvest (670 acres) was salvage of dead and dying Ponderosa pine from Western Pine Beetle infestations. The other 330 acres was regeneration of lodgepole pine and knobcone pine. This has reduced the amount of late successional forests within the Ash Creek Watershed by approximately 1.0 percent and in the Upper McCloud Watershed by approximately 0.9 percent[141]. These stands have some residual mid and late-successional stage trees and groups of trees with a much lower canopy closure.

There has also been approximately 11,400 acres of commercial thinning in the two fifth field watersheds that has not changed the amount of late successional forest in the short term (10 years and less), but will increase the percent of late successional forest in the long term (15 and longer) as mid-successional (3b and c) stands that were thinned grow into the late-successional (4b and c) stage. Development of these stands assumes no catastrophic loss from fire, insects or disease.

There are also two future projects within the fifth field watersheds. The Mudflow Project (Upper McCloud Watershed) will commercially thin approximately 2,100 acres of natural stands and plantations and treat root disease centers ranging from small group selection area (2-4 acres) to regeneration with reserve trees in areas of more extensive root disease on approximately 500 acres and remove encroaching conifers from approximately 200 acres of wet meadows. The Algoma Project will commercially thin approximately 4,000 acres of natural stands and

[141] Vegetation diversity calculations in project file.

plantations, partly in the Upper McCloud Watershed and partly within the Ash Creek Watershed. This project is in a late successional reserve and may treat root disease centers or insect infestations. These projects are predominantly thinning of mid and late successional stands to improve growth and resistance to insect, disease and wildland fires. Regeneration and sanitation harvest on approximately 700 acre of the Mudflow Project will reduce the amount of late-successional forest in the Upper McCloud Watershed by 1.3 percent.

There is a large percent of both watersheds currently in this mid-successional dense stage, 3b-c (33 percent of the Ash Creek and 31 percent of the Upper McCloud Watershed) that should develop into the late-successional stage in the next 10 to 40 years.

Past and proposed future regeneration harvest will reduce the amount of late-successional forest in the Upper McCloud Watershed by about 2.2 percent and in the Ash Creek Watershed by about 0.9 percent. Past and proposed future projects will or have thinned approximately 2,700 acres of mid-successional plantations that will increase the acres of late-successional forest in 30 to 50 years in both watershed.

Overall there will be a short-term reduction in the percent of late-successional forest in both watersheds, but they will remain above the 15 percent threshold. The percent of late-successional forests will increase over the next 10 to 40 years as mid-successional stands, especially those that have been or will be thinned, grow into the late-successional stage.

Alternatives 1, 2 & 3

Direct and Indirect Effects (Vegetation Diversity)

Thinning should not change successional stage diversity in the short term as the majority of dominant and co-dominate trees will be retained and average tree diameter will increase with the removal of smaller diameter trees from the understory. Increased diameter growth will advance the treated mid-successional stands to late-successional forests more rapidly. Approximately 2300 acre of thinning will remain late-successional forest. Approximately 785 of biomass thinning will develop into late-successional forest in 40 to 60 years.

Regeneration harvest, aspen release and meadow restoration will result in the change of about 535 acres late successional forest to early-successional forest. Much of this change would occur even if no action is taken, as described in the effects of no action. This change will reduce the amount of late-successional forest by .2 percent (100 acres) for the Ash Creek Watershed and by .8 percent in the Upper McCloud Watersheds. Both watersheds would remain above the 15 percent threshold for late successional forests

About 175 acres of early to mid-successional forest will be changed to early successional/open as pole and sapling size conifers are removed to expand dry meadows to their more historic size. These are predominately Ponderosa pine type and will remove about 1 percent of the Ponderosa pine type in the Ash Creek 5th Field Watershed. There will be a corresponding increase in the early-successional stage grass and forbes as dry meadow areas expand.

Vegetation type diversity will be increased for the 415 acres of regeneration harvest, as they are they are predominantly Ponderosa pine and will be planted with a mixture of conifer species.

Cumulative Effects (Vegetation Diversity)

Alternatives 1, 2 & 3 (approximately 535 acres of regeneration harvest) combined with the past actions (approximately 1,000 acres or regeneration harvest) and future actions (approximately 700 acres of regeneration harvest on the Mudflow Project) will result in reducing the amount of the late successional forests in the Ash Creek fifth field watershed by approximately 1.0 percent and in the Upper McCloud fifth field watershed by about 2.8 percent. The Ash Creek Watershed will then have about 28 percent late-successional forest and the Upper McCloud Watershed will have about 20 percent late-successional forest.

Commercial thinning in the last decade and proposed commercial thinning will have treated approximately 20% (8,700 acres) of the commercial forest lands in the Ash Creek Watershed and approximately 20% (11,100 acres) in the Upper McCloud Watershed. In the long term (15 years and longer), these watersheds will have a greater percent of the landscape in late successional and old-growth forests as thinning treatments accelerate tree growth and stands mature into late-successional and old-growth forest, absent any catastrophic event from fire, insects or disease.

Fuels and Wildfire[142]

Affected Environment

Refer also to the purpose and need in chapter 1 for affected environment specific to fuels. Generally the landscape is typical of Fire Behavior Fuel Models 2, 8, and 10[143], with about 92% of the areas proposed for treatment in Fuel Model 10. Fires in Fuel Model 10 burn in the surface and ground fuels with greater fire intensity than in other timber litter models. Crowning, spotting and torching of individual trees are more frequent in this fuel situation, leading to potential difficulties in controlling fire[144]. With Fuel Model 8, slow-burning ground fires with low flame lengths are generally the case, although the fire may encounter occasional heavy fuel concentrations that can flare up[145]. Fires in Fuel Model 2 spread primarily through fine herbaceous fuels, either curing or dead. These are surface fires where the herbaceous material, in addition to litter and dead downed wood from the open shrub or timber overstory, contribute to fire intensity[146].

The Pilgrim project area has a moderate hazard rating (i.e., to what degree does the condition of the vegetation and topography contribute to the increase in fire behavior), and a high risk rating (i.e., what is the chance of a fire starting in this area?)[147]. Between 1994 and 2004 there have been 21 lightning caused fires and 17 human caused fires within the 8th field watershed.

[142] Paraphrased from the *Fuels Specialist Report*, November 25, 2005.
[143] Anderson 1982. Aids to Determining Fuel Models for Estimating Fire Behavior. USDA Gen. Tech. Rep. INT-122, p. 13.
[144] Anderson 1982. *Aids to Determining Fuel Models for Estimating Fire Behavior*. USDA Gen. Tech. Rep. INT-122
[145] Anderson 1982. *Aids to Determining Fuel Models for Estimating Fire Behavior*. USDA Gen. Tech. Rep. INT-122, p. 11.
[146] Anderson 1982. *Aids to Determining Fuel Models for Estimating Fire Behavior*. USDA Gen. Tech. Rep. INT-122, p. 5.
[147] (potential for ignition based on; 1.5 fires per thousand acres per decade)

Under current conditions, with the increase of disease and insect infestation, severe weather blow down, and overcrowding, the existing fuel loading is 45-50 tons per acre (t/a) in the infected areas. Areas not experiencing accelerated deterioration have fuel loadings ranging from 5-30 t/a[148].

The current fire regime is one of moderate to high intensity fires at infrequent intervals and generally characterizes fast spreading, high intensity fires under worst case scenarios.

Desired fuel conditions are 5-10 tons/acre, retaining approximately 4-6 logs over 10' in length and of the largest available diameter[149], the Forest Service would need fire behavior conditions that mimic those of a Fuel Model 2, 8 or 9. This would allow suppression by ground resources and would create favorable conditions to apply prescribed fire where needed. Annual natural fuels accumulation should be in the range of .6 - 3 ton/acre per year[150].

Environmental Consequences

The criteria used to compare the alternatives are change in fuel model, flame lengths, and rates of spread. Direct, indirect and cumulative effects are also discussed as they relate to these criteria. Table 7 shows the changes to criteria.

Table 7. Fuel model, flame lengths, rates of spread and canopy cover by alternative in Harvest Units

	Alternative 4 no action (current condition)	Alternative 1	Alternative 2	Alternative 3
Change in Fuel Model (% acres)	FM 2 - 5 % FM 8 - 3 % FM 10 - 92 %	FM 2 - 18 % FM 8 - 82 % FM 10 - 0 %	FM 2 - 18 % FM 8 - 68 % FM 10 - 14 %	FM 2 - 18 % FM 8 - 75 % FM 10 - 7 %
Flame Length: **FM 2** **FM 8** **FM 10**	Untreated: 5%<8.5' 3% < 1.4' 92% > 6.2'	Treated acres: 18%< 8.5' 82% < 1.4'	Treated acres: 18% < 8.5' 68% < 1.4' 14% > 6.2'	Treated acres: 18% < 8.5' 75% < 1.4' 7% > 6.2'
Rate of Spread: **FM 2** **FM 8** **FM 10**	Untreated: 5% - 55 ch/hr 3% - 3 ch/hr 92% -11 ch/hr	Treated acres: 18% - 55 ch/hr 82% - 3 ch/hr	Treated acres: 18% - 55 ch/hr 68% - 3 ch/hr 14% - 11 ch/hr	Treated acres: 18% -55 ch/hr 75% - 3 ch/hr 7% - 11 ch/hr

Legend: FM=fuel model, ch/hr=chains per hour.

Alternative 4 - No Action

Direct and Indirect Effects (see Table 7 above) (Fuels and Wildfire)

With this alternative, current fire conditions would persist. Most of the project area would continue in the short term in Fuel Model 10 with flame lengths over 6 feet and rates of spread of about 11 chains per hour. Canopy base heights, surface fuel loads, dead crowns, crown density,

[148] 5 t/a in the meadow restoration units
[149] Forest Plan G-12 & 4-67
[150] Skaggs, B. Technical Fire Management Report Sequoia National Forest 1996, Agee. Fire Ecology of the Pacific North West Forests 1993 p336

and conifer encroachment would continue. Over time, portions of the project would transition to Fuel Model 12[151]. The primary carrier of fire in fuel model 12 is dead and downed slash like material. The rate of spread would be 17 ch/hr, with a flame length of about 9.7 feet[152] (fuel model 12)[153]. There will be a greater probability of surface fire transitioning to a crown fire as well as higher intensity surface fires. Greater crown density promotes transition of passive to active crown fires (passive fire is dependent on surface fuels and intermittently torches in the crowns; an active crown fire is independent of surface fuels and burn primarily in the crown[154]). Flame heights exceed direct attack capabilities. The fire regime will remain out of sync with historical conditions. Greater fire severity effects are expected, including the chance for stand replacing fire.

In areas of root disease and insect infestation, the expected fuel loading will significantly increase in the .1-9" class over the next 5 years, adding roughly 15-25 tons per acre[155]. Within 10 years, about 70 percent of the trees that are now dead or dying will have fallen,[156] adding approx. 30-50 total tons per acre (this includes >9" material). This would exceed 70+ tons per acre and significantly increase the amount of surface fuels that are the primary carrier of fire. These high fuel loadings will cause higher intensity fires and make fires harder to control.

Currently about 10 percent of the project area has fuel loadings in excess of 15 to 25 tons per acre. Over the next 10 years, areas of conifer mortality from disease and insects will add approximately another 500 acres of excessive fuel loading or about 12 percent of the project area. This additive effect does not consider possible salvage of dead and dying trees in the future.

Cumulative Effects (Fuels and Wildfire)

Effects were bounded by assessing the estimated maximum potential spotting range of a wildfire originating within the project boundary or from an outside source which could spot into the project area. This boundary is .5 miles or less from unit perimeters. This area is approximately 8500 acres, of which about 10 percent is private lands.

Timber harvest in the last 10 years within the cumulative effects bounded area has been about 220 acres of salvage of dead trees for western pine beetle infestations, about 1,400 acres of commercial thinning of natural stands and plantations, about 400 acres of underburning and about 250 acres of slash pile burning. Underburning and slash pile burning were done on the same acres as timber harvest. The effects of these actions have been a change from generally Fuel Model 10

[151] Fuel Model 12 is characteristic of rapidly spreading fires with high intensities that are capable of generating firebrands. When fire starts, it is generally sustained until a fuel break or change in fuels is encountered. Anderson 1982. *Aids to Determining Fuel Models for Estimating Fire Behavior*. USDA Gen. Tech. Rep. INT-122, p.13.
[152] Maxwell W.G. & Ward F.R. "Photo-Series for Quantifying Forest Residues" PNW-95 Oct. 1979 & "Behave 2.0.2 " fire modeling program
[153] Behave 2.0.2 fire modeling program
[154] Donna Sager, Assistant Fuels Officer.
[155] These figures are based on observation of infected stands on the McCloud Flats over a 3 year period.
[156] Keen. F.P. "*How Soon Do Yellow Pine Snags Fall?*" Jour-Forestry 27:735-737 oct.1929

to Fuel Model 8 on the acres that were thinned (18% of the cumulative effects area) and to Fuel Model 2 on the acres that were salvaged (2% of the cumulative effects area).

Alternative 1 - Preferred Alternative

Direct and Indirect Effects (see Table 7 above) (Fuels and Wildfire)

Thinning and sanitation/regeneration prescriptions and prescribed burning will remove fuel ladders, increasing the canopy base height. These prescriptions will also remove the majority of dead crowns, reduce crown density, and remove encroaching trees from historically natural openings. Prescribed burning and tractor piling treatments will reduce surface fuel loadings. Together, the activities would reduce ladder fuels and surface fuels that in turn would reduce the chance of a stand replacement passive crown fire in the treated units. This reduction of fuels changes the NFFL fire behavior fuel models changing the fire behavior characteristics. This change is in reduced flame lengths, rate of spread, scorch heights, and reduced mortality rate primarily by converting the existing fuel model 10 areas to fuel models 8 and 2. The chance of crown fire moving through the canopy or intense surface fire is reduced on 100% of the treated acres. Suppression resources are able to use direct attack methods in these areas with the reduced flame lengths/surface fuel intensities.

Fuel model 2 will have a flame length exceeding 4'. This is due to the nature of fine flashy vegetation but results in less overall resource damage.

Fuel loading will be in the desired range of about 5 to 10 tons per acre with annual accumulations of about .6 to 3 tons per acre.

Cumulative Effects (Fuels and Wildfire)

Past timber harvest along with slash pile burning and underburning (approximately 1600 acres) and the proposed action will reduce the chance of a crown fire on approximately 5300 acres of National Forest lands within the cumulative effects area. This is about 62 percent of the cumulative effects area.

Fuel loading will be within the desired range of 5 to 10 tons per acre on the approximately 5100 acres treated.

Alternative 2 - Proposed Action modified to retain 60% canopy cover

Direct and Indirect Effects (see Table 7 above) (Fuels and Wildfire)

The effects of this alternative are similar to Alternative 1 except where 60 percent canopy closure is maintained on approximately 535 acres. In areas with 60% canopy cover there will be more potential for passive crown fire. To quantify the specific change, the percentage of dead canopy would need to be calculated. Observation of infected stands shows that the progression of mortality can increase dramatically in a short period of time. Also the future surface fuel loading from the dead and dying trees will contribute to the fire behavior. When all treatments and effects of this alternative are looked at together, the chance of crown fire moving through the canopy or intense surface fire is reduced in about 86% (3200 acres) of the treated acres.

Cumulative Effects (Fuels and Wildfire)

Past timber harvest along with slash pile burning and underburning (approximately 1600 acres) and Alternative 2 will reduce the chance of a crown fire on approximately 4800 acres of National Forest lands within the cumulative effects area. This is about 56 percent of the cumulative effects area.

Alternative 3 - Proposed Action modified to maintain 15% green tree retention in regeneration harvest units

Direct and Indirect Effects (see Table 7 above) (Fuels and Wildfire)

Fire modeling results in very similar fire behavior outputs as Alternative 1. Alternative 3 would have greater potential for future increased surface fuel loading on 415 acres due to the possible dying and falling of the trees that were left to maintain the 15% retention. When all treatments and effects of this alternative are looked at together, the chance of crown fire moving through the canopy or intense surface fire for this alternative is reduced on about 93% (3500 acres) of the treated acres.

Cumulative Effects (Fuels and Wildfire)

Past timber harvest along with slash pile burning and underburning (approximately 1600 acres) and Alternative 3 will reduce the chance of a crown fire on approximately 5100 acres of National Forest lands within the cumulative effects area. This is about 60 % of the cumulative effects area.

Threatened and Endangered Species – Wildlife and Fish[157]

In addition to threatened and endangered wildlife and fish species, this section addresses significant issue 1, with regards to the northern spotted owl.

Affected Environment

Of the threatened and endangered wildlife and fish species considered in the *Biological Assessment*, (Appendix H) the project is within the range and contains potential habitat for only the northern spotted owl[158]. The project area is located entirely within designated Critical Habitat Unit CHU- CA-2 for the northern spotted owl and Forest Plan matrix and riparian reserve land allocations[159].

Matrix is designed to provide for important ecological functions such as dispersal of organisms, carryover of some species from one stand to the next, and maintenance of ecologically valuable structural components such as down logs, snags, and large trees. The matrix will also

[157] Paraphrased from the Biological Assessment (November 2005), *Specialist Report – Wildlife* (November 30, 2005), *Pilgrim Vegetation Management Project Forest Plan-Vegetation Size and Density* map (as adjusted by ground verification, October 23, 2005) and *Acres of Proposed Treatment with Vegsize and Vegdensity within the Pilgrim Vegetation Management Project* (frequency file).
[158] Biological Assessment, November 2005, p. 3 and 4.
[159] Biological Assessment, November 2005, p. 7 and 10. Forest Plan pages 4-53 and 4-61.

add ecological diversity by providing early-successional habitat[160]. Production of timber and other commodities is an important objective for matrix lands[161].

The proposed treatment areas occupy about 4% of CHU CA-2 acres[162]. CHU CA-2 was designated[163] to provide easterly distribution of the subspecies and to provide an opportunity to designate an area that may eventually support contiguous nesting habitat for northern spotted owl pairs[164]. Since then, it has been recognized that the area has limited capability to provide optimum dispersal habitat[165]. Critical habitat helps focus conservation activities by identifying areas that contain essential habitat features (primary constituent elements)[166].

Recent (2004, 2005 & 2006) and historic surveys (past 15 years) show no spotted owls within 1.3 miles of the project area[167]. A radius of 1.3 miles is used in this province to approximate a northern spotted owl home range territory. Black Fox Mountain and Elk Flat activity centers (based on detections of non-breeding pairs or single individuals) are well over 1.3 miles outside the net Project area[168]. These centers are irregularly and seldom occupied and contain low to moderate capability habitat (the best in the watershed). Unoccupied moderate to low capability activity centers are very unlikely to generate owl activity in even lower capability or unsuitable habitat in the project area outside of normal foraging radius from the nest. The probability of owls in the more marginal, unsuitable, and very low-capability habitat (the worst in the watershed) of the Project area is very low[169,170].

The Project is on the central flats in historically unsuitable or marginal dispersal habitat. The tree distribution is clumpy and non-uniform, often with patches of dense pine trees interspersed with more open areas. Limited riparian vegetation, flat ground, dry open meadows, and fragmentation also contribute to unsuitability. The Forest Service assumes that owls occasionally disperse through the north area (including private land), but are unlikely to stay, even for a short time. The route further north through private land with more slope and at least limited water is more probable, but also low capability and heavily logged.

[160] Northwest Forest Plan. Basis for Standards and Guidelines, page B-2.
[161] Northwest Forest Plan. Basis for Standards and Guidelines, page B-1.
[162] Formal Consultation for the Pilgrim timber Sale (1-12-2005-F-24), Biological Opinion, page 16.
[163] Northern spotted owl Critical Habitat was designated based on the identification of large block of suitable habitat that are well distributed across the range of the spotted owl. Most CHUS were expected to provide suitable habitat for population support, some were designated primarily for connectivity, and other were designated for both (Formal Consultation for the Pilgrim timber sale (1-12-2005-F-24), Biological Opinion, page 9.)
[164] Formal Consultation for the Pilgrim timber Sale (1-12-2005-F-24), Biological Opinion, page 16.
[165] Lava rims and soils with low water holding capacity occur throughout the McCloud Flats. These areas are often not capable of supporting stands with high crown canopies (Managing Dispersal and Connectivity on Matrix Land, April 22, 1997).
[166] Federal Register Vol. 57, No. 10, January 15, 1992. pp. 1796.
[167] Biological Assessment, November 2005, p. 17.
[168] Biological Assessment, November 2005, p. 17.
[169] Forest Plan, Appendix G, p. G-12 table, USGS Maps, Air Photos 1995.
[170] Biological Assessment, November 2005, p. 17 and 18.

The spotted owl is associated with late-successional and old growth forest. From a forest vegetation type or structural standpoint[171], approximately 1,722 acres of treatment stands are classified as 3N, 3G, 4N, and 4G[172]. These vegetation types are usually considered nesting, roosting, and foraging habitat based on vegetation type. Although they have been classified in this way, they are not habitat nor are they comparable to similarly classified stands found in more moist areas of the forest. About 150 acres of regeneration harvest areas have extensive tree mortality, but are still reflected as 3N.

Under the habitat capability model[173], 1,517 acres of treatment stands are classified as 3N, 3G, 4N, or 4G (subtracting the high mortality 3N stands). Approximately 1,502 acres of low quality 3N timber type stands would be considered foraging habitat in other areas and about 14 acres of 4N/4G timber types would be considered nesting and roosting, however they are so limited by the conditions on the flats (slope, aspect, water, and prey base are limited), that they are not considered suitable northern spotted owl nesting, roosting, or foraging habitat. Field reconnaissance confirms that the project assessment area is low quality dispersal habitat at best[174]. Based on vegetation typing, habitat capability models, and ground verification, the actual project contains no suitable nesting, roosting, or foraging habitat. The owl analysis in the *Biological Assessment* considered 1,517 acres of low capability dispersal habitat in treatment areas and about 1,251 acres of capable (potentially suitable) dispersal habitat[175].

Environmental Consequences

Alternative 4 - No Action

Direct and Indirect Effects (T&E Wildlife)

The direct effect of no action would be continuance of the present situation. Fragmented, low quality dispersal habitat would persist. The indirect effect of no action would be continuous further insect and disease induced tree mortality in the project area and vicinity (see also the Forest Vegetation section) and the potential for loss of habitat due to fire (see also the Fuels and Wildfire section). The highly probable continued effect of pathogens known to be present and/or wildfire would most likely remove some marginally suitable dispersal habitat. Approximately 150 acres of dispersal habitat has been lost from insect killed trees in the proposed regeneration harvest units. The remainder of these units, approximately 265 acres, could be lost over the next several years as pathogens continue to kill trees. An unestimated number of acres of dispersal habitat will continue to be lost in stands with root disease centers (within the approximately 1035 acres of proposed thinning/sanitation units) as the disease spreads to trees adjoining infection centers.

[171] Forest Plan (1975/1980) data with 1990 and 1994 updates for plantations.
[172] Size 3 = 12 to 24 inches in diameter; size 4 (and above) = > 25 inches in diameter. Vegetation density N= 40-69% canopy closure; density G = >70% canopy (Debbie Fleming, silviculturist).
[173] Habitat capability models, Appendix G of the Forest Plan.
[174] Francis Mangels, Wildlife and Range Biologist.
[175] Biological Assessment, November 2005, p. 22 and 23.

Juvenile owl may still disperse across the area, as owls are known to move across large areas of marginal or even unsuitable habitat[176].

Cumulative Effects (T&E Wildlife)

Cumulative effects for the Northern Spotted Owl are bounded by the Critical Habitat Unit, CHU-CA-2 which is approximately 89,000 acres of National Forest and private lands. The CHU contains all of the Algoma Late Successional Reserve (RC-357) and Bartle Managed Late Successional Area (DD-79) totaling approximately 26,891 acres and the Elk Flat Late Successional Reserve (RC-360) totaling approximately 3,056 acres. This cumulative effects area was used because there are two other vegetation management projects currently being planned within the CHU and will overlap in time with this project.

Since 1996 the U.S. Fish and Wildlife Service has consulted on thirteen projects within the CA-2 Critical Habitat Unit (CHU) [177]. Five minor projects have had no effect on suitable Northern Spotted Owl Habitat. The Pilgrim Creek Snowmobile Park Project included grooming of snowmobile trails and some hazard tree removal along these trails. The Intake Springs Water System Project removed 17 hazard trees. The Sugar Roadside Hazard Tree Project removed approximately 100 road hazard trees and the Cattle Camp Vegetation Management Project thinned 48 acres of a mixed conifer stand within the Cattle Camp Campground. The Coonrod Visual Enhancement Project removed about 70 trees in a historic meadow area that is part of a Native American cultural site.

Five green timber sale Projects have been consulted on. The Mt. Thin and Fuels Project temporarily degraded approximately 24 acres of foraging habitat, but this did not have an adverse effect to critical habitat[178]. The Edson Vegetation Management Project thinned approximately 1700 acres of natural stands and plantations and regenerated about 20 acres of root diseased infested trees. This project temporarily degraded approximately 1,300 acres of forage habitat, but this did not have an adverse effect on critical habitat[179]. The Davis Vegetation and Road Management Project temporarily degraded approximately 100 acres of foraging habitat by commercial thinning. The McCloud Flats Phase 1 Forest Health Project (North Flats, East Flats, Corral, North Flats Biomass and Ash Biomass sales were implemented under the Flats Phase 1 Environmental Assessment) thinned approximately 2,900 acres of natural stands and plantation and regenerated approximately 90 acres of root diseased infested trees. This project temporarily degraded approximately 200 acres of marginal dispersal habitat, but this did not have an adverse effect on critical habitat[180]. The Mud Forest Health Project (Pilgrim Biomass Sale) thinned approximately 2,200 acres of natural stands and plantations. This project temporarily degraded approximately 200 acres of dispersal habitat, but this did not have an adverse effect on critical

[176] Personal Comm. with Francis Mangels, Wildlife and Range Biologist
[177] Formal Consultation for the Pilgrim Timber Sale (1-12-2005-F-24R) page 17
[178] Biological Assessment for Mountain Thin and Fuels Mgt. Project, pages 9 & 11
[179] Biological Assessment for Edson Vegetation Management Project, page 23
[180] Biological Assessment for McCloud Flats Phase 1 Project, pages 29 & 31

habitat[181]. The South Flats Multiproduct Project (South Flats and the Flow Multiproduct Sales) thinned approximately 3,800 acres of natural stands and plantations and regenerated approximately 110 acres of Knobcone pine. This project also resulted in the clearing of approximately 800 acres of shrubfields that were planted to a mix if conifer species, mainly ponderosa pine. This project degraded approximately 1,500 acres of marginal dispersal habitat[182].

All of the green sales, except Mountain Thin, had been surveyed to protocol for Northern Spotted Owls for at lease two years prior to project implementation and no owl were detected in areas proposed for harvest.

Three salvage sales have been consulted on. The Elk Flat Salvage removed approximately 80 acres of dead trees that was dispersal habitat. The Kinyon Vegetation Management Project removed approximately 130 acres of dead trees that were formerly considered foraging habitat. The Old Station Salvage removed approximately 213 acres of dead trees that were formerly considered dispersal habitat.

The Ash Sink Salvage and Elk II Salvage were determined to have no effect to the Northern Spotted Owl but did remove approximately 225 acres of dead trees that was formerly considered dispersal habitat.

Past projects within the CHU have degraded approximately 3,400 acres of forage/dispersal habitat (about 12 percent of the forage/dispersal acres in the CHU). Degraded habitat is a temporary loss in the quality of habitat, but not habitat function. Approximately 10,700 acres of Thinning (about 41 percent of the forage/dispersal habitat in the CHU) has improve habitat quality in the long term as stands have improved growth rates and trees grow larger and are less susceptible to insects and disease. Regeneration of approximately 220 acres of knobcone pine and root disease centers and planting of shrubfields will improve habitat in the long-term as these areas were planted to a mixed of conifer species, primarily ponderosa pine, that will grow into suitable dispersal habitat in thirty to forty years.

There are two future projects within CHU CA-2. The Mudflow Project that will commercially thin approximately 2,100 acres of natural stands and plantations, treat root disease centers ranging from small group selection area (2-4 acres) to regeneration with reserve trees in areas of more extensive root disease on approximately 500 acres and remove trees from 200 acres of meadow areas. The Algoma Project (in the Algoma Late Successional Reserve) will commercially thin approximately 4,000 acres of natural stands and plantations. These projects are in the early planning stage and the total acres and locations of treatments could change when a final proposed action is approved. As currently planned The Algoma Project would thin approximately 3,500 acres of foraging/dispersal habitat (the other 500 acres of thinning is in young plantations not currently considered suitable owl habitat) and the Mudflow Project would thin approximately 2,100 of foraging/dispersal habitat. Thinning of these stands would be with emphasis on removing smaller trees in the understory and some dominant and co-dominant size trees to attain the desired stocking. The Mudflow project will also remove approximately 500

[181] Biological Assessment for the Mud Forest Health Project, pages 8 & 9
[182] Biological Assessment for the South Flats Project, page 5

acres of diseased trees that are now considered dispersal habitat and 200 acres of trees from meadow areas now considered dispersal habitat. At this time it has not been determined how many acres of thinning may be degraded as a result of these proposed actions.

Cumulatively, the combined past and future vegetation management projects in CHU CA-2 have or will commercially thin approximately 16,800, acres of Northern Spotted Owl foraging/dispersal habitat (about 64 percent of the forage/dispersal habitat in the CHU). These thinning treatments degrade some of this habitat in the short term (5-10 years) but improve the quality of habitat in the long term as the stands develop more rapidly into a larger tree size and better quality dispersal/forage habitat. Due to site conditions, many of these stands on the McCloud Flats are naturally very low capability dispersal habitat[183].

The greatest cumulative impact to the Northern Spotted Owl and its critical habitat in CHU CA-2 is the continued loss of habitat from insect infestations and root disease centers. Not considering small pockets of dead trees that are scattered throughout the CHU, approximately 800 acres of foraging/dispersal habitat(about 3 percent of the forage/dispersal habitat in the CHU) have been lost to insects and disease in the last five years and this trend could continue into the near term future. Approximately 220 of these acres are in late successional reserves within the Critical Habitat Unit. All of this loss has been in pine stands that either had not been thinned or were thinned to densities that were too high to sustain healthy trees (See Forest Health Section).

Continued loss of dispersal and foraging habitat could result in fewer juvenile owls dispersing across the landscape and finding suitable habitat for nesting and roosting that currently exists in the Algoma Late Succession Reserve.

Alternative 1 - Preferred Alternative

Direct and Indirect Effects (T&E Wildlife)

The proposed regeneration harvest prescriptions have almost no effect on owl habitat because disease and insects have killed many of the trees in these areas, rendering the stands essentially unsuitable[184].

The thinning prescriptions are designed to sustain a forest canopy, but leave the stands open enough so that they may survive the endemic pathogens in the area. Treated stands would be more resistant to stand replacing crown fires or pathogens and would include more large-diameter conifers with fuller crowns and larger lateral branches than untreated stands[185]. Treatment in these stands is likely to reduce the risk of total stand loss, thereby helping to maintain some low capability dispersal habitat for the northern spotted owl[186].

In the short term, vertical structure will be somewhat simplified by removing smaller diameter conifers by thinning and underburning. Release of willows, oaks and aspens will

[183] Biological Assessment, November 2005, p. 11
[184] Biological Assessment, November 2005, p. 19
[185] Biological Assessment, November 2005, p. 19
[186] Biological Assessment, November 2005, p. 19

improve cover diversity and prey habitat diversity[187]. Larger conifers will be removed on about 20 acres of aspen treatment; these trees are not old growth. Removal of these conifers is regarded as a beneficial trade-off for the value of saving the few remaining aspen. Deciduous trees contribute to forest diversity and a diverse prey base, benefiting raptors using the area, but on a very limited acreage[188].

Maintaining prescribed snag and logs densities will provide for prey cover and promote species diversity within the limitations of the site[189].

Prescribed burning would help protect nearby owl habitat from catastrophic fire losses and stimulate prey diversity on the forest floor, providing a more reliable food supply. Increasing vegetative diversity increases the prey base and thus helps raptors, but the effect is slight in the Project.

The proposed thinning actions would affect about 1,517 acres of low capability dispersal habitat. Approximately 670 acres of low capability dispersal habitat will be removed (functional loss of primary constituent elements, thus no longer considered suitable habitat) and 844 acres degraded (reduction of habitat quality but not function) [190]. Degraded habitat will be regained in 5 to 15 years as thinned stands, mainly the 785 acres of plantations, grow into suitable dispersal habitat.

Approximately 1251 acres of capable/potential habitat will be modified (benefited) by removal of dying trees and replanting, plantation biomass thinning, thinning to remove fuel ladders and conversion of Knobcone pine to mixed conifer trees. Plantation thinning will accelerate the development of dispersal habitat. Thinning of natural stands will also accelerate the development of future dispersal habitat and improve the stands resistance to insect, disease and stand replacing wildland fire. Removal of dying trees and replanting will benefit the critical habitat unit by reducing the spread of insects and disease pathogens and reducing future ground fuels to within a range of desired conditions.

The effects of the proposed project constitute an adverse effect to critical habitat because the function of primary constituent elements[191] has been adversely affected. However, due to the limited amount of dispersal habitat to be removed (approximately 670 acres) the U. S Fish and Wildlife Service does not expect this adverse effect will impede the ability of the project area to provide for the intended conservation needs of the Northern Spotted Owl[192]. The U. S Fish and Wildlife Service's determination is that *the proposed action is not likely to destroy or adversely modify designated critical habitat for the Northern Spotted Owl.* Overall the removal of the

[187] Biological Assessment, November 2005, p. 20
[188] Biological Assessment, November 2005, p. 20
[189] Biological Assessment, November 2005, p. 21
[190] Formal Consultation for the Pilgrim timber Sale (1-12-2005-F-24), Biological Opinion, page 20 & 21
[191] Primary constituent elements are an integration of habitat components such as tree and stand structure, prey base, cover, slope, aspect, availability of water, etc. that are essential to a species conservation.
[192] Formal Consultation for the Pilgrim timber Sale (1-12-2005-F-24), Biological Opinion, page 21

majority of the trees in the project area is beneficial to the CHU due to the currently severe pathogenic conditions[193].

Because the project area is unsuitable for nesting, roosting and foraging, owls are not likely to occupy the area for those purposes during proposed activities. Because the proposed project will not modify the limiting factors making the area unsuitable (availability of open water, slope, etc.), it is still highly unlikely that owls would occupy the area post-project. Although the operation modifies forest structure in the thinning and sanitation harvest, slope, water and soil limitations maintain unsuitable nesting, roosting and foraging habitat conditions throughout the Project Area. Juvenile owl could still disperse over the project area but may seek better habitat to the south of the project area along the McCloud River[194]. Owls normally disperse at night, so noise should not be a factor. Also, since owls have been known to disperse over large areas of marginal and unsuitable habitat[195], the proposed actions may discourage owl movement, but not prevent it. Openings created by regeneration harvest areas are scattered across the landscape and should not be a barrier to owl dispersal.

Future stand conditions will increase and improve dispersal habitat in 5 to 15 years, as thinned plantations grow into suitable owl dispersal habitat and thinned natural stands recover canopy closure and trees increase in size.

Based on the lack of owl occupancy within the project area and the low probably of owl presence in the future, the U. S Fish and Wildlife Service has concurred with the finding that this project *may affect, but is not likely to adversely affect the Northern Spotted Owl.*

Alternative 1 - Preferred Alternative

Cumulative Effects (T&E Wildlife)

Effects of past and future actions within CHU CA-2 are described under the cumulative effects section for the No Action Alternative. The combined effects of the proposed action with these effects would/has result in the removal of approximately 2,000 acres of foraging/dispersal habitat (600 acres of previous salvage, 700 acres of proposed regeneration harvest/meadow restoration in the Mudflow Project and 670 acres of the proposed Pilgrim Project) and the temporary degrading of approximately 4,200 acres of foraging/dispersal habitat. Most of the removed habitat (about 1,800 acres) is the result of root disease and Western Pine Beetle infestations killing large areas of trees. The removed foraging/dispersal habitat is about 8.0 percent of the total foraging/dispersal habitat in the CA-2 Critical Habitat Unit.

Degraded foraging/dispersal habitat retains its intended function, but at a lower quality. As this habitat grows into taller and larger trees, habitat quality will increase and in the long term (20 years and longer) and should develop into nesting/roosting habitat, especially within the late successional reserves in the CHU CA-2. Some of this habitat, in the project area and the

[193] Formal Consultation for the Pilgrim timber Sale, page 20
[194] Biological Assessment, November 2005, p. 22
[195] Personal Comm. Francis Mangels, Range and Wildlife Biologist

surrounding McCloud Flats especially, may never develop the factors[196] necessary for suitable nesting/roosting or foraging habitat for Northern Spotted Owls[197].

A range-wide evaluation of critical habitat indicated that the effects (consulted on and fire effects) to date have impaired, to varying degrees, the ability of individual CHU's to fulfill their intended function. However, these effects have not precluded the CHU network from providing for Northern Spotted Owl conservation across the species range[198]. Consulted upon effects and natural disturbances have had a minor impact to CHU-2 since its designation in 1992[199]. Vegetation management projects in the last ten years have benefited the critical habitat unit by removing infected and diseased trees and thinning overstocked stands to improve growth and resistance to pathogens.

Past and future actions, including the proposed action, will discourage, but not prevent, owl dispersal across the critical habitat unit for about 5 to 10 years, after which thinned plantations and natural stands will have grown into more suitable dispersal and foraging habitat. None of the past actions has impacted suitable nesting/roosting habitat and none of the future projects will affect nesting/roosting habitat if owls are found to be present. There is a long-term benefit to the northern spotted owl from managed habitat that is more resistant to stand replacing events, such as the recent western pine beetle outbreak in the critical habitat unit and on the general area of the McCloud Flats.

Alternative 2 - Proposed Action modified to retain 60% canopy cover

Direct and Indirect Effects (T&E Wildlife)

The effects are the same as Alternative one except that approximately 535 acres, in 20 stands, of marginal dispersal habitat will remain at 60 percent or greater canopy closure, making these acres more suitable for owl dispersal in the short-term. However, these stand densities cannot be sustained in the long-term as discussed in the effects of Alternative 2 under forest health. This could result in a stand replacing event, such as has recently occurred in the project area from a western pine beetle infestation. Owls would be less likely to disperse over the area if there are additional large blocks (100 to 200 acres or greater) of the forest canopy removed either from continued insect activity or from wildland fire.

Cumulative Effects (T&E Wildlife)

The cumulative effects of Alternative 2 are the same as Alternative 1 except that approximately 535 acres of denser canopy cover will be maintained on some stands. The denser canopy cover will be a short-term benefit to dispersing owls. The long-term effect could be detrimental to owl dispersal as insect and disease mortality would be greater (see effects of Alternative 2 to Forest Health).

[196] Biological Assessment, November 2005, p. 14
[197] Biological Assessment, November 2005, p. 19
[198] Formal Consultation for the Pilgrim timber Sale (1-12-2005-F-24), Biological Opinion, page 15
[199] Formal Consultation, page 17

Alternative 3 - Proposed Action modified to maintain 15% green tree retention in regeneration harvest units

Direct and Indirect Effects (T&E Wildlife)

The effects of Alternative 3 are the same as Alternative 1 with the exception of the regeneration harvest areas where 15% green tree retention would be maintained on all 415 acres instead of only 160 acres. Most of these areas are not considered dispersal habitat now due to mortality and the low canopy closure. The 15% green tree retention areas will provide remnant forest structure within regeneration harvest areas in the short term (2 to 10 years[200]) while still alive and for another 10-30 years as snags and eventual downed logs. Due to the low capability habitat of the project area and fragmentation, even in the absence of action, these areas are not likely to be used and therefore these 15% patches have no benefit to spotted owls.

Cumulative Effects (T&E Wildlife)

The cumulative effects of Alternative 3 are the same as Alternative 1.

Sensitive Species - Wildlife and Fish[201]

Affected Environment

Of the sensitive wildlife and fish species considered in the Biological Evaluation, the project is within the range and contains marginal habitat for only the northern goshawk (*Accipter gentiles*), Pallid Bat (*Antrozous pallidus*) and American marten (*Martes americana*)[202].

The project area is within a portion of the Upper McCloud River Redband Trout Refugium, a boundary that has been managed to be consistent with the Redband Conservation Agreement since 1998[203, 204]. The perennial fish-bearing reaches of Edson, Swamp and Trout Creek are well upstream of the creeks in the project area[205]. Also, a portion of Trout and Dry Creeks between the Pilgrim Creek Road and Road 40N12 has been recommended by the California Department of Fish and Game as intermittent Redband Trout refugium habitat. No Redband Trout have as yet been observed in this section of Trout and Dry Creeks.

Acceptable dispersal habitat surrounds the McCloud Flats, but the project area is marginal at best for goshawks, pallid bats and martens and has no resident foraging individuals. Intermittent streams exist within the project area, but riparian vegetation is very limited and dissimilar to typical riparian foraging areas. Since martens, goshawks and pallid bats have an affinity for riparian habitat, and the project area has almost none, the area has little attraction for these

[200] D. Shultz, Entomologist, Region 5 Forest Service.
[201] Paraphrased from the *Biological Evaluation*, November 10, 2005 and discussions with the author.
[202] Biological Evaluation November, 2005, p. 1-3.
[203] California Dept. of Fish and Game, "*Redband Trout Conservation Agreement Shasta-Trinity National Forest*," Fig. 1. Upper McCloud River Area Redband Trout Streams, May 2004 draft.
[204] California Dept. of Fish and Game, "*Redband Trout Conservation Agreement Shasta-Trinity National Forest 1998*.
[205] *McCloud Flats Ecosystem Analysis*, McCloud Ranger District, Shasta-Trinity National Forest, Siskiyou County, California, September, 1995, p. 42.

species. The Pilgrim project is in the poorest habitat surrounded by fair/poor habitat over three miles away on all sides.

Based upon habitat mapping, aerial photograph interpretation, and recent field surveys, crown canopy connectivity through the project is discontinuous and extremely limited. Very large natural openings of hundreds of acres, open pine forests, or old harvested areas limit dispersal. This is due to naturally occurring dry sparsely forested or shrub/grass dominated areas. Timber harvesting has had little effect on this naturally poor habitat for marten, pallid bats or goshawks.

American Martens have not been sighted in the project area since 1982. Habitat associations for marten on the Forest are found in higher elevation (>4,500 feet) true fir[206] stands[207] which are not found on the Flats (< 4200'). Protocol surveys (using baited trip cameras) for martens in 2002 and 2003 in and around the assessment area detected no martens in the project area and confirm the above habitat association. The watershed includes very little high or moderate capability habitat[208], and contains extensive low or marginal capability habitat, including all of the project area. Current dry habitat conditions and the absence of riparian areas suggest that marten do not likely occur in the watershed below 5000' except as transients. The total lack of any reasonable corridor in the flats suggests non-occupancy, even on a seasonal basis.

Goshawks nest outside of the project area in the Elk Flat LSR and on Black Fox. They may be foraging on the limited prey base along Ash Creek[209], but the creek has almost no riparian vegetation. The extinct Ash Creek Sink territory in NW section 22 was last active in 1991 before root disease became extensive. A goshawk was heard in the area in 2003 when extensive beetle and pathogen kill was beginning near the sink[210]. Due to extensive mortality of dense trees from pathogens in 2003-04, the entire territory was lost. Goshawks are locally common in Management Area 2, but are typically associated with late-successional dense old growth conifer habitat with some surface water supply into July. Habitat surveys suggest that nesting may occur outside the project area, but none within the project area[211]. Protocol surveys for Goshawks done in 2004, 2005 and 2006 within the project area did not detect any nesting pairs.

A single Pallid Bat was located at Trout Creek Meadows in October of 2005. This meadow is five miles north of the Pilgrim Project area. Prior to this sighting, Pallid Bats had never been found on the McCloud Flats. Pallid Bats are a very sedentary species and seldom venture far from its winter hibernation colonies and travel less than three miles from day roosts[212]. Due to this very sedentary habit, it is highly unlikely this bat came from the Pilgrim Project area.

[206] Criss and Kerns 1990 p. 17,18,25
[207] Buskirk, et al. 1994
[208] LRMP appendix G
[209] Simons 1997 Chapter 1
[210] Mangels, district goshawk database
[211] Biological Evaluation, November 2005, p. 8.
[212] BE. p. 8

Environmental Consequences

Alternative 4 - No Action

Direct and Indirect Effects (Sensitive Wildlife Species and Habitat)

The direct effect of no action would be continuance of the present situation. Poor quality foraging/dispersal habitat would persist. The indirect effect of no action would be continuous further insect and disease induced tree mortality in the project area and vicinity (see also the Forest Vegetation section) and the potential for loss of habitat due to fire (see also the Fuels and Wildfire section). The highly probable continued effect of pathogens known to be present and/or wildfire would most likely eliminate some marginal dispersal habitat for goshawks and martens.

Direct and Indirect Effects, Redband Trout

There would be no direct or indirect effects to Redband Trout from no action as there is currently no confirmed presence of the species within the project area or downstream of the project area.

Cumulative Effects (Sensitive Wildlife Species and Habitat)

Cumulative effects for sensitive wildlife and fish species are bounded by the 8th order watershed as described in Appendix F. This watershed was used because it best represents the habitat conditions for sensitive wildlife and fish species found on the McCloud Flats.

Timber harvest in the past 10 years has included approximately 8,300 acres of commercial thinning (approximately 2,800 acres on private lands), 550 acres of regeneration harvest (350 acres on private lands) and 1,500 acres of salvage (1000 acres on private lands).

Private land harvest has resulted in very open stands or clear cuts that are unsuitable or very poor habitat for sensitive wildlife species. Commercial thinning on National Forest lands has helped maintain some dispersal habitat for goshawks by creating open stands that are more resistant to loss from insects and disease, have larger trees with fuller crowns and larger lateral branches. Much of the watershed is marginal to poor habitat for the sensitive species of interest. Regeneration harvest on National Forest lands was all in Knobcone and Lodgepole pine stands, generally not considered suitable habitat for any sensitive species.

On National Forest land the loss of habitat from insects and disease has been the greatest cumulative impact to sensitive species. Approximately 500 acres has been lost in the last three years from Western Pine Beetle infestations killing large blocks of trees. Harvest of dead trees from this mortality did require leaving 2-3 snags per acre for snag dependent species. This has not been a significant impact because none of the three species are known to reside within the project area or the watershed and the habitat lost was of marginal quality.

Cumulative Effects, Redband Trout

As there are no direct or indirect effects, there are not cumulative effects to Redband Trout for the no action alternative. There are no perennial streams with Redband Trout within the cumulative effects watershed. There are intermittent streams considered Redband Trout habitat within the watershed, but these normally go dry sometime in June in an average rainfall year.

Alternatives 1, 2 and 3

Direct and Indirect Effects to Sensitive Wildlife Species and Habitat:

No goshawks, Pallid Bats or martens are likely to be harmed, harassed, or killed by any of the proposed actions for the following reasons: All of the proposed units are unsuitable or very low capability and the presence of these species is unlikely at any time. Activity centers are not in the project area. No recent sightings have occurred and none are expected[213]. A wandering individual may be disrupted from foraging during project implementation, which could occur over a three or four year period.

Marginal foraging/dispersal habitat has been or will soon be lost in the 415 acres of proposed regeneration harvest. Commercial thinning would slightly degrade about 3000 acres of low capability habitat for several years. In the long term (20 years+) habitat conditions would be maintained as stands would be more resilient to insects, disease and stand replacing wildland fire.

Proposed prescribed burning and piling would protect habitat from catastrophic fire losses and stimulate prey diversity on the forest floor, providing a more reliable food supply.

Aspen and oak will provide forage diversity, though at a small scale because so little exists at this time. Oaks and aspen will not be harvested, which potentially improves the habitat for raptors by improving prey base diversity (different vegetation provides a niche for different animals).

Meadow restoration and road management actions have almost no effect on sensitive species habitat because they impact poor or unsuitable habitat.

The concluding determination in the Biological Evaluation is that the project *may impact one or two individual Goshawks, one Pallid Bat and one Marten, but would not cause a trend towards federal listing or loss of viability.*

Direct and Indirect Effects to Redband Trout

There will be no direct or indirect effects on Redband Trout as suitable habitat does not occur within the project area, is very intermittent in adjoining areas and usually goes dry by June in a normal precipitation year.

Cumulative Effects to Sensitive Wildlife Species and Habitat

The combined effects of timber harvest in the past 10 years and the proposed actions will result in the change of approximately 900 acres (500 acres of previous salvage and 415 acres of regeneration harvest of dead and dying trees) of marginal foraging/dispersal habitat for sensitive wildlife species to unsuitable. All of this change has been from root disease centers and Western Pine Beetle infestations killing large areas of trees.

Commercial thinning on National Forest lands in the watershed has or will temporarily degrade approximately 8500 acres of marginal foraging/dispersal habitat for sensitive wildlife species. In the long-term this habitat will be maintained by making it more resistant to insects, disease and stand-replacing wildland fires. Approximately 3200 acres of private lands harvested in the last 10 years will remain marginal to unsuitable habitat for the three sensitive species.

[213] Biological Evaluation, November 2005, p. 8

This cumulative change and degrading of marginal habitat for sensitive species does not change the determination of effects in the biological evaluation because there are no resident sensitive species in the watershed and none are anticipated due to limiting factors of very limited riparian habitat, limited available water and limited prey base.

Cumulative Effects, Redband Trout

Because there are no direct or indirect effects to Redband Trout from the proposed actions, there are no cumulative effects. The determination in the Biological Evaluation is that *the proposed action will have no effect on Redband Trout.*

Threatened, Endangered, and Sensitive Botanical Species[214]

Affected Environment

At present, no plants on the Shasta-Trinity National Forest are federally listed as threatened or endangered[215]. Based on presence of potential suitable habitat, Forest recognized sensitive plant, bryophyte and fungi species of concern for this project are Mountain lady's slipper *(Cypripedium montanum*), Baker's globemallow (*Iliamna bakeri),* and Pacific fuzzwort (*Ptilidium californicum).*

A botanical survey was conducted of the proposed project area from June 2004 through October 2004 with follow-up surveys of suitable habitat areas in 2005. No plant species listed as Sensitive by the Regional Forester, nor listed on the USFWS quarterly listing of species of concern, were found to occur in the project area.

Environmental Consequences

All Alternatives

Direct, Indirect and Cumulative Effects (Sensitive Botanical Species)

No Sensitive plants or bryophytes were found during surveys and sensitive fungi habitat was found to be absent. Therefore, there will be no direct, indirect or cumulative impacts effects from any of the alternatives under consideration. Based on lack of individuals, a "*will not affect Cypripedium montanum, Iliamna bakeri, or Ptilidium californicum*" determination was made in the biological evaluation. The project would not affect any other threatened, endangered, or sensitive botanical species because the project is outside the range of the species, does not contain suitable habitat for the species, and no populations or individuals were found during surveys.

[214] Paraphrased from the *Biological Evaluation for Sensitive and Endemic Species and Supplemental Botanical Report*, November 3, 2005.
[215] USDI Fish and Wildlife Service, October 19, 2005, List of TES Species for the State of California.

Invasive Weeds[216]

Affected Environment

A weed inventory occurred in 2004. Bull thistle (*Circium vulgare*), Woolly mullein (*Verbascum thapsis*), Burgundy hounds tongue (*Cynoglossum offinale*), and cheatgrass (*Bromus tectorum*) are found in the project area in disturbed sites such as landings, young plantations, underburned areas, and along roads. Klamath weed (*Hypericum perforatum*) is known to occur along most roads[217]. There are no weed species rated "A" or "B" by the State of California.

These species tend to be poor competitors and do not tolerate shade well. They do not persist for very long once native vegetation starts to come back. Both Klamath weed and woolly mullein are collected as special forest products for medicinal use.

The project design includes requiring all off-road equipment used in project implementation to be washed before entering the project area to prevent introduction of weed species into the area or spreading weeds from one area to another.

Environmental Consequences

A weed risk assessment was used for determining the risk of introducing or spreading noxious weeds associated with a project. Several factors were evaluated, including known weeds, their locations, and habitats; project design features intended to eliminate or reduce the introduction or spread or noxious weeds; habitat vulnerability; non-project dependant vectors; and habitat alteration and increased vectors expected as a result of the project. This is summarized with an overall risk conclusion.

Alternative 4 - No Action

Direct and Indirect Effects (Invasive Weeds)

The "No Action" alternative poses a very low risk of spreading or introducing noxious weed species initially. However, this alternative will create a severe fuels problem in the future, increasing the chance of a stand replacing fire. Large, hot fires would create an extremely high risk (60 to 100 percent chance) of spreading or introducing noxious weed species.

Cumulative Effects (Invasive Weeds)

Non-project vectors for noxious weeds include general vehicle traffic on forest roads, wildlife, cattle grazing, wind and people walking through the forest. The bounding of cumulative effects for noxious weeds is subjective and effects would be similar for various size areas. The overall

[216] Paraphrased from the Weed Risk Assessment, November 3, 2005.
[217] Bull thistle and woolly mullein are not rated by the state, but are listed by CALEPPC (The California Exotic Pest Plant Council of California) on List B: Wildland Pest Plants of Lesser Invasiveness. Hounds tongue is not listed by the State of California or CALEPPC but is recognized as a possible problem in the future as it is spreading rapidly in some nearby states. Klamath weed is a "C" rated pest by the state and a "B" rated pest by CALEPPC. Cheatgrass is not listed by the State of California, but is on the CALEPPC List A-1: Most Invasive Wildland Pest Plants Widespread. Cheatgrass is found throughout the project area. Klamath weed has been kept under control by biological agents for many years.

effects for past and exiting activities in the general McCloud Flats Area is that there is an ever present moderate risk (30 to 60 percent chance) of introducing new weed species[218].

Alternatives 1, 2, and 3

Direct and Indirect Effects (Invasive Weeds)

There will be an increase in traffic while the project is going on. There will be an increase in off-road machinery being used for harvesting and piling slash. Once the project is completed, vectors will drop back to approximately pre-project levels. Due to measures built into the project to reduce and prevent the spread of noxious weeds[219], the short-term increase in vectors, gives this project a low probability of bringing in new invasive species. Given the presence of noxious weeds in the project area the overall risk of spreading noxious weeks is moderate.

Habitat Vulnerability (Invasive Weeds)

Bull thistle, Klamath weed, hounds tongue, cheatgrass and woolly mullein do not compete well. Once native vegetation has had some time to mature, most plants will disappear. Due to the small number of noxious weed species known to occur in the project area, and their low degree of persistence, the overall risk is low (0 to 30 percent chance) to habitat vulnerability.

Cumulative Effects (Invasive Weeds)

The combined effects of a moderate risk of introducing noxious weeds from past and on-going activities in the McCloud Flats Area and the low risk of introducing noxious weeds for the Pilgrim Project would result in an over moderate risk of introducing noxious weeds in the McCloud Flats Area.

Special Botanical Elements of Interest[220]

Affected Environment

There are several species that are now only present in very small quantities. These species are important for wildlife and maintaining species diversity. Tree species include aspen, black oak, sugar pine, and Douglas fir. Shrub species important for wildlife and maintaining species diversity are chokecherry (*Prunus virginiana* var. *demissa*), serviceberry (*Amelanchier utahensis*), currants and gooseberries (*Ribes* sp.), rose (*Rosa gymnocarpa*), willow (*Salix* sp.), bush chinquapin (*Castanopsis sempervirens*); and bitter brush (*Purshia tridentate*). Important forb species are prince's pine (*Chimaphila umbellatum*), mountain strawberry (*Fagaria virginiana*), butterweeds (*Senecio* sp.), several grass and Carex species, and bracken fern (*Pteridium aqualinum* var. *pubescens*).

[218] Pilgrim Weed Risk Assessment, November 3, 2005, p. 4
[219] Pilgrim Weed Risk Assessment., p. 3
[220] Paraphrased from the *Biological Evaluation for Sensitive and Endemic Species and Supplemental Botanical Report*, November 3, 2005 and discussions with the author.

A population of Indian tobacco (*Nicotiana attenuatta*) was found during the 2004 season in the project area (where piles were burned[221]). This species is important to all local Native American tribes in the area, especially the Winnemem Wintu tribe who use the area for ceremonies. The Indian tobacco has been flagged and will be avoided except for burning. Indian tobacco seed will be gathered and spread in the area once the area has been burned. Other species important to Native Americans are conifers of all kinds, oaks, aspen, willows, fruit-producing shrubs and forbs, ferns, grasses, rushes and sedges.

Parts of the planning area are known to be collecting areas for edible fungi such as the King boletes (*Boletus edulis*). King bolete is solitary, scattered or in groups on ground in woods; found throughout the world and very common in western North America. It favors conifers (pine, spruce, hemlock, fir) but also grows with hardwoods such as oak and birch. They are mycorhizzal which means they require a mutually beneficial relationship between the fungus and the rootlets of a plant (especially a tree) in which nutrients are exchanged[222]. Several units are known to have boletes. Damage to the duff layer and soils will be kept at a minimum with the design criteria described in chapter 2 so mycorhizzae in the soil are protected as much as possible.

Environmental Consequences

Alternative 4 - No Action

Direct and Indirect Effects (Special Botanical Elements)

Species diversity will decline with this alternative, unless a natural disturbance process sets an area back to early seral conditions. Oaks and aspen will continue to decline and may be lost due to conifer encroachment. Oak seedlings will begin to grow with the shaded conditions but will not mature due to conifer competition. Aspens will not sucker due to lack of sunlight (overshading from conifers). Dry meadows will continue to decrease in acreage due to conifer encroachment. Shrub and early seral species diversity, overall health, and acres will continue to decline. If no thinning occurs, trees in units with boletus habitat may die as seen in other units. If this is the case, fungi habitat will be degraded as host trees die (the fungi depend on the host tree to live). Riparian vegetation will continue to decline due to too much shade from conifers.

Cumulative Effects (Special Botanical Elements)

Past projects, on National Forest lands within the 8th field watershed in the last 10 years, Appendix F, have all met forest plan guidelines for protection of hardwoods and endemic plant species[223]. The acres of hardwoods protected in not available, but are generally small given the limited extent of oak and aspen in the watershed. Currently there are no incentives for private timber land owners to maintain aspen stands so any that might exist are probably in decline.

Areas of boletus mushrooms have also been protected in past timber sales on National Forest lands by either not harvesting or harvesting over snow to minimize ground disturbance.

[221] Donna Sager, Assistant Fuels Officer.
[222] *Mushrooms Demystified by Arora*, 1986. See pages 530 and 916.
[223] Forest Plan, page 4-14

Alternatives 1, 2, and 3

Direct and Indirect Effects (Special Botanical Elements)

Species diversity will be maintained or improve with this alternative. Aspen will be released on about 20 acres by reducing conifer competition for resources (primarily sunlight), improving aspen habitat for suckering and retention of existing trees. Some aspen may be harmed during conifer removal. In some cases this may actually increase aspen sprouting.

Soil disturbance from regular logging activities may impact oak seedlings. Thinning in areas with oak seedlings may encourage oak seedlings to grow by reducing conifer competition to some degree. Planting oaks in small openings may help to increase oak in the project area.

Removing encroaching conifers, burning and seeding bunchgrasses and forb species will enhance 275 acres of dry meadow. Removal of conifers will create some disturbance to soil and understory vegetation in these areas.

The combination of dry meadow restoration, aspen release, underburning, thinning and/or removal of encroaching conifers will improve shrub and early seral habitat, though some soil disturbance is inevitable when logging takes place and some plants will be destroyed. Planting or seeding of deciduous and nitrogen-fixing shrubs will also improve species diversity.

Opening the tree canopy within riparian reserves will stimulate the growth of riparian vegetation. There will be some soil disturbance. Relic plants will not be disturbed because mechanical equipment will not allowing within 20 feet of the channel.

Thinning in older conifer stands will improve *B. edulis* habitat by reducing competition among trees therefore increasing health and vigor of the remaining trees. There will be some soil and duff disturbance from thinning, which may disrupt some mycorrhizza and reduce the presence of fruiting bodies for one to two years.

Cumulative Effects (Special Botanical Elements)

Past actions in combination with the proposed actions will increase the acres of aspen and oak within the watershed. The number of acres is small, estimated to be about 30 to 50 acres in the watershed.

The Coonrod Visual Enhancement Project enhanced 20 acres of dry meadow and the Pilgrim Project will enhance 275 acres of dry meadow.

The Edson Project protected and improved about 185 acres of boletus mushroom habitat by thinning over the snow. The Pilgrim project will improve about 40 acres of boletus mushroom habitat by thinning.

Management Indicator Assemblages[224]

This section addresses management indicator assemblages including significant issue 2. A review was conducted using the Project Level Assessment Checklist to determine if the project affects the habitat of any of the nine management indicator assemblages.

[224] Summarized from Pilgrim Vegetation Management Project Level MIA Report, January, 2007

The following Management Indicator Assemblages were not considered for the Pilgrim Project for the reasons listed:

1. **Riparian**: There is less than an acre of riparian vegetation within the project assessment area and it will not be impacted by harvest activities
2. **Aquatic Habitat**: All streams within the project area are ephemeral or intermittent with the exception of Ash Creek. Field inventories by the unit biologist indicated that the streams in the project area do not support aquatic organisms.
3. **Chaparral**: This vegetation type does not exist in the project area.
4. **Cliffs/caves/talus/rock outcrops**: This habitat does not exist in the project area.

The following management indicator assemblage habitat associations were selected for analysis due to the presence of suitable habitat that could be impacted by the project:

1. openings and early seral stage forest
2. snag and downed logs
3. late-seral forest
4. Hardwoods.
5. Multi-habitat

The species used to represent the selected assemblages are:

1. Mule deer (open/ early seral and Multi-habitat)
2. Red-Breasted Nuthatch (snags and downed logs and late-seral Assemblages)
3. White-Breasted Nuthatch (Hardwood Assemblage).

These species were selected because they are found within the project area, the populations are known to be sensitive to habitat quality and there is high confidence population trend data for each.

Cumulative effects for all assemblages except the late-seral assemblage are bounded by the 8th order watershed for reasons discussed at the beginning of this chapter. The temporal bounding is the last 10 years for reasons discussed at the beginning of this chapter. Refer to Appendix F for a description of the 8th order watershed and actions that have occurred in the last 10 years and predicted future projects. The late-seral assemblage is bounded by the Fifth-field watersheds as the effects to the late-seral forests have already been evaluated in the Vegetation Diversity Section with that bounding.

Openings and early seral assemblage (mule deer)

Affected Environment

Mule deer are typical inhabitants of open pine areas. They are common to abundant in the area, a sought after game species and monitored by the California Department of Fish and Game through deer herd surveys and deer kill statistics. Deer occur in the project area and vicinity based upon frequent sightings and signs of presence (droppings, tracks, etc.). They are extremely mobile and occupy the flats in the summer only.

Quality of Forage

Among the various shrubs deer prefer are deer brush (*Ceanothus*), willow (*Salix*) and bitterbrush (*Purshia*), along with many forbs and a few grasses. Deer also prefer aspen as a tree, and in modest food shortage times, will create a browse line on this species. For fawning and general foraging, deer prefer riparian areas where the forage is more palatable.

In the project area, and also the McCloud flats, a consistent pattern indicates the forage quality averages fairly low. The bitterbrush and deer brush that deer should be eating show almost no signs of browsing[225]. The quality of aspen and willow forage is low because they are almost always overtopped by conifers and thus have lower nutritional quality than normal.

Cover and Water

Trees for shade and escape cover are abundant. Thermal cover is not critical as the project area is not deer winter range. Ash Creek is the only perennial stream in the project area and provides sufficient water for the existing deer population.

Cover/Forage Ratio

The ratio of forage habitat to cover strongly affects habitat quality with a 50:50 (1) ratio providing the highest quality habitat and moderate habitat provided by anything else ranging from a low forage ratio of 20:80 (0.25) to a low cover ratio of 75:25 (3). Any forage to cover ratio below .25 or above 3 is considered poor. Currently the project area provides about 2060 acres of forage habitat and about 1720 acres of cover habitat which is a 1.2:1.0 ratio[226].

Environmental Consequences

Alternative 4 - No Action

Direct and Indirect Effects (Open-early Assemblage)

Taking no action will have no direct effects on deer habitat[227]. Forgoing the project would result in a higher probability of a wildfire becoming catastrophic and uncontrollable. The heavy fuels and abundant dead trees provide strong conditions for severe fire damage. These fires, however, would likely improve the average forage value in deer habitat for a decade. However, it would also reduce the available thermal cover until brush and trees regrew. Under no action, forage would likely continue to be abundant and low-quality and cover would continue to be highly available and of excellent quality.

Cumulative Effects (Open-early Assemblage)

The 8th Field Watershed currently has approximately 16,270 acres of deer forage and about 13,440 acres of deer cover habitat[228]. Regeneration harvest, including salvage, in the past 10

[225] Based on range transects taken annually in the Bartle Cattle Allotment
[226] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 27
[227] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 30-31
[228] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 29

years has converted approximately 2,150 acres (both private and public lands) of cover habitat to forage habitat. The forage/cover ratio is the same as the project area or 1.2 to 1.0.

In general, past harvest operations in the watershed have not affected the occurrence, distribution or apparent local population levels of deer[229].

Alternatives 1, 2 and 3

Direct and Indirect Effects (Open-early Assemblage)

Thinning of dense conifer stands will reduce the canopy closure on approximately 3,000 acres of mid and late seral stands thus reducing the quality of deer cover habitat. In 10 to 15 years tree growth should recover canopy closure to near pre-harvest levels. Alternative 2 would retain higher density stands on about 535 acres which would be somewhat better deer cover habitat.

Regeneration harvest and meadow restoration will shift approximately 515 acres of late-seral stands to early seral or from deer cover to forage habitat. Alternative 3 would retain 15 percent of the oldest trees in these areas but would not change the overall effects.

Release of aspen will convert approximately 20 acres of late-seral stands to aspen or from cover to forage habitat.

Removal of small diameter conifers encroaching on dry meadows will not change the current open and early seral stage of approximately 175 acres.

Overall approximately 535 acres of deer cover habitat would be converted to deer forage habitat for about 15 to 20 years when the planted conifer trees on 415 acres of regeneration harvest grow into pole size stands or mid-seral habitat. The forage/cover ratio in the project area would be about 2.0:1.0 immediately post-harvest. This ratio is within the range of moderate habitat quality.

Cumulative Effects (Open-early Assemblage)

Past harvest and the proposed Pilgrim Project would convert approximately 2,690 acres of deer cover habitat to deer forage habitat in the watershed. The forage to cover ratio would change to about 1.7: 1.0 which is within the range of moderate habitat quality.

The shift of cover into a forage type habitat is unlikely to alter deer use of the area for the following reasons: Neither cover nor forage quantity are limiting factors in this area. Forage quality and water availability are limiting and are unlikely to change given the project's implementation. Deer use this area only during the summer months where cover is not as important[230].

Habitat Trends at the Forest Scale (Open-early Assemblage)

Open and Early Seral stage habitat on the Forest is decreasing relative to our larger land base. Although new openings and early stage habitat is created through natural disturbances such as wildfire or pest infestations and through management actions such as timber harvest, the large

[229] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 32
[230] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 29

amount of class 2 Openings and Early Seral Assemblage stands on the Forest are currently growing more wood and transitioning into class 3 late-seral stands faster than we are losing them. From 1991 to present there has been a net loss of approximately 218,200 acres of openings and early seral stage assemblage type on the Forest or about 24 percent of the total acres[231].

Population Status and Trends (Open-early Assemblage)

Population information for mule deer has been obtained at the following scales: range-wide, California, Sierra Nevada, and Forest. This species is monitored by the California Department of Fish and Game (CDFG) as part of its program to manage hunted species. CDFG assesses mule deer population status and trend by both Hunt Zone and DAU (Deer Assessment Unit) as part of their Environmental Documentation for the hunting program (CDFG 2003). Annual variation in deer population estimates may be high due to annual changes in environmental conditions, and varies geographically (CDFG 2003) [232].

Current data from the State indicates that mule deer population has been decreasing since the early 1960s[233]. California Department of Fish and Game website on deer populations indicates a declining population from the mid-sixties continuing to the present. This is borne out by hunter's perceptions (personal communication, Jess Hoopes, Mule Deer Foundation and Rich Kallas, California Department of Fish and Game). The State of California attributes most of this decline to reductions in early seral habitat accompanying less timber harvest and increasingly more effective fire suppression throughout this period. The Mule Deer Foundation however, attributes most of the decline to heavy predator pressure. Currently, the available data is not sufficient to conclude the causes of the decline[234].

Relationship of Project-Level Impacts to Forest-Scale Habitat and Population Trends for the species (Open-early Assemblage)

The Pilgrim project will shift approximately 540 acres of deer cover habitat to deer forage habitat for a period of between 15 and 20 years. On a forest scale this is a loss of .0004 percent of late-seral cover habitat and a gain of .0006 percent of forage habitat. The project level habitat impacts will not meaningfully alter or contribute to the existing forest wide trend in deer habitat or populations[235].

Snags and Downed Log Assemblage (Red-Breasted Nuthatch)

Affected Environment

The red-breasted nuthatch is a common resident in local coniferous forests, especially mature, open ponderosa pine and plays an important role as a primary cavity excavator on trees and snags. This particular species' dependence on snags for nesting sites and its attraction to mature

[231] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 32
[232] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 15
[233] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 33
[234] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 33
[235] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 34

mixed conifer and to a lesser extent, the ponderosa pine forests found within the project area, make it an able representative of the snag and down log assemblage. The red-breasted nuthatch is amongst the fifteen most commonly seen species in the nearby Bartle Breeding Bird Survey route[236].

Habitat Quality and Quantity

Snag densities in regeneration harvest and thinning/sanitation stands are very high and frequently outnumber the live trees in one to ten-acre pockets. Snags and downed logs are scattered throughout the stands proposed for treatment with the exception of about 785 acres of biomass thinning of young plantations and about 175 acres of meadow restoration. Based on field survey plots, snags average about 2.9 per acre within most proposed treatment areas. Snag diameters range from 16 to 36 inches DBH with an average diameter of 23 inches and an average height of 100 feet[237].

Recruitment from tree mortality is estimated at about 20 trees per acre per decade for unthinned pine stands and 1-3 snags per acre per decade for thinned pine stands (see Forest Health section). Ponderosa pine snag fall rates average about 7 percent per year. Small snags (5-14 inches DBH) fall at an annual rate of about 10 percent. Medium pine snags (15-29 inches DBH) fall at an annual rate of about 5 percent. Large pine snags (30 inches + DBH) fall at an annual rate of about 4 percent[238]. Given an average snag fall rate of 7 percent, there should be about two snags falling per acre per decade creating two to six logs depending on breakage.

Habitat Requirements

Forest Plan Guidelines are to maintain snag levels sufficient to support species of cavity nesting birds at 40 percent of potential population levels based on published guidelines or an average of 1.5 snags per acre that are greater than 15 inches in diameter and 20 feet in height[239].

For downed logs the desired condition is to have 4 to 6 logs per acre that are 10 feet long at the largest available diameter[240].

The red-breasted nuthatch forages on arthropods during the breeding season and conifer seeds outside of the season. The mixed conifer and ponderosa pine forests found within this 29,860 acre watershed provide ample suitable habitat for this species[241].

The red-breasted nuthatch prefers excavating nests in dead trees with broken tops. These trees are highly variable in size and range from 5 to 44 inches in diameter[242].

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[236] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 39
[237] Pilgrim Vegetation Data Analysis, Snag Supplement, May, 2005
[238] Landram, et.al., Demography of Snags in Eastside Pine Forests of California, PSW-GTR-181. 2002, page 619
[239] Forest Plan, page 4-62.
[240] Forest Plan, page 4-67
[241] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 38
[242] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 38

Environmental Consequences

Alternative 4 - No Action

Direct and Indirect (Snag and Downed Log Assemblage)

Snag density will remain at about 3 to 4 snags per acre over the next decade as insects and disease mortality continues at high levels and older snags fall adding coarse woody debris to the forest floor[243]. With a continued snag density and downed logs at or above desired conditions, there are no direct or indirect effects to the snag and downed log assemblage.

Cumulative Effects (Snag and Downed Log Assemblage)

As there are no direct or indirect effects to the snag and downed log assemblage from no action, there are no cumulative effects.

Alternatives 1, 2 and 3

Direct and Indirect Effects (Snag and Downed Log Assemblage)

Based on marking to-date (about 90 percent of the areas have been marked), none of the snags identified in the 2005 inventory will be removed. Snag densities should remain at 2-3 per acre and increase over the next decade to 3-4 per acre[244]. In thinning areas, snags will be retained (approximately 3 per acre) to meet snag density requirements unless they are an operational hazard.

Alternative 1 would indirectly reduce the generation of future snags by taking those trees currently dying. However, the thinning of understory trees will most likely result in more vigorous growth in the remaining trees, eventually producing material for better quality, larger snags[245]. The project will extend the time the flats will be forested and thus will be able to produce snags.

Alternative two would have higher snag densities (3.5-4.5 per acre) in the future on about 535 acres where 60 percent canopy closure is maintained, as retaining higher basal area will create higher tree mortality rates.

Alternative three will have higher future snag densities (4-6 snags per acre) on about 415 acres of regeneration harvest areas where 15 percent of the trees are retained as many of these trees have indicators of poor vigor and will be susceptible to mortality from insects and disease. Approximately 100 acres of meadow restoration and 20 acres of aspen restoration will have reduced snag densities as most large trees will be removed.

In the long-term there will be reduced snag densities on approximately 535 acres as dead trees fall in these areas and there are few replacement green trees for future snags.

This project retains old growth trees and generally the larger mature trees in thinning units, ensuring a future supply of very large snags and downed logs on approximately 3100 acres. The

[243] Pilgrim Vegetation Data Analysis, Snag Supplement, May, 2005
[244] Pilgrim Vegetation Data Analysis, Snag Supplement, May, 2005
[245] Pilgrim Salvage Sale. Ash Sink Salvage Sale. 2005.

current snag density is very adequate to support the small population of red-breasted nuthatches in the project and the effect would be unobservable within the project[246].

Cumulative Effects (Snag and Downed Log Assemblage)

In general, past thinnings on approximately 8300 acres and proposed project thinning on approximately 3100 acres have or will opened up stands temporarily, allowing for growth that will eventually create denser canopies once again. Due to concerns for northern spotted owl designated Critical Habitat, most Federal projects (over 75% of the thinning projects in the watershed) do not reduce canopy cover to below 40% . Most of the stands in this group may have opened up but did not shift assemblage type. Thinnings have to maintain, if available, the 1.5 snags per acre averaged over 40 acres minimum required in the Forest Plan.

Past regeneration of approximately 350 acres and salvage of approximately 440 acres on National Forest lands have required leaving a minimum of 2-3 snags per acre. The 2 to 3 snags per acre are above the natural background levels for snags in this forest type[247]. Over time these snags will fall and add to coarse woody debris to the forest floor. When combined with the proposed action approximately 1,300 acres in the watershed on National Forest lands will have reduced snag densities for approximately 60 to 80 years when planted trees in these areas reach maturity.

Habitat Trends at the Forest Scale (Snag and Downed Log Assemblage)

Between 1991 and 2005, approximately 79,300 acres of forest types containing useful snags and downed logs, or about 7.8% of the baseline in 1991, have been burned in wildfire or impacted by timber harvest. Although timber harvest will maintain minimum levels of snag densities, wildfire has highly variable results. Most fires, whether 'hot' or 'cool' will leave ample amounts of snags on the landscape[248].

Also, since 1991 approximately 218,200 acres of younger, early seral forest has grown into the late-seral assemblage category. This also represents an increase in the acreage for the snags and down logs assemblage, over double the acreage for the loss and represents a net increase in the acreage available. This represents an increasing trend in the snag and down log assemblage habitat forest-wide[249].

Relationship of Project-Level Impacts to Forest-Scale Habitat and Population Trends for the species (Snag and Downed log Assemblage)

To supplement the habitat information provided by Forest level analysis, the Shasta-Trinity National Forest also monitors the population trends of over 240 species found on the Forest. The large part of this data comes directly from the international Breeding Bird Survey operated by the wildlife research arm of the United States Geological Service (USGS). This data allows us to monitor directly the population trends for a large number of vertebrate species over six

[246] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 41
[247] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 41
[248] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 42
[249] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 44

geographic areas over three time periods. In some cases, such as the Bartle route on McCloud, we have more than 30 years of data from the BBS program[250].

Bioregional scale analysis gives a more robust and stronger analysis than project or forest level analysis. The Breeding Bird Survey has partitioned North America into Biogeographic strata that have similar habitats, conditions and fauna. Particularly with highly mobile animals such as birds, these biogeographic regions allow us to pool the data from individual routes, evening out the highly variable data at a route level and allowing us to get a much better understanding of population trends. This tends to even out the large local fluctuations of highly mobile species such as birds. Map 1 of the Project Level MIS Report illustrates the nearby BBS routes found on and close to the Forest and places them in the appropriate strata[251].

The Breeding Bird Survey (BBS) results for the red-breasted nuthatch shows a species with statistically insignificant decreases in two nearby strata (Sierra Nevada and Cascade Mountains), statistically insignificant increases in the local strata (Pitt-Klamath Plateau), one nearby strata (California Foothills) and a larger scale (California), statistically significant increases in one nearby strata (South Pacific Rainforests) and a statistically significant increase survey wide (which should cover the entire North American range of the species). With the exception of the California Foothills strata, all of these scales retain the highest credibility given in BBS data. Given the range of data it is hard to conclude that there is any significant relationship between the forest wide increases in the snag and downed log assemblage habitat type and population trends of the red-breasted nuthatch. Both decreases in population trends (the Sierra Nevada strata and the Cascade Mountains strata – both neighboring strata to the local Pitt-Klamath strata) are statistically insignificant whereas the most statistically significant data (where P = 0) is survey wide (the full range of the species) indicating a moderately increasing trend between 1966 and 2005[252].

The alternatives are unlikely to affect the population trend of this species and we would expect that current trends will continue. The results will be a continued population of the red-breasted nuthatch on the flats at roughly the present, uncommon numbers[253]. The project level habitat impacts will not alter or contribute to the existing forest-wide trends[254].

Late-Seral Assemblage (Red-Breasted Nuthatch)

Affected Environment

See the Vegetation Diversity Section for late-seral affected environment at the 5th order watershed scale.

[250] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 14
[251] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 15
[252] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 44-45
[253] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 23
[254] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 46

Within the project area stands proposed for thinning and thinning/sanitation and mature stand thinning are all classified as late seral (Table 7 of Project Level MIS Report). These stands total approximately 2,300 acres or about 60 percent of the proposed treatment areas.

Approximately 415 of regeneration harvest stands are considered late-seral, but due to mortality from insects and disease they are loosing stand structure and converting to a more open-early seral stage.

Approximately 100 acres of proposed meadow restoration units are considered late-seral. These occur in small pockets and stringers of 1 to 5 acres

Approximately 20 acres of late-seral ponderosa pine has an understory of aspen that is declining in numbers due to shade from the larger conifer trees.

Based on the MIS Project level report definition of late-seral, approximately 785 of plantations are also classified as late-seral[255].

Based on marking done to-date, trees to be harvested in thinning and thinning/sanitation stands averages 22 inched (DBH). In all thinning and thinning/sanitation stands the trees retained have an average diameter greater than that of trees being removed, thus the average diameter of leave trees is between 24 and 26 inches (DBH) [256]. The leave trees in these stands are all mature and thus are classified as late-seral after harvest.

Quality and quantity of Forage

The red-breasted nuthatch forages on arthropods during the breeding season and conifer seeds outside of the season. The mixed conifer and ponderosa pine forests found within this 29,860 acre watershed provide ample suitable habitat for this species[257].

Quality and quantity of Nesting Habitat

The red-breasted nuthatch prefers excavating nests in dead trees with broken tops. These trees are highly variable in size and range from 5 to 44 inches in diameter. Late-seral habitat and associated snags make up approximately 25 percent (11,300 acres) of the Ash Creek Watershed and 22 percent (12,000 acres) of the Upper McCloud Watershed. This habitat is highly fragmented by harvest and natural openings. The availability of water is likely a strong limiting factor in this area[258].

Environmental Consequences

Alternative 4 - No Action

Direct and Indirect Effects (Late-Seral Assemblage)

See Vegetation Diversity Section

[255] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 23
[256] Based on field inspection of marked stands by the unit silviculturist
[257] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 47
[258] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 47

Cumulative Effects (Late-Seral Assemblage)

See Vegetation Diversity Section

Alternatives 1, 2 and 3

Direct and Indirect Effects (Late-Seral Assemblage)

See the Vegetation Diversity Section

Cumulative Effects (Late-Seral Assemblage)

See the Vegetation Diversity Section

Habitat Trends at the Forest Scale (Late-Seral Assemblage)

In general, late-seral assemblage habitat is lost through harvest and wildfire and gained through forest ingrowth. Forest ingrowth occurs continuously, but affects assemblage categories when it shifts a stand from a size class 2 or size class 3 stands with less than 40% cover, to a size class 2 stand with greater than 40% cover[259].

Since 1991, wildfire and timber harvesting shifted 61,400 acres of late-seral assemblage habitat to openings and early seral stage assemblage habitat. This reduced the stock of late-seral assemblage habitat from 779,100 acres down to about 777,700 acres (about a 7.9 percent decrease). During the same time period, about 218,200 acres of size class 2 open and early seral assemblage type grew into size class three or late-seral assemblage type. There has been a net gain of approximately 156,800 acres of late-seral stands on the forest since 1991[260].

Relationship of Project-Level Impacts to Forest-Scale Habitat and Population Trends for the species (Late-Seral Assemblage)

See the Snag and Downed Log Assemblage for population trends of the Red-Breasted Nuthatch.

Given the small scale of the current activities relative to the Forest, the small increases in the red-breasted nuthatch population trends over most of its range, and the generally increasing quantity of late-seral assemblage habitat on the Forest, it is unlikely that the habitat changes engendered by the project will significantly affect the population trend of this species or the current trend in habitat on the Forest[261].

Hardwood Assemblage (white Breasted Nuthatch)

Affected Environment

Habitat Quality and Quantity

Aspen stands are represented by scattered small groves totaling approximately 20 acres in the project, and most groves are less than one acre in size. The single largest grove in the center of the project contains about 10-12 acres, depending on whether the outlying individuals are included. Black oak does not occur in groves, but as isolated individual trees scattered throughout

[259] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 50
[260] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 50
[261] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 52

the project area. Hardwoods are considered relicts in this area. Attempts to propagate or transplant aspen have failed in the droughty soils of the area, and the present action seeks to save the remaining trees.

The extremely limited riparian vegetation with no hardwood association indicates low-quality habitat.

Habitat Requirements

Although it can survive in coniferous forests, this species has strong associations with hardwoods and uses old woodpecker holes[262] or excavates its own holes in soft snags[263]. It forages on arthropods of all kinds gleaned from live or dead trees, and also eats acorns and seeds when available. The white-breasted nuthatch often will cache large seeds for the winter. White-breasted nuthatches nest and live in old woodpecker holes, but will excavate its own cavity only in soft snags over 14" dbh. They prefers soft snags about 25" dbh and makes a hole about 19' above ground. Populations in riparian areas are over four times higher than those in coniferous forests[264].

Since this bird is a soft-snag cavity excavator and soft snags are unusual due to rapid decay from termites and ants, the habitat is considered low-quality. Raphael and White[265] summarize that in a good conifer forest habitat about 2.4 breeding pairs per 100 acres may be expected or about 40 acres per pair. Since the aspen component is only 20 acres in scattered clumps over about 3,780 acres, the data implies that at best in the project's aspen habitat, a nesting pair may occur in conjunction with conifers nearby. Aspen may be providing slight forage diversity in very small acreages, and the occasional oak would be so rare as to make no difference in the low-quality habitat[266].

Quality and Quantity of Forage

Strictly speaking in terms of hardwood habitat, the forage opportunity for the White-Breasted Nuthatch is poor on the basis of having only 20 acres of aspen in the entire project. This bird can survive on insects from conifers, and this could account for its presence in the project area. The periphery of the flats has small oak groves and scattered oaks that may account for the species as a year-long resident. We presently have abundant insect-killed trees on the flats, mute testimony that insect food for birds is likely plentiful at this time. The quantity of acorns varies greatly from year to year and may account for shifting populations, but these are rare in the flats. The extremely limited riparian vegetation with no hardwood association indicates low-quality habitat[267].

[262] (Pravosudov and Grubb 1993)
[263] Zeiner, 1990. WHR Bird Narratives Vol. 2.
[264] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 31
[265] Raphael and White 1978. Cited in Zeiner, 1990 WHR Bird Narratives, Vol. 2
[266] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 35
[267] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 35

Quality and Quantity of Nesting Habitat

Soft snags are very uncommon, probably due to rapid felling from termites, carpenter ants, and snow loading. Very likely the white-breasted nuthatch nests in old woodpecker holes in this area. The onsite snag density is very high at this time, averaging about 3 per acre in timber surveys, but much higher than that in pathogen areas. The high density of snags provides ample resources for other primary excavators such as woodpeckers. These primary excavators create nesting sites for a variety of birds and small mammals including the white-breasted nuthatch. The white-breasted nuthatch prefers riparian areas, and the dry sandy habitat on the flats is low quality for this species.

This nuthatch feeds on insects gleaned from the boles of trees and from the litter beneath the canopy. They will also eat small quantities of seeds. The white-breasted nuthatch population in the flats is very small relative to the population in riparian areas a few miles away[268].

Environmental Consequences

Alternative 4 - No Action

Direct and Indirect (Hardwood Assemblage)

Conifers would continue to encroach on the existing aspen trees resulting in the loss of these trees within one or two decades.

Cumulative Effects (Hardwood Assemblage)

Currently there are approximately 30 acres of aspen in scattered pockets of 0.5 to 10 acres within the Pilgrim 8th Field Watershed. There is no information on the amount of hardwoods on private lands within the watershed or how it is managed. All of these aspen stands on National Forest lands are in a state of decline due to competition with conifer trees. Other than this project, there are no other projects in the past or immediate future that propose treatment on hardwoods within the watershed. Thus, cumulative effects are the same as direct and indirect effect.

Alternatives 1, 2 and 3

Direct and Indirect Effects (Hardwood Assemblage)

Implementation of these alternatives is designed to restore the healthy representation of aspen within an existing area of approximately 20 acres. Aspen are currently present in the area, but are being overshadowed by conifers. Removal of competing conifers in this area will allow existing aspen to persist and will provide site conditions more favorable to aspen regeneration in that area.

Maintaining vegetative species diversity within the relatively homogenous habitats of the McCloud Flats is key to maintaining the diversity of forest wildlife including birds. Enhancement of this aspen stand should provide increased foraging opportunity for this species[269].

[268] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 35-36
[269] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 36

Cumulative Effects (Hardwood Assemblage)

Currently there are approximately 30 acres of aspen in scattered pockets of ¼ to 10 acres within the Pilgrim 8th Field Watershed. There is no information on the amount of hardwoods on private lands within the watershed or how it is managed. All of these aspen stands on National Forest lands are in a state of decline due to competition with conifer trees. There are no other projects in the past or immediate future that propose treatment on hardwoods within the watershed. Thus, cumulative effects are the same as direct and indirect effect.

Habitat Trends at the Forest Scale (MIS- Hardwood Assemblage)

Hardwood habitat occurs both as a separate forest type and as a component of almost all forest types on the Forest. Although we have lost approximately 15,700 acres of hardwood habitat on the Forest due primarily to wildfire, an undeterminable amount of hardwood habitat has also grown in or been established in the same amount of time. Current Best Management Practices and Forest policy favors the protection and enhancement of hardwood habitat components, retaining it and releasing oaks, aspen and other common hardwoods from competition. Harvest in these areas is likely to favor hardwoods by retaining them in the thinned stand or selecting them as leave trees in green tree retention units[270].

In areas of wildfire, hardwoods frequently respond well to fire and hardwoods are likely to replace the burnt stand. Current policy on the Forest is to retain and enhance growing conditions for hardwoods in operational areas. Given this retention, we believe hardwood occurrence is likely to be stable or increasing despite the known losses from wildfire[271].

Relationship of Project-Level Impacts to Forest-Scale Habitat and Population Trends for the species (Hardwood Assemblage)

The Breeding Bird Survey provides the most comprehensive and long-term data available on population trends.

Based on this data, the white-breasted nuthatch is increasing in five of the six geographic analysis areas over the years 1966 to 2005. In the three strata (Pitt Klamath Plateau, California and California Foothills) with the highest level of credibility given by the Breeding Bird Survey, the trend is increasing. The only decreasing trend in the six analysis areas presents itself in the Sierra Nevada and is of intermediate credibility. Although populations may or may not be limited by the occurrence of hardwoods in this area, the dominant increasing population trend of this species is consistent with an increasing trend in hardwood occurrence[272].

The project will enhance and protect aspen through elimination of nearby competing conifer. This won't immediately increase the acreage of aspen or hardwoods in the area, but will enhance and protect the current stands allowing for a higher probability of regeneration. Given the focus on maintaining existing aspen stands, and the small number of acres being enhanced, this project

[270] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 37
[271] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 37
[272] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 38

is unlikely to have any significant or observable effect on population trends of the white-breasted nuthatch in this area.

The project-level habitat impacts will not alter or contribute to existing forest-wide trends[273].

Neotropical (migrant) Birds[274]

Affected Environment

The project has low capability habitat for neotropical birds (poor forest diversity, droughty soils, limited riparian habitat, etc). Riparian habitat usually required by some neotropical birds is nearly absent. Ash Creek usually dries up in June below Ash Creek Sink. Creeks are the only natural water source, but are effluent sinking streams in sandy soil with very limited riparian vegetation. In riparian areas outside the project, such as the McCloud River Canyon, neotropical birds are often seen, however, the project area is and always has been remarkably poor for bird watching; neotropical birds are seldom seen there, according to local Audubon Society bird watchers[275]. In 25 years of observations, only the solitary vireo, yellow warbler, and western tanager have been observed, but are unusual. None of these three neotropical birds (nor their related species) are snag-dependent[276]. Other neotropical birds have not been seen on the flats or similar areas[277]. Typically, only the usual resident birds are seen, and those too, are uncommon[278].

Neotropical cavity nesters[279] are seldom seen on the flats, despite snag abundance, due to limited prey base, lack of large nesting trees, limited hardwoods and limited riparian habitat.

Environmental Consequences

Alternative 4 - No Action

Direct and Indirect Effects (Neotropical Birds)

The trend of poor habitat and poor vegetation diversity will continue. The area will continue to be susceptible to insect infestations, root disease, and fire (see also the Forest Vegetation and Fuels and Wildfire sections). Riparian vegetation and hardwoods will be lost through shading out by larger overtopping conifers. The presence of neotropical birds will be severely limited to non-existent due to lack of suitable habitat.

Cumulative Effects (Neotropical Birds)

Cumulative effects for neotropical birds is bounded by the 8th order watershed as described in Appendix F. This bounded area best represent the habitat for neotropical birds found on the McCloud Flats. The watershed has habitat similar to the project area for neotropical birds. Water,

[273] *Management Indicator Assemblages Project Level Assessment*, January, 2007 page 39
[274] Paraphrased from *Neotropical Birds in the Pilgrim Project*, November 30, 2005.
[275] Birds of Siskiyou County, 1990, Audubon Society list.
[276] Cavity Nesting Birds of North American Forests, table 1, pages 5, 6.
[277] Finch, 1991, page11, table 2.
[278] Personal communication, Mangels and other district biologists.
[279] Finch, , 1991

riparian vegetation and hardwoods are very limited, thus limiting the suitable habitat for neotropical birds. Past thinning and salvage harvest would have opened the canopy, allowing any hardwoods and riparian vegetation present to improve growth and vigor. Timber harvest on both National Forest and private lands generally require protection of riparian vegetation. Due to the limited amount of suitable habitat for neotropical birds found in the watershed, the cumulative effects of no action on neotropical birds is unnoticeable[280].

Alternatives 1, 2 & 3

Direct and Indirect Effects (Neotropical Birds)

The direct effects are logging disturbance and tree removal. If this occurs before mid-July, it is probable that some neotropical bird nests will be displaced or destroyed that year in this type of habitat. The habitat affected is not preferred nesting habitat, as neotropical birds generally nest near riparian areas that would have more abundant insects to feed their young. This action affects only about 1-2% of the habitat in the watershed, and the loss would be unobservable in a population in a project area likely limited by low-quality habitat. This is well within losses expected by natural variation.

The indirect effects are that more trees will survive the pathogens and provide more stability (i.e., good forest health). Protection from catastrophic fire will be improved in both the short and long term for neotropical bird habitat. The biggest improvement will be acceleration of growth to larger diameter trees and more under story vegetation diversity. However, poor habitat and the small acreage on a watershed scale make any change negligible.

The project would retain 2-3 snags per acre, exceeding the Forest Plan minimum. The proposed action is designed to forestall total tree loss and provide a relatively stable number of snags over time. The project will improve snag size and availability in the long term due to tree growth acceleration after treatment. It will also maintain and promote now-limited aspen and nearly absent oak diversity. This improvement will be slight because the basic habitat remains naturally low quality and good habitat combinations are absent for neotropicals. Fire re-introduction is an improvement for some neotropical birds, but the benefit will be very limited in the project area due to factors above.

Cumulative Effects (Neotropical Birds)

Because the natural habitat for neotropical birds in the watershed is limited and very low quality, the cumulative effects of past actions and the proposed action are negligible.[281]

[280] Paraphrased from *Neotropical Birds in the Pilgrim Project*, November 30, 2005, p. 3
[281] *Neotropical Birds in the Pilgrim Project*, November 30, 2005, p. 7

Survey and Manage Species

Survey and Manage Fauna[282]

Affected Environment

The project is within the suspected range of one mollusk species[283] that is in a category requiring surveys prior to habitat disturbing activities under the *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standard and Guidelines*[284], as updated by annual species reviews (December 2004[285]). This species is *Vespericola Shasta*. The project is not within the range or does not contain suitable habitat for other survey and manage species suspected to occur on the Shasta-Trinity National Forest[286].

Protocol surveys were conducted for the *Vespericola Shasta* in the spring of 2006 and none were found.

Environmental Consequences

Alternatives 1, 2, 3 and 4

Direct and Indirect Effects (Survey & Manage Species, Fauna)

As no survey and manage mollusk species were found during recent surveys, there are no direct or indirect effects for any of the alternatives.

Cumulative Effects (Survey & Manage Species, Fauna)

As there are no direct or indirect effects to survey and manage mollusks, there are no cumulative effects.

Survey and Manage Flora

Affected Environment

A small amount of suitable habitat is present within the project area for Mountains lady's slipper (*Cypripedium montanum*) and Pacific fuzzwort (*Ptilidium californicum*). No populations of Pacific fuzzwort or Mountain lady's slipper were found in the assessment area. Field surveys

[282] *Background information on Terrestrial and Aquatic Survey and Manage Mollusks in the McCloud Flats as related to the Pilgrim Vegetation Management Project*, October 17, 2005.
[283] Duncan, N., Burke, T. Dowlan, S., and P. Hohenlohe, 2003. *Survey Protocol for Survey and Manage Terrestrial Mollusk Species from the Northwest Forest Plan, Version 3.0*. Portland, Oregon: USDA Forest Service and USDI Bureau of Land Management. 70 pp.
[284] USDA Forest Service and USDI Bureau of Land Management 2001. *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standard and Guidelines.*
[285] USDA Forest Service and USDI Bureau of Land Management 2003. *Implementation of 2003 Survey and Manage Annual Species Review*. December 19, 2003.
[286] Pilgrim Project Survey and Manage Report, June, 2006.

were completed during the 2004 field season. Areas of suitable habitat were re-visited during the 2005 field season.

There are three bryophytes in "Category A," requiring pre-disturbance surveys. Of the three, only one *Ptilidium californicum* (Pacific fuzzwort) is known to occur in the McCloud Flats. Pacific fuzzwort and *Buxbaumia viridis* (bug-on-a-stick) are now on the Region 5 Sensitive Species List. No habitat was found for bug-on-a-stick, which requires large diameter, advanced decay logs in riparian habitat in coniferous forests. Surveys were done in 2004 for Pacific fuzzwort in older stands containing white fir. No populations were found.

There are no known sites of any Survey and Manage fungi species in the project area. There is one fungi species requiring pre-disturbance surveys and that species is *Bridgeoporus nobilissimus.* This species has not been reported in northern California[287].

There are no known sites of any Survey and Manage lichen species in the Shasta-McCloud Management Unit of the Shasta-Trinity National Forest.

There are two vascular plants listed on the 2004 list of vascular plants that occur in California; *Cypripedium fasciculatum* (Brownie lady's slipper) and *Cypripedium montanum* (Mountain lady's slipper). Both species were added to the Region 5 Sensitive Species List in 2004. Neither species has been found to occur in the McCloud Flats or the Pilgrim Vegetation Management Project area. Surveys for mountain lady's slipper were done during sensitive plant surveys in 2004 and none were found. There are no known sites for brownie lady's slipper on the Shasta-McCloud Management Unit.

Environmental Consequences

Alternatives 1, 2, 3 & 4

Direct and Indirect Effects (Survey & Manage Species, Flora)

Based on the lack of habitat and individuals there are no direct, indirect to survey and manage flora species for this project.

Cumulative Effects (Survey & Manage Species, Flora)

As there are no direct or indirect effects to survey and manage flora species for this project, there are no cumulative effects.

Soils[288]

Affected Environment

The analysis of the soils included a review of a soil survey conducted in 1980 (SRI, Soil Resource Inventory), field verification of soil map units and a qualitative assessment of compaction in

[287] According to Dr. David L. Largent, retired, Humboldt State University, no herbarium specimens are known from Northern California. Dr. Largent is a respected mycologist who put together training on the eight fungi added to the Sensitive Species List, in Arcata, CA. for Forest Service botanists in November 2004.
[288] Paraphrased from *Soils Report*, November 23, 2005.

legacy landings and skid trails. Field verification of soil map units was conducted in Spring and Summer of 2005[289]. A map of the soil series is in the project file.

The project landscape is composed of alluvial terraces and lava flows which have been inundated with outwash from Mount Shasta. The area is dominated by moderately deep and deep soils formed from volcanic ash deposited over andesitic basalt[290]. Topography is mostly flat except for a few lava rims where slopes exceed 35 percent. There are no sustained slopes over 20 percent.

More than half the area is covered by deep alluvial deposits, which tend to be somewhat excessively drained, meaning that water is removed from the soil rapidly[291]. These soils occupy the lower terraces and support open stands of ponderosa pine. The remaining deep and moderately deep soils are formed in tephra and older alluvial deposits and occupy the higher terraces. They tend to support slightly denser stands of ponderosa pine and some white fir at the higher elevations. A small portion of the area (6%) has shallow soils with exposed lava reefs. These areas tend to support open ponderosa pine stands[292].

Since the 1980 SRI, the soil series within the Project area have been reclassified to reflect the taxonomic order of Andisols[293]. The SRI classifies the soils in the project area as being in either Hydrologic Soil Group (HSG) A (low) or B (moderately low)[294]. Generally, this means the soils in this area have a high water infiltration capacity and low runoff potential, due to their coarse surface textures[295].

The soils in the project area have medial or ashy surface textures[296]. Soils with these textures are known to be resistant to the adverse effects of compaction because their initial bulk density is low[297] (i.e., even when compacted by 10 or 15 percent the bulk density is still low enough as to not detrimentally restrict root penetration or porosity[298].) There is even some evidence that increasing the bulk density of these soils, which results in increased water holding capacity, may

[289] All proposed activity units were visited to confirm that the soil types were mapped accurately. The on-site verification confirmed the accuracy of the existing surveys with the following few exceptions (Units 453, 256, 902, 441, 408, and 416 have rock outcrops in areas that were mapped as soil map units not containing rock outcrop as a component or inclusion. In none of these units did rock outcrop comprise more than 15 percent of the area).
[290] Soil Resource Inventory, Shasta-Trinity National Forest, 1980; Personal observation
[291] Internal free water commonly is very rare or very deep. *Field Book for Sampling Soils, Version 2.0.* NRCS. Pg. 1-11.
[292] Soil Resource Inventory, Shasta-Trinity National Forest, 1980; Personal observation.
[293] For the reclassification, see the Soils Report, p.3.
[294] Soil Resource Inventory, Shasta-Trinity National Forest, 1980.
[295] The exception is the Ledmount-Rock Outcrop map unit which is classified as HSG D (high) because it is shallow. However, the highly fractured nature of the parent material and coarse surface texture allows for ample water infiltration and renders the runoff potential low.
[296] Soil Resource Inventory, 1980; Black Fox Ecological Unit Inventory, 1991.
[297] less than 0.9 g/cc
[298] Gomez, A. R. F. Powers, M. J. Singer, and W. R. Horwath. *Soil Compaction Effects on Growth of Young Ponderosa Pine Following Litter Removal in California's Sierra Nevada.* Soil Sci. Soc. Am. J 66:1334-1343, 2002. page 1342. Evidence to the contrary was established under greenhouse conditions and does not necessarily predict a similar response under field conditions (Siegel-Issem, C.M., J.A. Burger, R.F. Powers, F. Ponder, S.C. Patterson. *Seedling Root Growth as a Function of Soil Density and Water Content*. Soil Sci. Soc. Am. J 69:215-226, 2005. page 224-225.)

provide water for plant growth longer into the growing season and promote increased tree growth[299].

Nonetheless, compaction was found to be at or slightly above threshold[300] over approximately 20 percent of the area surveyed in two transects within the project area[301]. Approximately 20% of the area was in skid trails or landings and these areas had a 10% or more decrease in porosity[302]. These transects were conducted in existing, non-plantation stands on the Shasta soil series.

Preliminary results show that while up to 70% or more of a unit may be disturbed by past activities, detrimental compaction was limited to obvious skid trails and landings. The units sampled are fairly representative of those on the Shasta soil within the Project area. The Shasta soil covers about 50% of the Project units. Similar transects were conducted near, but outside, the Project area with similar findings. Approximately 45 percent of the Project area has been harvested within the last 20 years. It is estimated that about 7% (approx. 250 acres) of this area has detrimental legacy compaction[303].

Environmental Consequences

Alternative 4 - No Action

Direct and Indirect Effects (Soils)

Under the no action alternative, there would be no post-harvest treatment, so any existing compaction would persist. Estimates indicate that compaction persists in these soils more than 30 years after harvest, if left untreated[304]. Because alternative 4 does not alleviate known soil compaction, the landings and skid trails currently compacted above threshold would continue to be so and thus would, indirectly, not lead to increase in productivity for those areas.

The no action alternative provides soil organic matter, but perhaps excessively so with the potential increase in downed woody debris from tree mortality. It is unknown what specific consequences might occur if this were to lead to a stand replacing fire. This has most likely occurred at some time in the past and the soils have appeared to recover, though the recovery time is unknown.

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[299] Gomez, A. R. F. Powers, M. J. Singer, and W. R. Horwath. *Soil Compaction Effects on Growth of Young Ponderosa Pine Following Litter Removal in California's Sierra Nevada*. Soil Sci. Soc. Am. J 66:1334-1343, 2002. page 1337

[300] Threshold is the point at which there is a significant decline is soil productivity. Significant is defined as any disturbance in soil productivity which results in a 15% or greater reduction in soil productivity over the next 50 years. Avers, .P. E., J.O Nordin, R.T Meurisse, and C. B. Goudey. Soil Quality Standards in National Forest Management. Internal Forest Service document, page 3.

[301] Transects by Brad Rust, Forest Soil Scientist, Shasta-Trinity National Forest, August 2005

[302] The amount of pore space in a volume of soil.

[303] Personal observation, qualitative sampling during field visits.

[304] Geist, J. Micheal, John W. Hazard, and Kenneth W Seidel. *Assessing Physical Conditions of Some Pacific Northwest Volcanic Ash Soils After Forest Harvest.* Soil Sci. Soc. Am. J. 53:946-950, 1989, p. 950.

Cumulative Effects (Soils)

The boundary for cumulative effects to soils is the areas to be treated. This boundary is used because the very flat topography and high infiltration rate of the soils in the project area and surrounding area make soil movement very unlikely. There has been no observed soil movement in the past 10 years, even after extreme rainfall events, within the project area or the larger 8th order watershed[305].

Because the bounding of cumulative effects is the same as direct and indirect effects, the effects are the same.

Alternatives 1, 2 and 3

Direct and Indirect Effects (Soils)

With thinning, the dominant overstory portion of the forest canopy is retained. Organic cycling is uninterrupted and organic cover quickly recovers. Prescribed levels of coarse woody debris are retained. In regeneration harvest areas, organic inputs to the soil will be reduced for a period of time. Soil disturbance on all harvest units is caused by mechanical cutters, which have minimal ground disturbance because they do not transport logs but merely cut and bundle trees. Skidder tractors carry the bundles of logs to the landings on designated skid trails. Bundled logs and designated skid trails greatly reduces the disturbed area.

Informal and subjective monitoring of soil compaction on other areas that have been harvested in past years show some evidence of decease in soil porosity or increased soil density, but well below threshold. An exception is landings and skid trail networks where they coalesce near landings. Skid trail networks within several hundred feet of landings bear many passes with loaded skidders. Although these areas are of limited extent (6 percent or less of the harvested area), they often show considerable soil compaction. Landings and skid trails within approximately 200 feet of landings are slated for soil rehabilitation with a winged subsoiler to alleviate soil compaction. This activity is common to all alternatives except for the no action alternative.

Fuels activities, including tractor piling, pile burning, and underburning, have low impact on soils as long as adequate organic matter is retained in accordance with Soil Quality Standards[306]. Piling to remove excess fuel from the site is performed by tractor-type equipment with a brush rake. The tractor does not typically cover the same ground repeatedly (as a skidder would). It only occurs in units where it is necessary to meet fuel loading requirements and only on those portions of a unit with excess logging slash. Because it is of limited extent (typically 20 to 30 percent of a unit and only in certain units), tractor piling is generally considered have low potential for compaction beyond threshold.

Soil Quality Standards are not applied to areas not dedicated to productivity. As such, new road construction is not held to the same criteria as other activities[307]. Road closures and

[305] Personal Comm. with Jonna Cooper, Project Soil Scientist
[306] Forest Plan, Appendix O.
[307] Forest Plan, Appendix O.

decommissioning, when accomplished by ripping, have the effect of reducing compaction and increasing the potential for those areas to be placed back into productivity.

Direct and Indirect Effects by soil productivity indicators

Environmental consequences are discussed within the context of potential adverse or beneficial impacts to soil productivity indicators. These are: Soil Erosion, Soil Compaction, and Loss of Soil Productivity Due to Loss of Soil Organic Matter.

Soil Erosion

All soils within proposed activity units were evaluated and given a Soil Erosion Hazard Rating (EHR) in accordance with the California Soil Survey Committee EHR System[308]. Soils were evaluated for both thinning and regeneration harvest treatments[309]. Any ratings product less than 4.0 is considered low[310]. EHR for proposed treatment units is uniformly low[311], regardless of the remaining vegetative cover following treatment. This means there is little potential for significant amounts of soil to be removed from the site by water or wind. This applies to all alternatives.

[308] *Soil and Water Conservation Handbook*, R-5 FSH 2509.22. Chapter 50.
[309] One factor which contributes to accelerated soil erosion is slope. An average slope of 10 percent was used for this analysis, though most of the area falls below that value. A query of GIS data returned those parts of proposed activity units where slope exceeds 35%. The query response indicates that only a few percent of the units exceed 35% slope in any portion. These areas fall on lava rims where they are exposed within units and will be avoided in layout.
[310] *Low* is a qualitative rating applied to a numeric value that is obtained by rating various factors such as soil texture and structure, climate, water movement, rock outcrop and slope. It means that there is little potential for significant amounts of soil to be removed from the site by water or wind.
[311] Ratings products ranged from 1.0 (thinning on Germany soils) to 3.7 (regeneration harvest on Ledmount soils). Soils Report, September 27, 2005, p. 6.

Table 8. Soil Erosion Hazard Ratings

	Treatment	I. Soil Erodibililty Factors			II. Runoff Production Factors						III. Runoff Energy Rating (Slope % ÷ 100)	IV. Soil Cover Factors			V. Ratings Product (IC x IIF x III x IVC)	VI. Adjective Rating
		A. Soil Texture Erodibility Factors	B. Aggregate Stability Adjustments	C. Soil Erdodibility Rating (A+B)	A. Climate (from NOAA Atlas 2, Vol. XI-Calif.)	B. Water Movement in the Soil	C. Runoff from Adjacent Areas	D. Uniform Slope Length	E. Runoff Production Factor (A+B+C+D)	F. Runoff Production Rating (E ÷ 3)		A. Quantity and Quality	B. Cover Distribution	C. Soil Cover Rating (A+B)		
Germany	Thinning	2	-1	**1**	3	1	0	6	10	**3.3**	**0.10**	3	0	**3**	**1.0**	Low
Germany	Harvest & Replant	2	-1	**1**	3	1	0	6	10	**3.3**	**0.10**	5	0	**5**	**1.7**	Low
Sadie	Thinning	2	0	**2**	3	1	0	6	10	**3.3**	**0.10**	3	0	**3**	**2.0**	Low
Shasta	Thinning	2	0	**2**	3	1	0	6	10	**3.3**	**0.10**	3	0	**3**	**2.0**	Low
Shasta	Harvest & Replant	2	0	**2**	3	1	0	6	10	**3.3**	**0.10**	5	0	**5**	**3.3**	Low
Ledmount	Thinning	2	0	**2**	3	2	0	6	11	**3.7**	**0.10**	3	0	**3**	**2.2**	Low
Ledmount	Harvest & Replant	2	0	**2**	3	2	0	6	11	**3.7**	**0.10**	5	0	**5**	**3.7**	Low

Soil Compaction

Given that detrimental compaction will be alleviated in areas that are currently compacted at or beyond threshold, the consequence of treatments will be an overall improvement to the soil resource. This is true for all action alternatives as there is no discernable difference in impact between the different density treatments or the tree retention level in regeneration harvest units.

Loss of Soil Productivity Due to Loss of Soil Organic Matter

Thinning units maintain most of their vegetative cover and the organic input from needle cast and leaf fall assure the organic cover will be quickly reestablished. Regeneration harvest units will fall below the natural vegetative cover and thus, reduce the normal input of organic matter for a period of time following harvest. A study of biomass harvesting and whole tree removal[312] indicates that this does not affect long term soil productivity as long as longer rotations are used. Past experience on these sites supports that conclusion. Given that replant units will be brush raked and hand-planted, soil disturbance and organic matter removal will be minimized. All

[312] Wells, C.G and J.R. Jorgensen. *Effects of Intensive Harvesting on Nutrient Supply and Sustained Productivity*. USDA Symposium Proceedings, 212-230, 1979, pages 225-226.

action alternatives provide similar and adequate maintenance of soil organic matter and support long term soil productivity.

There are no known or measurable indirect effects of soil erosion or soil productivity due to loss of organic matter as a consequence of any action associated with this Project. Thresholds are not expected to be exceeded for these soil productivity indicators, thus any indirect consequences which might occur would be in line with the natural or existing condition of the soil and not due to any action as a result of this Project.

Reduction in overall soil compaction from any of the action alternatives could result in an increase in the amount of land capable of growing desirable vegetation. The alternatives are consistent with Soils Quality Standards[313] and Forest Plan Standards and Guidelines[314].

Cumulative effects (Soils)

Because the bounding of cumulative effects is the same as direct and indirect effects, the effects are the same.

Hydrology[315]

Affected Environment[316]

The project area is within two 5th field watersheds, Ash Creek and the Upper McCloud River[317]. Pilgrim Creek lies within the Upper McCloud River Watershed. Ash, Dry, Trout and Edson Creeks flow through the Ash Creek Watershed.

The McCloud Flats has developed a sandy basin with high rates of water infiltration. While Ash Creek has perennial flow into the project area, it joins the other four streams, flowing intermittently[318] and finally becoming ephemeral[319] in the southern portion of the project area. Surface terrain exhibits low relief with occasional undulations, exposed volcanic flows, and uplifted rock along faults that interrupt the otherwise flat terrain. Debris flows are not uncommon.

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[313] Forest Plan, Appendix O.
[314] Forest Plan, page 4-25
[315] Paraphrased from the *Hydrology Report*, December 2, 2005.
[316] Discussed in the context of water quality and the Aquatic Conservation Strategy. In addition, the State of California has agreements with the Forest Service to control non-point source discharges by implementing control actions certified by the state Water Board as best management practices (California Regional Water Quality Control Board Central Valley Region, *The Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board Central Valley Region Fourth Edition, the Sacramento River Basin and the San Joaquin River Basin*, 2004. Ch. IV-3.00.)
[317] *The McCloud Flats Ecosystem Analysis* (1995) provides a watershed analysis of the Pilgrim Creek project area. Watershed boundaries were redrawn several times before the Hydrologic Unit Code (HUC) system (now accepted as the definitive watershed coverage) was created for this area. The area that was addressed in the Watershed Analysis differs from the 5th Field HUC (Ash Creek Watershed) because the latter watershed coverage had not been completed at the time of the original planning efforts.
[318] Intermittent character refers to the interruption of surface flows along the length of the channel as well as the duration of flow.
[319] Ephemeral character is a response to peak snowmelt, precipitation, and diurnal evapotranspiration in the summer.

Stream form ranges from having poor- to well-defined banks. In-stream features, such as pools and riffles, are variable as well, dependent on flow and the integration of woody debris. Mature trees contribute woody materials to the channel corridor, serving to dissipate high energy during normal runoff events and to trap sediment during receding flow. Without woody material, energy dissipation is limited and leads to channel down cutting. Down cutting tends to eventually create a gully that contains all stream flow and prevents floodplain access and interaction.

The existing condition of overstocked conifer stands within the riparian reserves has provided abundant large woody debris, necessary for in-stream structure, while also limiting sunlight. With limited light, the riparian species vigor and abundance necessary for increasing soil strength to form and maintain stream banks is absent.

Where the channel form is functioning, woody debris is capturing sediment and providing opportunities for riparian species to establish. Too much woody debris can have adverse impacts for low gradient channels due to insufficient energy and competence to carry the bedload[320].

Surface flow in the project area is very rare. Stream flow is fed by spring rain and snowmelt runoff with occasional rain-on-snow events that cause extensive flooding.

Water quickly infiltrates into the ashy soil during the day from conifer respiration during evapotranspiration[321] and likewise quickly surfaces at night as diurnal variation occurs. Perennial reaches of the intermittent streams are mostly limited to the upstream reaches located well outside the project area; these streams become intermittent as they flow downstream to the alluvial fan.

All streams vary from low to severe entrenchment into the floodplain. Flow connectivity among the Ash Creek sink channels and the McCloud River only occurs for short periods at 3-6 year intervals during exceptional runoff events. Besides episodic flood events, over-bank flooding occurs with the diurnal nature of the flow regime and high infiltration capacity of the ashy soils. Stream flow and sediment move across the landscape unhindered by normal channel boundaries and construction processes. These dynamic conditions determine the timing, variability and duration of floodplain inundation and water table elevation in the area. Spatial and temporal connectivity within and between watersheds is interrupted by the intermittent nature of these streams. However, during significant runoff events stream networks form and supply the McCloud Flats and the McCloud River with water and sediment necessary for fulfilling life

[320] Rosgen, D. 1996. *Applied River Morphology*, Ch.6. p.26.

[321] After seasonal flows diminish, surface water flow is more dependent on daily rates of evapo-transpiration. In this case, surface water flowing down the channel recedes in the upstream direction as diurnal changes in evapo-transpiration rates occur. As the wetted front of the stream recedes, sediment falls out of suspension and is deposited in situ. The accumulation of sediment falling out of suspension as surface water infiltrates becomes a depositional form unique to the amount of sediment that was in transport at the time of flow recession. At the next time of surface flow, the interception by these previously deposited forms, and other features, such as fallen trees or branches, directs the stream accordingly. In this area, channel migration is common, so much so that mature trees having established prior to channel migration are growing in the wetted channel, an unlikely location for most conifer to establish or survive. The highly migratory character of the streams is in response to changing hydrologic conditions across a relatively young landscape on a watershed scale.

Creek Descriptions

Pilgrim Creek, the western-most creek in the project, is primarily ephemeral in the project area, though it experienced several days of debris flow in 1996. The creek is dry for miles from its confluence with the McCloud River. Only in significant flow events does it reach the river with any surface flow.

Ash Creek flows through the project area until reaching the Ash Creek sink where it is characterized by fluctuating intermittent stream flow. It becomes ephemeral towards its confluence with the McCloud River.

Swamp Creek is intermittent/ephemeral through Elk Flat and into the project area. The creek is captured by the road, becoming the channel by default, flowing down it for a half-mile, before turning off the road to Elk Flat in an incised channel. The influence from a culvert outlet is causing channel straightening and entrenchment. Conifer encroachment in Elk Flat is such that the conifer overstory out competes other plants like willow that would benefit soil strength and channel form maintenance.

Edson Creek is intermittent becoming ephemeral in the downstream direction within the project area. Limited riparian vegetation occurs in association with intermittent stream channels.

Dry Creek contributes flow from its confluence with Trout, then Swamp and finally Edson, before its entry into Ash Creek. Channel character and flow is well to poorly defined, intermittent becoming ephemeral. About 3 miles upstream from the project (along Trout Creek) is the nearest portion that has recorded fish populations during spring runoff. It is currently recommended for Putative Redband Trout Intermittent Refugia down to forest road 40N12 by the California Division of Fish and Game. A stream crossing on road 41N44Y is contributing sediment to the channel from repeated crossings by vehicles.

An intermittent **Trout Creek** channel lies adjacent to unit 457 for a very short distance (500 feet) before it joins with Dry Creek.

history requirements of aquatic and riparian-dependent species[322].

There are no known aquatic communities in these intermittent streams. However, a portion of Trout Creek upstream from the project area, approximately 3 miles, was electro-shocked last spring runoff and a single fish was observed. Trout Creek flows into Dry Creek, which is known to flow during most years down to Forest Road 40N12, the length of intermittent flow down to 40N12 is currently being recommended for Putative Redband Trout Intermittent Refugia by the California Division of Fish and Game as identified in an October 2005 draft map[323].

Edson, Swamp, Dry and Trout Creeks unite with Ash Creek in the project area and in years of extremely high flows connect with the McCloud River during a period determined by the storm events. During the receding flood period, when fish are more likely to move upstream, the infiltration rate is so high that the likelihood of fish becoming stranded is higher than their ability to migrate into favorable habitat[324].

[322] Reid, L.M. and R.R. Ziemer, USDA Forest Service, Pacific Southwest Research Station. *Evaluating the Biological Significance of Intermittent Streams*, Summary of workshop held at the Humboldt Interagency Watershed Analysis Center May 4, 1994.
[323] Curt Babcock, DFG, Staff Environmental Scientist memo 6/22/05.
[324] Curt Babcock, DFG, Staff Environmental Scientist.

Riparian Reserve widths for streams are based on the site-potential tree height[325] representative of stands in the project area[326]. The site potential tree height for the project area was identified to be 175 feet[327]. Because of the proposed extension of Putative Redband Trout to 40N12, those units adjacent to the putative refugia will be prescribed a two-site potential tree height Riparian Reserve buffer width for fish-bearing streams, until further evaluation of the presence of fish habitat is completed. One potential tree height applies for the stream reaches within other units, as these are not fish-bearing,

Water quality parameters[328] for the basin in the Water Quality Control Plan for the Central Valley Region were reviewed to identify the dominant water quality concern for aquatic and riparian resources in the project area most critical to maintaining beneficial uses[329] and water quality. The project area does not contain any unique riparian habitats (i.e., wet meadows, lakes, seeps, etc.) with the exception of a short reach of perennial flow in Ash Creek. The duration of surface flow in the upper reaches of the project area ranges from several weeks to about 2 months during an average water year[330]. The occurrence of surface flow in the creeks decreases in a downstream direction in the project area. The lower four-mile reach of Ash Creek usually does not flow at all during years of below normal precipitation. Due to the beneficial uses, water quality parameters and the lack of surface-flow connectivity with the McCloud River there are no water quality concerns identified in this analysis.

Environmental Consequences

Alternative 4 - No Action

Direct and Indirect Effects (Hydrology)

Water and riparian conditions as described above would remain unchanged. Dense canopy cover within riparian reserves would cause the loss of vigor to riparian plant species and reduced plant community diversity. Continued conifer tree mortality may add excessive amounts of woody debris to some stream channels causing blockage and diversion of flows[331].

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[325] The site-potential tree height is based on the average maximum height of the tallest dominant trees (200 years or older) for a given site class. Forest Plan 4-54.
[326] USDA Forest Service and USDI Bureau of Land Management, 1994. *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl*, including Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Related Species.
[327] McCloud Flats Ecosystem Analysis, 1995
[328] Bacteria, biostimulatory substances, chemical constituents, dissolved oxygen, floating material, oil and grease, pH, pesticides, radioactivity, salinity, sediment, settleable material, suspended material, tastes and odors, temperature, toxicity, turbidity (*Hydrology Report*).
[329] Beneficial uses of any specifically identifed waterbody generally apply to its tributary streams (CVRWQCB, 1998 II-2.0). The designated beneficial uses for streams within and downstream of the project are established in the Water Quality Control Plan for the Central valley Region. For the McCloud River: municipal and domestic supply, hydropower generation, water contact recreation, canoeing and rafting (proposed), non-contact water recreation, cold freshwater habitat, cold water spawning habitat, and wildlife habitat.
[330] Steve Bachmann, Unit Hydrologist, personal communication.
[331] Hydrology Report for the Pilgrim Project, May 2006, page 21

Cumulative Effects (Hydrology)

Cumulative effects for hydrology are bounded by the 8th order watershed as described in Appendix F. This scale watershed was used because it best represents the hydrologic characteristics found on the McCloud Flats. A larger 5th order watershed would have included activities whose effects are not hydrologically connected to activity in this project and thus do not contribute to cumulative effects[332]. This is due to the nearly flat terrain within and surrounding the project area and the absence of any perennial streams running into and through the project area.

The Equivalent Road Acres method of assessing cumulative watershed impacts was not used in this analysis because the degree to which cumulative impacts can occur is a function of the amount of sensitive ground in the watershed. Erosion hazard ratings for the Pilgrim Project are low in all proposed treatment units. The probability of soil loss from any of the action alternatives is very low. The Project area lacks inner gorges, perennial streams and steep topography, all of which are sensitive features that the ERA model is designed to address. The ERA methodology is based on a rainfall-runoff driven model that identifies potential for land-use activities to affect peak flows and water quality. This model is not suited to areas that lack rainfall-runoff characteristics, such as found in the Pilgrim Project Area.

Also, the 5th order watershed has a high threshold of concern (18 percent) [333]. Characteristics of almost flat terrain, high soil infiltration rates and very low erosion hazards associated with the McCloud Flats are responsible for this high threshold.

Based on these conditions, there are no cumulative effects to water and riparian resources from past or future actions within the watershed.

Alternatives 1, 2 & 3

Direct and Indirect Effects (Hydrology)

Because activities (about 175 acres of thinning and about 55 acres of regeneration harvest) are proposed within Riparian Reserves in the project area, the proposed action was evaluated to determine how implementation of planned activities would affect attaining Aquatic Conservation Strategy Objectives[334]. The proposed action is designed to improve stand conditions in Riparian Reserves and thereby contribute to the overall health of this portion of the watershed.

A description of how the proposed action will affect each of the nine Aquatic Conservation Strategy Objectives[335] is located in Appendix G. The project has neutral to beneficial effects with respect to all Aquatic Conservation Strategy Objectives.

Thinning activities will reduce the risk of stand-replacing fires in the Riparian Reserves and promote stand and aquatic health by maintaining woody debris inputs without overwhelming the streams with an excessive supply of woody debris from a stand-replacing fire. The proposed

[332] Personal Comm. with Heidi George
[333] Hydrology Report for the Pilgrim Vegetation Management Project, March, 2006, page 22
[334] Forest Plan, page 4-53
[335] Forest Plan, page 4-53.

action would also promote proper functioning condition within riparian reserves compared to the current status of decline[336, 337]. The shrub component of plant communities should improve as sunlight reaches the forest floor. Thinning activities adjacent to and within the riparian reserve, which maintain mature healthy conifers and open the canopy will favor regeneration and establishment of riparian plant communities including willow.

Regeneration units that include riparian reserves should reduce the incidence of insect infestation and root disease within riparian areas. Reforestation with a mix of conifer species should improve the overall health of the riparian plant community.

Renewal of riparian vegetation will eventually lead to stream processes that reduce energy, detain sediment, build banks and discourage entrenchment. With sufficient improved vegetation along the banks, the channel should narrow and the channel bottom should sustain attributes that reflect a higher proper functioning condition[338,339]. For entrenched channels, coarse woody debris will add channel roughness favorable for the channel building processes; for low-gradient channels, too much woody debris can have adverse impacts, such as encouraging channel abandonment[340]. Entrenchment of streams may lower the adjacent water table responsible for sustenance of deep-rooted riparian communities and lead to conversion of the plant community representative of a drier type[341].

A reduction in evapotranspiration from removal of conifers may temporarily prolong and slightly increase seasonal runoff/base flows in the project area until the riparian vegetation becomes re-established. Studies indicate that forest openings that receive shade and wind protection from a perimeter of conifer retain snow longer compared to forested stands as sublimation occurs more rapidly on branch surfaces[342]. This would tend to have a beneficial effect on increasing the duration of snowmelt.

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[336] USDI Bureau of Land Management, *Process for Assessing Proper Functioning Condition for Lentic Riparian-Wetland Areas*, Technical Reference 1737-11, 1994.
[337] Reid, L.M. and R.R. Ziemer, USDA Forest Service, Pacific Southwest Research Station. *Evaluating the Biological Significance of Intermittent Streams*, Summary of workshop held at the Humboldt Interagency Watershed Analysis Center May 4, 1994.
[338] USDI Bureau of Land Management, *Process for Assessing Proper Functioning Condition for Lentic Riparian-Wetland Areas*, Technical Reference 1737-11, 1994.
[339] Stermer, C. J., T. S. Burton, R. L. Callas, and Dr. Lawrence Fox III, 1998. *Habitat Predictability Model for Willow Flycatchers (Empidonax trailii) in Northern California, using Landsat Thematic Imagery, Organization of Fish and Wildlife Information Managers* In: 4th Microcomputer Applications in Fish & Wildlife Conference, Symposium 4,Technology in the Wildlife Profession: Research, Application, and Education.
[340] Rosgen, D. 1996. *Applied River Morphology*
[341] Minshall, G., S.E. Jensen, and W.S. Platts. 1989. *The Ecology of Stream and Riparian Habitats of the Great Basin Region: a Community Profile*. U.S. Fish & Wildlife Service Biological Report 85 (7.24) p. 44.
[342] Pomeroy, J. W. and J. Parviainen, N. Hedstrom, D. M. Gray. *Coupled modeling of forest snow interception and sublimation*. Hydrological Processes Vol. 12, Issue 15, Date: December 1998, pps: 2317-2337; www.Interscience.Wiley.com.

Best Management Practices[343] have been identified for the proposed activities in the project area (Appendix E). Objectives and implementation strategies have been identified for key practices that will protect aquatic and riparian resources and prevent degradation of water quality.

Best Management Practices are field monitored every year on the Shasta-McCloud Management Unit. Monitoring reports for the last three years indicate that all management practices related to timber harvest on the McCloud Flats have been effective in protecting riparian resources and water quality.

Based on this analysis, none of the action alternatives will have an adverse affect on water quality or riparian reserves located within, upstream or downstream of the project area[344].

Alternatives 1, 2 & 3

Cumulative Effects (Hydrology)

As there are not direct or indirect effects to water and riparian resources, there are no cumulative effects.

Range[345]

Affected Environment

The project is entirely within the Bartle Cattle Allotment, which has 240 cattle from June 1 to October 30. Cattle prefer to graze near the central troughs and along Ash Creek. Cattle forage mainly on secondary Rossi sedge. Bitterbrush is abundant, but used only if near water and hedging is light to none. Aspen, willow, oak, elderberry, and serviceberry are sometimes browsed severely when isolated or suppressed, but grow well despite grazing if substantially released from conifers. The allotment has no outstanding forage areas and forage is widespread and of low quality.

Environmental Consequences

Alternative 4 - No Action

Direct and Indirect Effects (Range)

Forage values will remain at the present low level, due to prolonged canopy cover, but may slowly increase where pathogens kill trees and create openings. Pine needle duff (and shading) will continue to prevent good grass growth.

Cumulative Effects (Range)

Cumulative effects for range are bounded by the 8th order watershed as described in Appendix F. This watershed was used because it encompasses approximately 70 percent of the Bartle Cattle

[343] *Water Quality Management for Forest System Lands in California*, USDA Forest Service, Pacific Southwest Region, September, 2000.
[344] Hydrology Report for the Pilgrim Vegetation Management Project, March, 2006, page 22
[345] Paraphrased from Range Report, November 30, 2005.

Allotment. Past actions of thinning, regeneration, underburning and salvage on both National Forest and private lands have slightly increased forage values and acres by opening stand canopy and allowing grasses to grow more vigorously. Despite these actions, the allotment continues to have low quality forage, due mainly to the ashy soils that have high water infiltration rates and the continued accumulation of needle duff on the forest floor that impede grass growth.

Alternatives 1, 2 & 3

Direct and Indirect Effects (Range)

Alternative 1 allows maximum diversity and exposure of the forage species to more sun and water, providing much better forage growth conditions in the understory. Removal of trees will reduce the rate of duff buildup from pine needles, allowing for better grass growing conditions. Forage will increase directly proportional to the acreage burned because fire will reduce the duff such that grasses, forbs, and shrubs can reestablish.

Forage amounts will be less under Alternative 2 than that produced by the open canopy of Alternative 1 because of the denser overstory on 535 acres.

Alternative 3 is similar to two, but the immediate canopy and eventual death and fuel buildup in 15% retention areas within the 415 of regeneration harvest areas will delay forage increases in those areas.

Cumulative Effects (Range)

Past and future actions, including the alternatives proposed by the Pilgrim Project result in some increases in forage value and amounts for cattle. Overall forage values would remain low due to the factors of low soil moisture retention and continued needle duff accumulation.

Overall effects on the Bartle Allotment are insignificant and no plans exist to change the grazing season or numbers of cattle as a result of the past or future actions.

Transportation System[346]

Affected Environment

The Pilgrim assessment area has approximately 51 miles of classified system road[347]. The 51 miles of classified road include 6.3 miles of arterial routes[348], 10 miles of collector routes[349], and 35 miles of local roads. In addition there are about 4 miles of unclassified low standard roads[350]. They are not part of the official forest road system, but are considered a potential resource impact and access need, which must be addressed with any road analysis of an area. Together, these

[346] Paraphrased from *Transportation Report*, October 11, 2005, as updated by discussion with the author.
[347] Classified roads are part of the inventoried forest road system and have road maintenance and traffic service levels assigned according to designed use, safety, traffic mix, cost, and other factors.
[348] Forest arterials are primary forest roads that serve large land areas and connect with public roads. They are usually double-lane and hard surfaced.
[349] Forest collectors are secondary forest roads that serve smaller land areas but are still relatively high standard for forest roads, often double-lane with gravel surface.
[350] Unclassified roads are low standard roads, often user-built by hunters, campers, woodcutters, OHV-users, and other recreationists.

roads equate to a relatively high road density of 4.1 miles per square mile. The terrain is generally flat which has historically made effective road closures difficult to implement and maintain in this area and, along with heavy road use, is a primary factor in the high open road density of this area.

The area has a concentration of multiple user traffic due to the intersection of several arterial and collector routes[351] and supports year-round recreation use. Local features that draw users include the Pilgrim Creek Snowmobile Park, dispersed campsites, and popular mushroom and deer hunting areas (see also the Public Use section). Vehicle counts show an average of approximately 8,500 vehicles, including log truck traffic, travel through this transportation corridor during the spring through fall seasons and approximately 3,000 vehicles travel to the Snowmobile Park during the winter.

A Roads analysis of the project assessment area was completed in April of 2005. The recommendations of that analysis are included in the proposed action. See Appendix D for a detailed list of these proposed actions.

A culvert across Trout Creek on road 41N44Y (SE¼ Sec. 27, T41N, R1W) was identified by the hydrologist as being an undersized and having the potential to cause road damage and erosion during flood level runoff (it is recommended for replacement with a larger culvert). An open stream road crossing (ford) on forest road 41N52 is causing bank erosion and is recommended for decommissioning.

The forest standard and guidelines are that no more than 15 percent of harvested lands are to be dedicated to non-productive purposes such as roads, trails and landings[352].

Environmental Consequences

Alternative 4 - No Action

Direct and Indirect Effects (Transportation System)

Road conditions and road density will remain the same in the short term. Local road systems will eventually become overgrown and close over next 5 years, decreasing road densities and roaded recreation opportunities. Local road maintenance needs and related issues will increase in short-term as conditions continue to deteriorate, but as corresponding use decreases these will abate. Less access from overgrowth may reduce sources for person-caused fires. Minor road and erosion problems associated with stream crossings may increase slightly. This alternative does not address access needs required to implement Forest Standards and Guidelines[353].

Cumulative Effects (Transportation System)

Cumulative effects for the transportation system are bounded by the 8th order watershed as described in Appendix F. This bounded area best represents the transportation system conditions as it relates to the McCloud Flats.

[351] FA13 Pilgrim Creek, FA19 Military Pass/Sugarpine Butte, and 40N12 Bear Wallow Roads.
[352] Forest Plan, page 4-25, j
[353] Forest Plan, pages 4-16 & 4-17

Projects on National Forest lands in the past 10 years, mainly timber sales, have not added any miles of classified roads to the transportation system. Past timber harvest on National Forest lands did result in the construction of approximately 250 landings[354] of about ½ acre in size each. This resulted in the loss of approximately 130 acres of commercial forest lands to long-term timber production. Main skid trails associated with these landings have affected approximately 150 acres of commercial forestland. This loss is assumed because many of these landings and skid trails will be used again in future timber sales.

There are approximately 190 miles of roads in the 8th order watershed including 20 miles of arterials (impacting about 60 acres), 40 miles collector roads (impacting about 100 acres) and 130 miles of local roads (impacting about 200 acres). These roads have removed about 360 acres of commercial forest lands from production. Roads and landings together have removed about 530 acres of commercial forest lands in the watershed from long-term timber production. This is about 2.0 percent of the commercial forest lands in the watershed.

Overall road density has remained static or decreased slightly due to roads being overgrown by trees and brush.

Other construction projects have removed approximately 7 acres of commercial forest lands from long-term timber production.

Alternative 1, 2, and 3

Direct and Indirect Effects (Transportation System)

Road density will increase slightly during project implementation (from 4.1 to 4.2 miles of road per square mile), but post project, the open road density will be reduced to 3.4 miles of road per square mile. Classified roads will be reduced from about 51 miles to 45 miles. Unclassified roads will be reduced to 0 miles.

Local road maintenance needs and related issues will be addressed for roads affected by this project[355]. Open road densities increase in the short term until road closures and decommissioning are put into effect 3-5 years from the start of timber harvest (after post-sale activities are complete). Road maintenance costs decrease slightly with road closures but administrative costs increase (signing, maintenance of closures, enforcement, etc.). In the long term the risk to man-caused fires should decrease as the road density will be reduced once the road closures and decommissioning is completed. Roaded recreation opportunities remain about the same, despite the reduction in roads due to the access to similar opportunities throughout the project area and vicinity.

Decommissioning approximately 2 miles of roads will return about 4 acres of roadbed to productive land. Initially grasses and brush will revegetate these acres and over time conifer trees will seed into the area.

[354] Based on an average of 25 harvest acres per landing
[355] Not all roads used or stands treated with this project.

The proposed project will require approximately 150 landings of about ½ acre in size each. Approximately 40 of these landings already exist from previous timber harvest activities in the project area. These approximately 80 acres of landings would be lost to long-term timber production even though they will be subsoiled and trees will naturally start to grow on them. This is because they will be probably be used again in 10-15 years for timber harvest in these same stands.

The proposed project will require approximately 0.3 miles of new road construction. This action will remove approximately 0.6 acres of commercial forest lands from long-term timber production. The road will be located on flat terrain with no streamcourses within about one mile. The location follows open areas and avoids large trees and areas of conifer tree reproduction.

Existing roads in the project assessment area have removed approximately 100 acres of commercial forest lands from production. Main skid trails will impact approximately 50 acres and landings will impact about 80 acres as noted above. A total of approximately 230 acres of commercial forest lands will be dedicated to roads, landings and skid trails for the project. This is approximately 6 percent of the harvest acres

Cumulative Effects (Transportation System)

Approximately 760 acres of commercial forest lands has been/would be lost to long-term timber production from the cumulative losses of past projects when combined with this project and the existing roads in the watershed. This is about 3.0 percent of the commercial forest lands in the watershed.

Open road density would be reduced in the project area to about 3.4 miles per square mile. Overall road density will decrease slightly in the watershed from proposed closures and natural closure of some roads as they are overgrown with brush and trees.

Scenic Quality

Affected Environment

The McCloud area boasts of flat terrain covered in prolific mixed conifer stands with a variable understory. Usually, only foreground views[356] can be seen due to the flat topography[357]. The existing scenery ranges from management activities being unnoticed (Retention Visual Quality Objective [VQO][358]) to dominating the landscape (Modification VQO[359]) as seen from Pilgrim

[356] Foreground views: The portions of a view between the observer and up to ¼ to ½ mile distant. Surface patterns on objects and visual elements are important in foreground views. *Scenery Assessment*, October 5, 2005, page 3.
[357] The Forest Plan uses the Visual Management System (VMS)357 to reduce scenery impacts caused by management activities. VMS utilizes the distance of the project from the viewer, duration of the view, variety class and the sensitivity level of the viewpoint to assess visual impacts. Visual Quality Objectives (VQO's) were established for areas seen from travel routes. VQO's indicate allowable changes to scenery as a result of management activities.
[358] Retention VQO: Management activities are not evident to the casual forest visitor. *Scenery Assessment*, October 5, 2005, page 2.

Creek Road and Mount Shasta due to prior vegetation management activities, the Pilgrim Creek Snowmobile Park and roads.

A portion of the project area is within the foreground view of Pilgrim Creek Road. The Forest Plan identifies the foreground views from Pilgrim Creek Road[360] must meet a minimum of Modification VQO per the Forest VQO map[361]. There may also be background views of the entire project area from the Mount Shasta summit, which must meet a minimum VQO of Modification to Maximum Modification per the VQO map.

Local residents use Pilgrim Creek Road for hunting, woodcutting, dispersed recreation, and snowmobiling. Mitigations for foreground views within the Pilgrim Creek corridor were integrated into the project design to minimize impacts to scenery as much as possible while addressing ecosystem health (Design Criteria Common to All Action Alternatives).

Environmental Consequences

Alternative 4 - No Action

Views from Pilgrim Creek Road - Direct and Indirect Effects

No action may change the future landscape character by creating a forest with dense under growth, which creates less visual diversity and inhibits the sight distance of the viewer (Photo 3 in Appendix A), thus resulting in a less interesting visual experience[362]. The No Action Alternative may result in an increasing number of dead and dying trees as a result of both root disease and bark beetle mortality as evident in 2004 and 2005 insect mortality flights. The dead trees will look 'natural,' but may not meet the publics' expectations to see a green and healthy forest.

The No Action Alternative will perpetuate the existing conditions of dense undergrowth, over stocked stands, and high mortality from disease and insect infestations. Tree mortality may continue to spread causing an increase in dead, brown tree canopies. Dead trees are usually not seen as scenic by most of the public. Increase in fuels may add to the likelihood of a stand replacing fire. A devastating forest fire would leave a charred, denuded landscape, which many people find as visually undesirable.

Cumulative Effects Views from Pilgrim Creek Road

Past projects in the last 10 years along the Pilgrim Creek Road within the 8th order watershed have included portions of the Elk and Old Station Salvages (.5 miles), the Pilgrim Hazard Tree Removal (5 miles) and portions of the North Flats (1.5 miles) and Flow (1.0 mile) sales. All these

[359] Modification VQO: Management activities may dominate the characteristic landscape, but must follow naturally established form, line, color, and texture characteristics. *Scenery Assessment*, October 5, 2005, page 2.
[360] The units considered for scenery analysis within the Pilgrim Creek corridor are 404, 23, 24, 424, 240, 230, 414, 240, 230, 414, 266, 421, 436, 422, 455, 324, 460, 456, 452, 401, 467, 128, and 305.
[361] On file at the Shasta Trinity National Forest Headquarters in Redding, California.
[362] Based on professional experience on the McCloud Flats and current conditions.

projects met or exceeded the Visual Quality Objectives of modification within the viewshed of this road.

Views from Mount Shasta - Direct and Indirect Effects

The existing visual condition will not be affected by Alternative 4, which meets the VQO of modification.

It is difficult to estimate if the scale of tree mortality would be large enough to be seen from Mt. Shasta. The scale of forest devastation through insects, disease and fire could have effects large enough in scale to be seen from Mount Shasta.

Cumulative Effects - Views from Mount Shasta

The cumulative effects boundary for visual quality as seen from the Mt. Shasta is generally all of the McCloud Flats when looking east from the summit. Projects on National Forest lands should not be highly visible because they are viewed from a distance of 10 miles or more and through hazy atmospheric conditions. Also, management activities are less noticed on flat topography.

The No Action Alternative will not affect the existing visual condition, which meets or exceeds the VQO's of Modification as seen from Pilgrim Creek Road and modification/maximum modification as seen from the Mount Shasta summit.

Alternative 1 - Preferred Alternative

View from Pilgrim Creek Road - Direct and Indirect Effects

Thinning and biomass units will meet a VQO of Partial Retention post completed management activities. The management activities may be noticed, but the area will primarily look natural. The units may meet a VQO of Retention after one or two years post management activities when grasses and forbs reestablish.

The mature stand thin units will meet a VQO of Retention post management activities. The mature trees that will be left will still dominate the viewshed, thus making the management activities unnoticed. Thinning may help to achieve a desired future condition for scenery that would meet the public's expectation to view a forest that has a variety of species and age classes, including mature trees and open areas. Light to moderate thinning would allow light to shine through the canopy, which would highlight mature trees, extend the foreground views, and create interesting shadow patterns. See photo 4 in Appendix A.

The harvested and replanted units will meet a VQO of Modification post management activities. The management activities within the units may be evident, but will be subordinate to the natural characteristic landscape (Partial Retention) within 5 to 10 years when shrubs and small trees are established. Since there are natural meadows within the project area the units may look like natural openings after 1 to 2 years when grasses and forbs reestablish.

The tractor pile and burn units will meet a VQO of Modification post management activities. Initially, the soil disturbance and brush piles will be apparent, however, within 1 to 2 years the effects will probably not be noticed when grasses and forbs are reestablished. Within 5 years the

VQO may rise to Partial Retention, the management activities may be evident, but will be subordinate to the natural characteristic landscape, when shrubs and small trees are established.

The underburning fuel treatments in units 460, 401, 421, and 422 will meet Partial Retention to Modification post completion. The lower portion of the tree boles and other vegetation may turn black / brown, however site disturbance to soil and vegetation isn't as great as the effects of a tractor piling. The units should meet Partial Retention in 1 to 2 years when grasses and forbs reestablish and the blackened boles are not as noticeable. Often, prescribed fire results in growth of visually attractive combinations of trees, shrubs, herbaceous plants and grasses[363].

The dry meadow restoration units will meet a VQO of Modification post management activities. However, they may look more visually interesting than the current dense undergrowth along the road that prevents views into the meadows. The management treatment will reduce the dense undergrowth and open views. The units should meet Partial Retention after a year or two post management activities when grasses and forbs reestablish. See photo 5 in Appendix A for an example.

Hardwood management and knobcone sanitation units are unseen from Pilgrim Creek Road.

These management activities may increase the size of trees. Larger, vigorous trees appear more scenic than small, diseased trees with dense understory to many people. The mature trees, increased visual access, and shadow patterns emulate a park-like setting which can be very scenic. The meadow like openings and mature tree stands will enhance visual diversity in form, color, texture, and scale in vegetative material, which is seen as more interesting than a monotonous landscape[364].

Cumulative Effects - Views from Pilgrim Creek Road

Projects in the past 10 years and the proposed action will meet or exceed the visual quality objectives for the viewshed along the Pilgrim Creek Road.

Views from Mount Shasta - Direct and Indirect Effects

A variety of visual studies were utilized to analyze views from Mount Shasta towards the project area. A Geographic Information System (GIS) analysis was used to determine the size and shape of regeneration harvest units that may be seen from Mount Shasta. Only approximately 50% of the scattered units could be seen from Mt. Shasta with the largest opening being approximately 35 acres. Photos were also taken from Mt. Shasta and compared with orthophotos to correlate the size of an opening and how readily it could be viewed from Mount Shasta (see photo 6 in Appendix A).

The project should not be noticed as viewed from Mount Shasta Summit. The project will not be highly visible because it is approximately 10 miles from the viewer, seen through hazy atmospheric conditions, and occur on flat topography. According to the GIS analysis, the largest opening of the regeneration harvest units that will be seen is approximately 35 acres. This is

[363] USDA Forest Service, *National Forest Landscape Management Volume 2*, Chapter 6, Fire.
[364] USDA Forest Service, *National Forest Landscape Management, Volume 2*, Chapter 1. The Visual Management System, Handbook 462.

approximately half the size of Airport Pasture, which is barely visible from this view. Elk Flat and other meadow restorations may appear slightly larger than current conditions, but should look like natural occurrences as viewed from Mount Shasta and not be noticed. Thinning, knobcone sanitation, hardwood management and other treatments, including a short segment of road construction are much smaller in scale than the largest opening created with this project, and thus should be barely perceptible or not noticed at all. Overall there are no direct or indirect effects to visual quality as seen from the summit of Mt. Shasta.

Cumulative Effects Views from Mount Shasta

As there are no direct or indirect effects to visual quality as seen from the summit of Mt. Shasta, there are no cumulative effects.

Alternative 2

View from Pilgrim Creek Road - Direct and Indirect Effects

Visually this alternative differs from Alternative 1 by retaining more canopy closure in thinning units 266 and 436 along the Pilgrim Creek Road. The proposed average 60% canopy retention could meet a VQO of Partial Retention to Retention as seen from Pilgrim Creek Road. The direct effects for all other units would be the same as Alternative 1, since they have the same proposed action.

The indirect effects are the same as Alternative 1, since most of the units on Pilgrim Creek Road have the same proposed action.

Cumulative Effects Views from Pilgrim Creek Road

The cumulative effects for scenery from Pilgrim Creek Road are the same as Alternative 1.

Views from Mount Shasta - Direct and Indirect Effects

The effects for views from Mt. Shasta are the same as Alternative 1, since most of the units have the same proposed action and the small changes in stand density on about 535 acres would be imperceptible from Mount Shasta.

Cumulative Effects Views from Mount Shasta

As there are no direct or indirect effects to visual quality as seen from the summit of Mt. Shasta, there are no cumulative effects.

Alternative 3

Views from Pilgrim Creek Road - Direct effects:

Visually this alternative differs from Alternative 1 by retaining more vegetation in the regeneration harvest units. In the short term, leaving more trees per acre would result in a more natural look, thus slightly raising the VQO. However in the long term, if the diseased trees die then the forest would still look ‘natural’, but may not meet the publics’ expectation to see a green and healthy forest. The regeneration harvest units would still meet a Modification VQO as in

Alternative 1, since 85% of the vegetation would be removed, but the units probably would not be as noticeable as in Alternative 1.

Cumulative Effects Views from Pilgrim Creek Road

The cumulative effects for scenery along the Pilgrim Creek Road are that the Visual Quality Objectives of Modification will met or exceed.

Views from Mount Shasta - Direct and Indirect Effects

The effects for views from Mount Shasta are the same as Alternative 1.

Cumulative Effects - Views from Mount Shasta

Since there are no effects to scenery as seen from Mount Shasta (the project should not be noticed), there are no cumulative effects.

Public Use/Recreation[365]

Affected Environment

The Pilgrim Creek Snowmobile Park ("snowpark," unit 421) is the only developed recreation site within the project area. Vehicle counts within the area show an average of 8,500 vehicles travel through the area during the spring through fall seasons and 3,000 vehicles travel to the snowpark during the winter. These numbers are generated from traffic counters located on the Pilgrim Creek (FA-13) and the Sugar Pine Butte (FA-19) roads. Recreation visitor travel through the assessment area is concentrated on these two roads. In addition to the snowmobile park, these two paved roads are the primary travel routes for visitors going to the trail heads on the east side of the Mount Shasta Wilderness. They also access other dispersed recreation sites located at Ash Creek Mill, Ash Creek, Trout Creek Meadows and Harris Springs. There is also some incidental traffic going towards geologic features in the Medicine Lake Highlands and travel towards Tennant and Mt. Hebron, California.

The other roads receive very little recreation traffic with the exception of deer hunting and mushroom gathering seasons. Hunters travel most of the interior roads during deer hunting season. Upland game bird and squirrel hunting occurs through out the area also. Within the assessment area, the activity is concentrated along Ash Creek and Trout Creek. Since this particular type of hunting is done primarily by walking, moving vehicles are not encountered as frequently.

Firewood cutting occurs in the project area although the preferred firewood species, lodgepole pine, in the southern Siskiyou County area does not grow in great abundance in the project area. There is incidental cutting of ponderosa pine for personal use firewood that occurs throughout the area but is a minor activity that is occurring because of the species preference.

There are several informal dispersed camps that occur within the assessment boundary in the vicinity of the Pilgrim Creek Experiment Station in Unit 423 and at the Pilgrim Creek

[365] Paraphrased from the *Public Use Report*, November 14, 2005.

Snowmobile Park in Unit 421. Use at these locations occurs mainly during deer hunting and mushroom gathering season. There are two well-established undeveloped campsites to the north of the assessment boundary. They are located at Ash Creek Mill and where Ash Creek crosses the Pilgrim Creek Road. Use at these two sites are again primarily during deer hunting season but contractors have been known to occupy these locations also during the summer months. There are also two hunting camps in the vicinity of Elk Flat to the north of the project area. These sites only receive use during deer hunting season.

The primary use season for the Pilgrim Creek Snowmobile Park (unit 421) is between December 1 and April 15. The park is one of four trailheads that access the Tri-forest Snowmobile Trail System. The primary activity associated with this facility is snowmobile use and general snow play. There has been an increase over the past couple of years of both cross country and skate ski activities on the maintained trails. During the winter months, the only road that is plowed in the area is the Pilgrim Creek Road up to the Snowmobile Park. From that point, both the Pilgrim Creek and Sugar Pine Butte Roads are converted to winter trails. These are the main trails leaving the park. Other use periods of this facility are mainly during the spring mushroom season and deer hunting season. There is also sporadic use of this facility during the summer months. The main activity during these seasons is overnight camping. This use is considered to be incidental to the main purpose for this facility.

Design criteria listed in Chapter 2 area intended to minimize or eliminate disturbance or effects related to this unit and to winter recreation.

Environmental Consequences

Alternative 4 - No Action

Direct and Indirect Effects (Public Use/Recreation)

There will be no direct benefits or impacts to recreation use in the project area. The indirect impacts will be further spread of insect and disease centers. The spread could eventually reach both dispersed and developed use areas and make them undesirable for use.

Cumulative Effects (Public Use/Recreation)

Cumulative effects for recreation is bounded by the area ¼ mile on either side of the Pilgrim Creek Road from State Route 89 to the beginning of the project and from that point a width of 1 mile on either side of the Pilgrim Creek Road to the end of the project in the SE¼ of Section 27, T41N,R1W. This is the area of concentrated public use within the project assessment area and the 8th order watershed. The time frame is the past decade, the period when developed recreation facilities were constructed and public use the highest.

Actions in the past 10 years have had no effect on hunting, mushroom gathering or dispersed recreation except short-term (several weeks to a month) displacement. Some past actions have created openings that are adjacent to the snowmobile trail along the Pilgrim Creek Road. These openings create early icing and early melt out of the trail. This causes snowmobilers to leave the

groomed trail for engine cooling and track lubrication. This is not a major problem as it only occurs early and late in the winter season.

Alternatives 1, 2 & 3

Direct and Indirect Effects (Public Use/Recreation)

The snowmobile park will be closed when large equipment is operating in unit 421 for public safety. This will affect public use for a short period, possibly two weeks[366], if this occurs during the winter.

Opening the canopy at the intersection of Pilgrim Creek and Sugar Pine Butte roads will indirectly benefit visitor safety and snow removal operations during the winter. This is because the increased solar effects on the snow and road surface helps to melt the ice accumulations and snow plow berms. The duration of this effect is expected to persist for about 10-15 years, because the canopy of the remaining trees and any regenerating trees is expected to grow in by this time.

Reduction of canopy in the intermediate and larger tree size classes will affect the winter trails north of the snowmobile park on both Pilgrim Creek and Sugar Pine Butte road. It will increase the rate of snowmelt and potentially shorten the season of use. Primary effects will be in those treatment areas that are adjacent and on the south side of Pilgrim Creek road and the west side of the Sugar Pine Butte road (from increased solar radiation from reduced canopy[367]). The greatest impact will be in units 456 and 305, from a major reduction in canopy from proposed treatments. These units are deteriorating rapidly from disease and insect infestations, which will eventually remove the shading of the trails regardless of implementation. This impact will be limited because other areas along the trial already experiences earlier melt out of the groomed trail. A benefit would be the increased spacing between trees that allow riders to leave the trail for short distances for motor cooling and track lubrication.

The dry meadow restoration will remove most of the trees and natural regeneration along the Pilgrim Creek road and improve access to the Elk Flat snowmobile play area for winter use.

The effect of unit 421 on the snowmobile park will be improved access to trails in the future. It will provide easier options for riders to get to the main trials without traveling on the plowed roadways. It will also provide an opportunity for creating a larger area where snow can be placed during snow removal operations. The planned fuel treatments will further reduce the number of hazards to people by removing limbs and material that can be hidden under snow.

The potential exists for damage to existing facilities, improvements, and public use areas from logging in unit 421. Visual resource and traffic flow problems created by the need for landing locations in developed public use areas may still exist, but design features described in chapter 2 minimize this impact as much as possible[368].

[366] Typically felling and removal of trees and biomass material within stand this size and density takes about two weeks. Dave Smyth, Timber Management Officer.
[367] Ed Hatakeda, personal communication.
[368] Ed Hatakeda, personal communication.

Hunters and mushroom gatherers will be displaced from areas where activity is occurring. Once active treatment is completed, public use will recur. This is generally of short duration of several weeks to one month in any one harvest area.

Dispersed camping will be affected by equipment noise, increased large vehicle traffic, fuel treatments and closure of the area during project activity. These effects will be only during the period of time when project activities are close by or along haul routes and will only last for several weeks to several months over the 3 to 5 year life of the project. Aesthetics of the camping areas may change for better or worse, either discouraging or encouraging use, depending on the person. The effects will be small in relation to the land base that is available to the public since all of these activities can occur in other areas. All of these activities are transient in nature and move with the availability of resources and desired aesthetics[369].

Overall there is a minor benefit from this project to snowmobile use by opening the understory of some stands along the snowmobile trail for more access. There is a minor effect to the snowmobile trail through potential shortening of the use season. This effect is highly variable as snow accumulations vary from year to year in the project area.

All other dispersed recreation use will have short term displacement when harvest occurs within the corridor of concentrated use.

Cumulative Effects (Public Use/Recreation)

All past activities have been completed and do not occur within the same timeframe as the proposed action. Thus, there are no cumulative effects to hunting, mushroom gathering or dispersed recreation. There has been no reduction in these uses within the cumulative effects corridor over the past 10 years[370].

Creation of opening along the snowmobile trail on the Pilgrim Creek Road had had some cumulative effect when combined with the proposed action. Past actions when combined with the proposed action will create opening along about 1.5 miles of the snowmobile trail within the defined corridor of concentrate use. This is about half the trail length within the corridor. This is not a major effect to the use of the trail as it only impacts the trail during period of low snow levels either early or late in the season of use.

Heritage[371]

Affected Environment

An archeological pre-field investigation and field reconnaissance identified nine archeological properties within the project boundary. One site is a Traditional Cultural Property. Of the remaining properties, three are wagon roads, one is a logging railroad grade system, one a sheep camp, one a refuse scatter, one a multi-component site (obsidian lithic scatter and refuse scatter),

[369] Ed Hatakeda, personal observation.
[370] Public Uses for the Pilgrim Vegetation Management Project, Nov. 2005.
[371] Paraphrased from the transmittal letter for the Pilgrim Vegetation Management Project: ARR #05-14-01051, November 8, 2005.

and one the Pilgrim Creek Nursery and Experimental Station (circa 1910 to 1940s). All sites and features eligible or potentially eligible to the National Register of Historic Places have been flagged for identification and will be protected during project activities. The archeological reconnaissance and management measures performed conform to the procedures identified in the Region 5 Heritage Programmatic Agreement.

The Pit River and Wintun Tribal Organization have been consulted regarding the proposed project as required under 36 FR 800. Native American Tribal organizations did not express any significant issues relating to Section 106 of the National Historic Preservation Act. Documentation is located in Archeological Reconnaissance Report 05-14-01051.

Environmental Consequences

All Alternatives

Direct and Indirect Effects (Heritage)

All alternatives require the same protections for sites. There will be pre-designated crossings of linear features where needed to best protect overall resources. Therefor, in consideration of the management and protection measures identified for archeological sites and features associated with the project area, and that no Native American Tribal Organizations issues or concerns were identified regarding Section 106 of the National Historic Preservation Act, this project will have no direct or indirect effect on any archeological properties either eligible or potentially eligible to the National Register of Historic Places.

Cumulative Effects (Heritage)

As there are no direct or indirect effects to heritage resource, there are no cumulative effects.

Economics

Affected Environment

The economic area of influence for the Shasta-McCloud Management Unit includes the several surrounding counties: Siskiyou and Shasta in California as well as Jackson, Josephine, and Klamath in Oregon. Siskiyou County traditionally had a high degree of dependence on lumber and wood product manufacturing.

Currently, there are no saw mills in Siskiyou County. There are two veneer mills, one in Weed and one in Yreka. Saw log material from the local area goes mostly to mills in Burney and Redding, California (Shasta County). Biomass material goes to one of three co-generation plants in Burney, CA. Veneer material from the two mills in Siskiyou County goes to plywood plants in Medford and Roseburg, Oregon.

The California Timber Yield Tax program sets the harvest value of timber and collects an in lieu tax when it is harvested. The revenue from this program is allocated to the counties where the timber was harvested. In 2004 approximately 24 million board feet of timber, with a harvest value

of about $3,325,000 was harvested from public lands in Siskiyou County[372]. The Yield Tax rate for 2006 is 2.9 percent of the assessed timber value[373].

Environmental Consequences

Alternative 4

Direct and Indirect Effects (Economics)

This alternative would not produce any economic benefits. Timber would not be available to regional markets, and demands for lumber and other wood products would be satisfied by timber cut from other sources, both domestic and foreign. No Yield Tax revenue would be collected and distributed to Siskiyou County.

Cumulative Effects (Economics)

Yield tax was collected for past and current timber sales within Siskiyou County on public lands, however the rates and assessed values for those years is not available from the State Board of Equalization.

Alternatives 1, 2 & 3

Direct and Indirect Effects (Economics)

Actions used to accomplish forest health, fuels, and hardwood/dry meadow objectives will use various implementation methods, including Forest Service crews, timber sales, and/or service contracts. Timber products are a direct output of actions to improve forest health, reduce fuel loads, and maintain hardwoods and dry meadows.

The economic effects of the timber product removal can be expressed in monetary terms, while other effects such as improved tree growth, resistance to insects and disease and reduced fire hazard are not as easily quantifiable. Predictions of project receipts and costs, even for short periods into the future, may prove to be inaccurate due to variables such as inflation, market supply and demand, and the accuracy of the timber cruise. While these forecasts may not predict actual product values, receipts and costs, most deviations from these figures would likely remain constant with other general economic indicators, i.e., rate of inflation. This makes it possible to conduct a reasonable analysis of the relative revenue and costs.

A Financial Efficiency Analysis was done in accordance with Forest Service Handbook 2409.18, to provide a comparison of anticipated costs and revenues. The indicators used to compare the various economic effects of each alternative are (1) harvest volume for proposed activities, (2) Present Net Value, which is a comparison of short-term costs and revenue to the Federal government, and (3) number of jobs generated by proposed activities based on harvest volume.

Although harvest volumes, costs and revenue, and jobs created are estimates, they can be used to compare the relative economic value of timber management activities for each alternative. The following tables display these estimated costs and revenue by alternatives.

[372] California State Board of Equalization Web Site, Report YT-36
[373] California State Board of Equalization Web Site, January 6, 2006 letter

Table 9. Project Costs, Alternatives 1 & 3

Cost Description	Quantity	Unit of Measure	Unit Cost 2006$	Total Cost
Planning/Prep/Administration	50,000	CCF (thousands of cubic feet)	$30/CCF	$1,500,000
Reforestation-Seedlings	190,000	M (thousands)	$300/M	$57,000
Reforestation-Site Prep	400	acres	$289/ac	$115,600
Reforestation-Pile Burning	400	acres	$80/ac	$32,000
Reforestation-Planting	400	acres	$160/ac	$64,000
Reforestation-Survival Exam, 1st yr.	400	acres	$13/ac	$5,200
Reforestation-Survival Exam, 3rd yr.	400	acres	$14/ac	$5,600
Reforestation-Survival Exam, 5th yr	400	acres	$15/ac	$6,000
Reforestation-Release	400	acres	$470	$188,000
Landing and skid trail subsoiling	150	landings	$155 ea	$23,250
Road Construction	.3	miles	$17,750/mi	$5,325
Culvert Replacement	1	each	$3,500 ea	$3,500
Road Closure-barricades	11	each	$900 ea	$9,900
Road Closure-berms	9	each	$150 ea	$1,350
Road Decommissioning	2.12	miles	$1,500/mi	$3,180
Fuels Treatment- Machine Piling	700	acres	$289/ac	$202,300
Fuels Treatment- Pile burning	700	acres	$80/ac	$56,000
Fuels Treatment- underburn	200	acres	$200/ac	$40,000
Total Project Costs				**$2,318,205**

Table 10. Project Revenue, Alternatives 1 & 3

Species	Est. Vol. in CCF	Wt. Ave. Value Per CCF*	Revenue
Ponderosa Pine	36,200	$157	$5,683,400
White Fir	6,400	$114	$729,600
Chips (all species)	**9,200**	**$.30**	**$2,760**
Total Volume/Revenue	**50,000**		**$6,415,760**

*Weighted average high bid from the last three sales sold

Table 11. Project Costs, Alternatives 2

Cost Description	Quantity	Unit of Measure	Unit Cost 2006$	Total Cost
Planning/Prep/Admin	44,000	CCF	$30/CCF	$1,320,000
All other costs the same as Alts. 1 & 3				$818,205
Total Project Cost				**$2,138,205**

Table 12. Project Revenue, Alternative 2

Species	Est. Vol. in CCF	Wt. Ave. Value Per CCF*	Revenue
Ponderosa Pine	31,000	$157.	$4,867,000
White Fir	5,200	$114.	$592,800
Chips (all species)	**7,800**	**$.30**	**$2,340**
Total Volume/Revenue	**44,000**		**$5,462,140**

*Weighted average high bid from the last three sales sold

Table 13. Economic indicators for the Pilgrim Vegetation Management Project.

Economic Indicators	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Est. Volume (CCF)	50-54 CCF	44-48 CCF	50-54 CCF	0
Present Net Value (low vol. est.)	$4.3 million	$3.3 million	$4.3 million	0
Estimated Yield Tax	$180,000	$156,000	$180,000	0
Jobs Created, direct and indirect for lumber and wood products industry only[374]. (number of)	750-810	660-720	750-810	0 No new jobs will be created.
	The area will continue to provide some employment (mostly indirect) from its recreational uses and other resource values, under all alternatives.			
Jobs Income[375]	**$7,382,500**	**$6,496,600**	**$7,382,500**	**0**

These alternatives would meet a portion of the regional demand for lumber, plywood and biomass and provide employment for local workers in the wood products industry. It would off-set some of the demand that is now being met through foreign markets. Revenue received that is above the project costs is returned to the U.S. Treasury. Yield Tax revenue and a portion of the jobs income noted above would be realized by Siskiyou County.

Jobs include both those for the wood products industry and subsequent service contracts for growing seedlings, planting seedlings, site clearing for planting and fuels reduction and seedling release. Jobs would be created over a period of about 3 to 7 years when timber harvest and subsequent work is accomplished.

Cumulative Effects

Alternatives 1, 2 & 3 (Economics)

Within the 8th order watershed there is one timber sale on National Forest lands currently under contract. The Edson Timber Sale, sold in 2005, has a total volume of 19,246 CCF and was bid at a total value of $2,105,000. This sale is similar to the proposed Pilgrim Project and treats approximately 1,700 acres by thinning and sanitation harvest. This sale has an approximate

[374] *Forestry, Forest Industry and Forest Products Consumption in California*, Pub. 8070, 2003, University of California, Division of Agriculture and Natural Resource
[375] Based on the median family income for Siskiyou County of $29,530, 2000 Census.(low jobs number)

present net value of approximately $1,000,000 and will create about 100 jobs for a period of about 3 to 5 years[376].

Current timber harvest on National Forest lands within the watershed and the proposed Pilgrim Project would have a positive present net value of approximately $4.0 to $5.0 million dollars and create about 700 to 900 direct and indirect jobs over a period of about 5 to 7 years.

Air Quality

Affected Environment

The Pilgrim Project is located in the Northeast Plateau Air Basin. The project vicinity is primarily forested federal and private lands with no substantial emission sources other than fugitive dust from logging operations. Other emission sources are smoke and haze from seasonal prescribed fires, both within and outside the air basin.

The climate is a Mediterranean subtype with warm dry summers and cool moist winters. The Average maximum temperature is 65°F with a range of 45 to 87° F. The Average minimum temperature is 34°F with a range of 23 to 47° F. Average total precipitation is 51 inches with an average snowfall of 80 inches. Wind speeds range from 0 to 7 miles per hour on average with gusts to 10 and 20 miles per hour[377].

The Northeast Plateau Air Basin is classified as "attainment" for both National Ambient Air Quality Standards under the Federal Clean Air Act and the California Air Resource Board standards[378].

The Mt. Shasta Wilderness is a Class II Airshed that is approximately 7 to 10 miles northwest of the project area. Table 14 displays the current air quality standards.

Table 14. State and Federal Ambient Air Quality Standards

Emission	Averaging Time	Federal Primary Standard	California Primary Standard
PM_{10}	Annual	50	20
	24-hour	150	50
$PM_{2.5}$	Annual	15	12
	24-hour	65	30
CO	8-hour	10,000 (9)	10,000 (9)
	1-hour	40,000 (35)	40, 000 (20)

The project area is located away from populated areas where emissions are generally higher due to industries and smoke from private residence.

Air quality in the project area and Siskiyou County is good. Data compiled by the California Air Resources Control Board indicate that air quality with respect to PM_{10} has improved from 1988 to the present. The annual state standard has not been exceeded during that time except the

[376] Estimates based on costs for the Pilgrim Project
[377] NOAA RAWS weather station, Ash Creek
[378] Per. Comm. with Elden Beck, Siskiyou County Air Pollution Control Officer

24 hour state standard was exceeded in 2002 due to smoke incursions from the Biscuit Complex wildfires in southwest Oregon.

Alternative 4 - No Action

Direct, Indirect and cumulative Effects (Air Quality)

As there would be no timber harvest there would be no dust from logging operations and no smoke or haze from underburning or pile burning. As there are no direct or indirect effects, there are no cumulative effects.

Alternatives 1, 2 & 3

Direct and Indirect Effects (Air Quality)

Logging operations will produce some dust, primarily from tractor skidding of log bundles and hauling over earth surface roads. Dust from hauling will be minimized by requiring abatement with either water or an acceptable alternative. Logging operations are generally done over several years and localized dust from skidding and hauling dissipates rapidly.

The approximately 700 acres of slash pile burning and about 200 acres of underburning will produce smoke and ash from partially burned plant matter. This burning of organic matter will produce emission of particulates suspended in the atmosphere for from one to several days. An estimated 38 tons of particulate matter (PM_{10})[379] will be produced from slash pile burning and an estimated 6 tons of particulate matter (PM_{10})[380] will be produced from underburning. Burning would be done only on designated "burn days" as designated by the Siskiyou County Air Pollution District. All burning is also done under the approved Northeast Air Alliance Smoke Management Plan. It is unlikely that the 24 hour State or Federal standard for PM_{10} or $PM_{2.5}$ would be exceeded as the only time it has been exceeded in the past five years is when a large wildfires burn over considerable time. Burning will also be done under an approved burn plan, which will schedule burning when wind conditions dissipate smoke rapidly and direct it away from populated and other sensitive (Class II Airsheds) areas.

The action alternatives will reduce the overall fuel loading on approximately 3100 acres treated by various prescriptions. This will decrease the expected emissions from a wildland fire if it occurs in the project area.

Cumulative Effects (Air Quality)

Within the 8th field watershed there has been an average of approximately 160 acres of underburning and approximately 100 acres of pile burning every year over the past 10 years. There has also been an unestimated amount of burning on private lands within the watershed. Compliance with burn day designations and permitting from the Siskiyou County Air Pollutions Control District has minimized the effects of this annual burning so that Federal and State air quality standards have not been exceeded.

[379] USFS Region 5 Conformity Handbook, Tables 6-8, 1995
[380] USFS Region 5 Conformity Handbook, Tables 6-8, 1995

The only other current project in the watershed on National Forest lands is the Edson Timber Sale, which has approximately 350 acres of pile burning and 200 acres of underburning. This project is near completion and fuels treatments will probably occur within the next two years.

The Pilgrim Project fuels treatments will not occur until harvesting is completed, which could be four to six years from now. In that time the average number of acres of underburning should be about the same as the current 10 year average. The average acres of pile burning might increase to 250 for one or two years in the future, if all the proposed pile burning is done.

Overall cumulative emissions are expected to be similar to the past years when controlled burning of fuels in the McCloud Flats area has not exceeded Federal or State air quality standards.

Short Term Uses and Long Term Productivity[381]

NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity (40 CR 1502.16). As declared by Congress, this includes using all practical means and measures, including financial and technical assistance, in a manner calculated to foster and promote general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic and other requirements of present and future generations of Americans (NEPA Section 101)

Under the Multiple-Use Sustained Yield Act and the National Forest Management Action, all renewable resources are to be managed in such a way that they are available for future generations. The harvesting of timber can be considered a short-term use of a renewable resource. As a renewable resource, trees can be reestablished and grown again if long-term soil productivity is maintained through application of resource protection measures described in Chapter 2.

Short-term use (2 to 5 years during harvest operations and subsequent treatments) for the Pilgrim Project will remove forest products and generate revenue for the Federal Government, Siskiyou County and workers in the wood products industry. There will be a loss of some acres of late-successional forest and marginal dispersal habitat for the Northern Spotted Owl. There will be a loss of soil productivity on a small number of acres (about 130) dedicated to landings, main skid trails and new road construction. Dust and air pollutants will be created in the project area, but will disperse quickly and not impact long-term air quality. Smoke from burning will put particulate matter into the air, which will disperse within several hours to several days and not exceed Federal or State Air Quality Standards. Some recreation users may be displaced for short periods of time (several weeks to a month). Noxious weeks will be monitored and removed when found.

In the long-term (5 to 15 years), removal of dead and dying trees will reduce the spread of disease pathogens and keep future ground fuels within forest plan desired conditions, reducing

[381] From conclusions described in this chapter as well as interdisciplinary discussion.

wildland fire hazard. Thinning will improve forest health and make stands of trees more resistant to insects and disease. Vegetation diversity will increase with more acres of both early and late seral vegetation and more acres of aspen, oaks and willows. Soil productivity will be improved by subsoiling areas with residual soil compaction. Renewal of riparian vegetation will improve stream channel processes, which will have a beneficial effect toward meeting the Aquatic Conservation Strategy Objectives. Road density will be reduced and scenic quality along the Pilgrim Creek Road will be improved. Recreation visitor safety will be improved with the removal of hazard trees in developed and dispersed recreation sites.

Unavoidable Adverse Effects

Implementation of any of the alternatives, including no action, could cause some adverse environmental effects that cannot be effectively mitigated or avoided. Unavoidable adverse impacts often result from managing the land for one resource at the expense or condition of other resources. Some adverse effects are short-term and necessary to achieve long-term beneficial effects. The application of Forest Plan standards and guidelines and resource protection measures are intended to limit the extent, severity and duration of potential impacts.

No action will have an adverse affect on fuel loading and fire hazard. Over the next ten years, fuel loading of 25 to 50 tons per acre will accumulate on about 22 percent of the project area or about 800 acres. These acres will be at high risk of causing a stand replacing fire that could destroy several hundred, if not several thousand acres of surrounding forest. Forest health will be adversely affected on about 3500 acres as root disease centers continue to spread and weaken trees, making them susceptible to insect infestation.

Regeneration harvest treatments will remove dying trees from approximately 415 acres, creating openings on the landscape of up to 40 acres in size, including openings in riparian reserve uplands. Even though these areas will be reforested, creating openings in the forest is seen by some as an adverse effect to the environment. Also, removing dying trees from the forest can be considered and adverse impact to snag dependent wildlife species.

Regeneration harvest and meadow and aspen restoration will reduce the amount of late-successional forest by less than 1 percent (535 acres total) in each of the two fifth-field watersheds affected by the project. Even though the watersheds will remain above the 15 percent threshold, some will consider this an adverse impact.

Approximately 670 acres of marginal dispersal habitat for the Northern Spotted Owl will be “removed” (temporary reduction of canopy closure below 40 percent) and approximately 844 acre of marginal dispersal habitat degraded in the short-term in a critical habitat unit. Even though the entire project area is considered marginal Northern Spotted Owl habitat and no owls have ever been found to inhabit the project area, this is considered an adverse effect to Northern Spotted Owl critical habitat.

Approximately 130 acres of commercial forest lands will be lost to long-term timber production where landings, main skid trails and new roads are constructed. Although these areas

are necessary for conventional ground based logging operations and the acres lost are within Forest Plan standards, some will see this as an adverse impact to the environment.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irreversible commitments of resources are permanent losses of non-renewable resources.

Irretrievable commitments are those that are 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. Irretrievable commitments of resources are temporary losses of renewable resources.

With implementation of this project, there are no irreversible commitments of forest resources. The irretrievable commitment of resources for the action alternatives includes:

- The temporary loss of productive timber lands from creation of landings, main skid trails (approximately 130 acres) and new permanent roads (approximately 0.6 acres).
- The temporary loss of approximately 670 acres of marginal dispersal habitat for the Northern Spotted Owl within a critical habitat unit. This loss will be regained in 5 to 15 years as thinned stands, mainly the 785 acres of plantations, grow into suitable dispersal habitat.

Legal and Regulatory Compliance

NEPA at 40 CFR 1502.25(a) direct "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with… other environmental review laws and executive orders." The proposed action and alternative must comply with environmental laws, as well as direction provided to agencies through executive orders.

Principal Environmental Laws

The following laws contain requirements for protection of the environment that apply to the proposed actions and the alternatives:

Endangered Species Act

See Threatened and Endangered Species Section, Chapter 3.

Clean Water Act

See Hydrology Section, Chapter 3.

Clean Air Act

See Air Quality Section, Chapter 3.

National Historic Preservation Act

See Heritage Section, Chapter 3.

National Forest Management Act

The National Forest Management Act requires projects to be consistent with the Forest Plan, and to make the following findings [16 U.S.C. 1604 (g)(3)(E)]:

1. **Soil, slope, or other watershed conditions will not be irreversibly damaged;**
   See Soils and Hydrology Sections of Chapter 3.
2. **There is assurance that such lands can be adequately restocked within five years after harvest;**
   All areas proposed for tree planting have been review by a certified silviculturist and a soil scientist to ensure adequate soils for planting and growth of conifer seedlings.
3. **Protection is provided for streams, streambanks, shorelines, lakes, wetlands, and other bodies of water from detrimental changes in water temperatures, blockages of water courses, and deposits of sediment, where harvests are likely to seriously and adversely affect water conditions or fish habitat;**
   See Hydrology Section, Chapter 3 and Design Criteria Common to All Action Alternative, Chapter 2.
4. **The harvesting system to be used is not selected primarily because it will give the greatest dollar return or the greatest unit output of timber.**
   See Purpose and Need, Chapter 1.

A Responsible Official may authorize project and activity decisions on National Forest administered lands using clearcutting, seed tree cutting, shelterwood cutting, and other cuts designed to regenerate an even-aged stand of timber as a cutting method only where:

1. **For clearcutting, it is determined to be the optimum method, and for other such cuts it is determined to be appropriate, to meet the objectives and requirements of the relevant land management plan.**
   All harvest units have been reviewed by a certified silviculturist. Some units have also been review by the forest entomologist and pathologist to verify the presence and extent of insect and disease infestations. Also see the Forest Plan Direction Section, Chapter 1.
2. **The interdisciplinary review as determined by the Secretary has been completed and the potential environmental, biological, esthetic, engineering, and economic impacts on each advertised sale area have been assessed, as well as the consistency of the sale with the multiple use of the general area.**
   See Chapters 3 and 4.
3. **Cut blocks, patches, or strips are shaped and blended to the extent practicable with the natural terrain.**
   See Alternatives maps.
4. **There are established according to geographic areas, forest types, or other suitable classifications the maximum size limits for areas to be cut in one harvest operation, including provision to exceed the established limits after appropriate public notice and review by the responsible Forest Service officer one level above the Forest**

Service officer who normally would approve the harvest proposal; provided, that such limits shall not apply to the size of areas harvested as a result of natural catastrophic conditions such as fire, insect and disease attack, or windstorm.
See Forest Plan Standards and Guidelines, page 4-27.

5. **Such cuts are carried out in a manner consistent with the protection of soil, watershed, fish, wildlife, recreation, and esthetic resources, and the regeneration of the timber resource.**
   See Design Criteria Common to all Action Alternatives, Chapter 2.
6. **Even-aged stands of trees scheduled for regeneration harvest generally have reached culmination of mean annual increment of growth, unless the purpose of the timber cutting is excepted in the land management plan.**
   See Purpose and Need, page 5.

Forest Plan Amendment & Analysis

Modify Forest Plan 4-61 "Emphasize green-tree and snag retention in Matrix management" (GTR) to read;

For Pilgrim Vegetation Management Project regeneration harvest treatment units 14-408, 419, 420, 438, 439, 44 & 442, 16-46 & 466, 8-411, 412, 413, 41 & 415 (approximately 255 acres) the largest healthiest ponderosa pine trees and all other conifer species will be retained. Adequate treatment of these units to control the annosus and black stain root infection will require that, less than15 percent of the area associated with cutting units can be retained[382].

Specific measures for green tree retention and snag retention follow. These measures are to be applied to the treatment units listed above for implementation of these projects, only. Upon completing these Projects the 1995 Forest Plan standard and guide will apply to these treatment units.

1. Retain healthy green trees up to 15 percent of the area associated with each cutting unit (stand). It is estimated the less than 15 percent of the area will be retained due to existing mortality and treatment needs to control the root disease.
2. Trees will be retained as individuals and patches where feasible to meet project objectives.
3. As a minimum, snags will be retained within these harvest units at 1.5 per acre greater than 15 inches in diameter and 20 feet in height.

Significance Analysis (16 U.S.C. 1604(f)(4), 36 CFR 219.10(f) 1982: Forest Service Handbook FSH 1909.12.5.32 (WO Amendment 1909.12.91-1, 8/3/92) directs consideration of significance of change to a forest plan. The following factors are used to determine whether the proposed forest plan amendment is significant or not significant.

a. **Timing**. Amendment of the GTR standard and guideline of the Forest Plan direct the regeneration harvest of approximately 255 acres in cutting units 14-408, 419, 420,

[382] Pilgrim Vegetation Management Project FEIS page 38

438, 439, 440 & 442, 16-461 & 466, 8-411, 412, 413, 41 & 415 of the Project. This change is only in effect for the treatment duration of these cutting units. Once harvest of these units is complete the 1995 Forest Plan standard and guide will apply. This change will take place prior to revision of the Forest Plan.

b. **Location and Size**. These regeneration harvest units (14-408, 419, 420, 438, 439, 440 & 442, 16-461 & 466, 8-411, 412, 413, 414 & 415) are within the Matrix (250 acres) and Riparian Reserve (5 acres) land allocations on the McCloud Flats[383]. They range in size from 5 to 40 acres (average of 18 acres) and total approximately 255 acres. The Project will treat approximately 3,800 acres. The assessment area is 8,500 acres. Units 16-461 & 466 are in the Ash Creek 5th Field Watershed and total about 12 acres or less than .0001 percent of the commercial forestlands and less than .0001 percent of the late successional forest in the watershed. The other units are in the Upper McCloud Fifth Field Watershed and total about 243 acres or less than .004 percent of the commercial forestlands and less than .02 percent of the late successional forest in the watershed.

c. **Goals, Objectives, and Outputs**. The GTR amendment would not alter long-term relationships between the levels of goods and services projected by the forest plan. The amendment would not alter timber outputs projected by the Forest Plan because it does not adjust the capable, available, and suitable land base. The amendment would not significantly alter the amount of very old forests used by dependent organisms,[384] because treatment would retain healthy trees up to 15 percent within the cutting units. These units are dispersed throughout the project area and are surrounded by predominantly late-successional forest.

d. **Management Prescription**. The amendment would change the GTR standard and guideline for cutting units 14-408, 419, 420, 438, 439, 440 & 442, 16-461 & 466, 8-411, 412, 413, 41 & 415 of the Project, only. The amendment would not apply to future decisions for those cutting units.

Conclusion: The amendment to change Forest Plan 4-61 "Emphasize green-tree and snag retention in Matrix management" is not a significant change to the forest plan, because;

- It is a site-specific amendment that applies only to the identified Project cutting units.
- It is a small portion of the total project and a very small portion of the watersheds and late successional forests in those watersheds.
- It is minor in context of the achievement of Forest Plan goals and objectives.
- It will make improvements towards meeting the goals of the Forest Plan by controlling a root disease problem that would result in greater losses to forest cover if no action is taken[385].

[383] Pilgrim Vegetation Management Project FEIS page 2
[384] Forest Plan 4-61
[385] Pilgrim Vegetation Management FEIS pages 30-32

The proposed Mudflow project also includes the same forest plan amendment for approximately 228 of regeneration and sanitation harvest units in the Upper McCloud Fifth Field Watershed. This is about 8.0 percent of the total harvest units proposed for the Mudflow Project. Cumulatively, there would be approximately 480 acres of harvest in this watershed that would not meet the Green Tree Retention Standard. This represents approximately .009 percent of the commercial forest land in the watershed and approximately .04 percent of the late-successional forest in the watershed. The addition of about 228 acres of harvest not meeting the GTR Standards in the Upper McCloud Watershed does not change the above analysis and conclusions.

Executive orders

The following executive orders provide direction to federal agencies that apply to proposed action and alternatives:

Invasive Species, Executive Order 13112 of February 32, 1999

See Invasive Weed Section, Chapter 3 and Design Criteria Common to All Action Alternatives, Chapter 2.

Migratory Birds, Executive Order 12962 of January 10, 2001

See Neotropical Birds Section, Chapter 3.

Environmental Justice, Executive order 12898 of February 11, 1994

This order requires an assessment of whether implementation of this decision would disproportionately affect minority or low-income populations. Although there are a high proportion of lower income people living in this portion of the State, as well as a number of tribal groups of Native Americans, neither action alternative will affect them any differently than any other member of the public. Adverse environmental effects and effects on human health are minimal. Tribal groups have been contacted about proposed actions on the Forest and did not express any interest in this particular project.

Special Area Designations

There are no Research Natural Areas, Inventoried Roadless Areas, Wilderness or Wilderness Study Areas, Wild and Scenic Rivers or municipal watersheds within or adjoining this proposed project.

Federal, regional, state, and local land use plans, policies, and controls

- All timber harvest sales that could affect water quality are submitted to the Central Valley Water Quality Control Board for coverage under the Timber Harvest Waiver (Resolution No. R5-2005-0052). Timber sales are submitted when they are sold. Due to the lack of

surface water flow and the low probability of downstream impacts to water quality and riparian habitat, this project will not be submitted to the board.

- All vegetation burning is done under permits from the Siskiyou County Air Pollution Control District.

Energy and natural or depletable resource requirements and conservation potential

Consumption of fossil fuels would occur with the action alternatives during logging and timber hauling as well as road and fuel treatment actions. There are no unusual energy requirements associated with the action alternatives nor is it the type of proposal that provides an opportunity to conserve energy at a large scale. Wood is a renewable resource. With the proper application of Forest Plan standards and guidelines and design criteria described in Chapter 2 for soils, water, wildlife, forest vegetation, and other resources, the project would conserve resources, as described in this chapter.

Urban quality, historic and cultural resources, and the built environment

Historic and cultural resources will be protected (flagged and avoided), as described under the Heritage section. There would be no changes to urban quality or the built environment with this project.

Chapter 4: Consultation and Coordination

Preparers and Contributors

The Forest Service consulted with the following individuals, federal, state, and local agencies, tribes, and non-Forest Service persons during the development of this environmental impact statement:

Federal, State, and Local Agencies

U.S. Environmental Protection Agency
U.S. Fish and Wildlife Office, Red Bluff, CA
California Department of Fish and Game, Redding, CA
California Department of Forestry and Fire Protection, Cascade Region Office, Redding, CA
California Water Quality Control Board, Central Valley Division, Redding, CA
Siskiyou County Air Pollution Control District, Yreka, CA

Native American Tribal Organizations

Pit River Tribe
Winnemem Wintu

Interdisciplinary Team Members

William Banek: 28 years experience as a professional Archaeologist. BA, Anthropology, CSU, Sacramento; responsible for compliance with Section 106 of the National Historic Preservation Act and its implementing regulations 36 CFR Part 800. Responsible for archaeological reconnaissance and report.

Emelia Barnum: Ten years experience in environmental planning and project development, National Environmental Policy Act environmental analysis documentation, and team leading. Bachelor of Science in Zoology. Planning and NEPA sufficiency specialist. Responsible for team leading and writing and editing the Draft Environmental Impact Statement.

Julie Cassidy: 25 years as a professional archaeologist. BA in Near Eastern Studies and Archaeology from U.C. Berkeley and an MA in Anthropology from Chico State University. Has conducted numerous archaeological excavations, written historic contexts, evaluated significance of traditional cultural properties and many prehistoric, and historic archaeological site. Responsible for project coordination with Native American Tribes and Nations.

Jonna Cooper: Fifteen years experience as a Soil Scientist, including 5 years of field mapping. Bachelors of Science in Soil Resource Management, emphasis in mapping and soil taxonomy. Concurrently, 11 years experience in GIS. Responsible for soils input and analysis. Provided coordination and technical advice for GIS mapping information.

Debbie Fleming: Twenty four years experience in timber stand improvement, sale preparation and silviculture. Bachelors of Science in Wildland Recreation Management/Forestry and Silvicultural Institute (certified silviculturist) Expertise as a Certified Silviculturist. Responsible for vegetation analysis and silvicultural prescriptions.

Steve Funk: Project developer and planner to scoping, now retired.

Heidi George: Hydrologist, 15 years Forest Service, 2 years Calif. Dept. of Water Resources. MS in Watershed Science, BS in Geology. Publication: George, H. and R.C. Sidle, 1995. *Geomorphic and Pedologic Influence on Small-Scale Ephemeral Channel Dimension in Rangelands.* AWRA Paper Number 94085 · Volume 31, No. 6. Responsible for hydrology input and analysis. Responsible for hydrology input to the project.

Ed Hatekeda: Fifteen years experience in public uses and facilities planning and operations at the local level; including environmental documentation and social analysis. Eleven years experience in timber management planning and preparation. Responsible for public use input and analysis for the project.

Jeff Huhtala: Twenty-five years experience as Civil Engineering Technician, transportation planner, and interdisciplinary team member providing technical engineering support and planning for watershed and environmental analyses. AS in Forest Technology 1976 and graduate of Forest Engineering Institute #27, Oregon State University, 1985. Responsible for leading the roads analysis process and for project transportation planning.

Stephanie Joyce: Fourteen years experience in scenery analysis, recreation planning and design. Bachelors of Science in Landscape Architecture, Cal Poly San Luis Obispo. Responsible for scenery management, recreation site analysis and design, and Accessibility Coordinator, focusing on integrating the human dimension into the environment. Responsible for Scenic Assessment of the project.

Francis Mangels: Thirty-three years experience in range, wildlife, forestry, soils, fisheries, and botany. Bachelors of Science in Forestry and Masters of Science in Zoology. Worked on this district 24 years, currently serving as range conservationist and district biologist. Responsible for wildlife input and analysis for the project.

Dennis Poehlmann: Twenty two years experience in timber sale preparation, administration and planning. Ten years experience in lands and minerals management. Bachelor of Science in Forestry. Unit Planning Officer and co-team leader responsible for completion of the FEIS.

Rhonda Posey: Twelve years experience in botany and vegetation ecology. Bachelor of Science in Agriculture with an emphasis on Range Management. Six years in vegetation mapping and classification and six years providing botanical and ecology input to timber sales, restoration projects and other projects. Also, 3 years as the greenhouse manager for Mt. Shasta Greenhouse, which grows plants for restoration projects. Responsible for the botanical input and analysis for this project.

Donna Sager: Nineteen years experience in fires and fuels management. Integrated experience in timber sale layout, silvicultural treatment implementation, and wildlife surveys. Focus on prescribed fire and fuels reduction treatment planning and implementation. In process of obtaining professional series accreditation in fire and fuels management. Responsible for the fuels input and analysis for this project.

Other Contributors and Technical Support

Peter VanSustren: Forest Service Soil Scientist for 28 years with 25 years stationed at the McCloud Ranger District. He holds a Bachelors of Science in Natural Sciences from the University of Wisconsin (1975). His expertise is in soil mapping, mitigations of impacts on the soil resource and ecosystem restoration.

Joe White: Twenty-two years experience in Geographic Information Systems (GIS) and fire and fuels management. GIS Cartographic Technician responsible for producing map products for Forest Fire Management, NEPA/ EIS projects, Forest Watershed Analysis and District timber sales contracts maps.

Steve Bachmann: Hydrologist, 13 years Forest Service, 3 years U.S. Geological Survey. MS in Earth Science, Colorado State University, 1994. BS in Parks and Recreation Administration, Ohio State University, 1988. Responsible for hydrology input and analysis

Kelly Wolcott: Forest Wildlife Biologist with the Shasta-Trinity National Forest since 2003. Before that, he was an instructor at the National Conservation Training Center and a senior consulting biologist with the U.S. Fish and Wildlife Service in Red Bluff, California. He has worked as a wildlife biologist for approximately 25 years and has a Master's Degree in Forest Ecology from the University of Washington with a specialty in Wildlife Habitats. Responsible for review and revisions to the project biological assessment and biological evaluation.

David E. Schultz: B.S. Forestry, 1968, S.U.N.Y. Coll. Forestry, Syracuse, N.Y. Ph.D. Forest Entomology, 1976, S.U.N.Y. Coll. Forestry, Syracuse, N.Y. Advanced Course in Silviculture and Forest Ecology (Silvicultural Certification), 1981, University of California Extension, Berkeley. Entomologist, 1977-1988, USDA Forest Service, San Francisco, CA (Regional Office, Region 5). Entomologist, 1988-Present, USDA-Forest Service, Redding, CA. (Shared Services Area: Mendocino, Six Rivers, Klamath and Shasta-Trinity NFs). Total 29 years employment as a Forest Service Entomologist. Field reviewed project and provided input to silvicultural prescriptions.

Pete Angwin: Plant Pathologist with the US Forest Service for 17 years. BA in Biology, Colgate University, 1978. MS, PhD in Plant Pathology, Oregon State University, 1985, 1989. As Plant Pathologist for the four National Forests of northwest California, Pete provides information and advice on a wide variety of disease and insect management situations. Field reviewed project and provided input to silvicultural prescriptions.

Circulation of the Final Environmental Impact Statement

This final environmental impact statement will be distributed to the following government agencies as well as to those organizations and individuals who submitted comments during the 45 day comment period. Other parties on the project mailing list will get a summary of the FEIS and be notified that the full document is on the Forest Web Site.

Federal Agencies

U.S. Fish and Wildlife Service, Red Bluff Office

Director, Planning and Review
Advisory Council on Historic Preservation

Deputy Director
USDA APHIS PPD/EAD

Natural Resources Conservation Service
National Environmental Coordinator
U.S. Department of Agriculture

USDA, National Agricultural Library
Head, Acquisitions & Serials Branch

National Marine Fisheries Service
Habitat Conservationists Division
Southwest Region

U.S. Army Engineer Division, South Pacific
CESPD-CMP

Environmental Protection Agency
Region 9
EIS Review Coordinator

Director, Office of Environmental Policy and Compliance
U.S. Department of the Interior

U.S. Coast Guard (USCG)
Environmental Impact Branch
Marine Environmental and Protection Division

Western-Pacific Region
Regional Administrator
Federal Aviation Administration

Division Administrator
Federal Highway Administration

U.S. Department of Energy
Director, Office of NEPA Policy and Compliance

State Agencies

California Department of Fish and Game

California Water Quality Control Board, Central Valley Division

County

Siskiyou County Board of Supervisors, Jim Depree, Natural Resources Advisor(copy)

Mt. Shasta Public Library (copy)

Organizations

Pete Harrison, Californians for Alternatives to Toxics

Kyle Haines, Klamath Forest Alliance

Michelle Berditschevsky, Mount Shasta Bioregional Ecology Center

Scott Greacen, Environmental Protection Information Center (copy)

Denise Boggs, Conservation Congress (copy)

George Sexton, Klamath-Siskiyou Wildland Center

Richard Svilich, American Forest Resource Council (copy)

American Indian Tribes and Nations

Michelle Berditschevsky, Pit River Tribe Environmental Department

Caleen Sisk-Franco, Winnemem Wintu Tribe (copy)

Jessica Jim, Tribal Chair, Pit River Tribe

Individuals

Joy Newcom

Chuck and Denise MacDonald

Tom Glunt

Joe and Michael Wirth

Steve Courtney, Sierra Pacific Industries (copy)

Regina Chichizola

Claude Douglas

Michael Taff

Charles Picard

Katy Ostroski

Robert Diment

Wes Truax

Steve Funk (copy)