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Draft

Environmental Impact Statement

Salt Timber Harvest and Fuel Hazard Reduction Project

South Fork Management Unit, Hayfork Ranger District, Shasta-Trinity National Forest, Trinity County, California

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Figure 1: Salt Timber Harvest and Fuel Hazard Reduction Project Area Vicinity

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Salt Timber Harvest and Fuel Hazard Reduction Project

Draft Environmental Impact Statement

South Fork Management Unit, Hayfork Ranger District, Shasta-Trinity National Forest,
Trinity County, California

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Abstract: The Hayfork Ranger District of the Shasta-Trinity National Forest is proposing vegetation management in the Salt Creek watershed to improve forest health, reduce risks from fire and provide forest products. Three alternatives are considered in detail in this Draft Environmental Impact Statement (DEIS). Alternative 1 is the no action alternative. Alternative 2 is the proposed action. Alternative 3 is an alternative to the proposed action developed in response to scoping.

It is important that reviewers provide their comments at such times and in such a way that they are useful to the Agency's preparation of the EIS. Therefore, comments should be provided prior to the close of the comment period and should clearly articulate the reviewer's concerns and contentions. The submission of timely and specific comments can affect a reviewer's ability to participate in subsequent administrative review or judicial review.

Comments received in response to this solicitation, including names and addresses of those who comment, will become part of the public record for this proposed action. Comments submitted anonymously will be accepted and considered; however, anonymous comments will not provide the respondent with standing to participate in subsequent administrative review or judicial review.

Send Comments to:	**Salt Project** **1801 N. First** **Hamilton, MT 59840**

Electronic Comments Accepted:
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Date Comments Must Be Received:	The opportunity to comment ends 45 days following publication of the notice of availability (NOA) in the Federal Register

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Summary

The Shasta-Trinity National Forest proposes to conduct vegetation management activities in the Salt Creek watershed to improve forest health, reduce risks from fire, and provide forest products by thinning 1,561 acres (963 acres of intermediate thin, 14 acres of hand fuel treatment, 481 acres of pre-commercial thin, and 103 acres of intermediate thin in a shaded fuel break), shelterwood harvesting with green tree retention[1] on 31 acres, and regeneration harvest with green tree retention on 27 acres. A total of 1,619 acres would be treated with the proposed action. Thinning from below would generally retain 50% of the canopy closure in each unit, with 40% canopy closure retained in the shaded fuel break. Sub-merchantable fuels would be reduced to desirable levels in all treatment units. Approximately 0.3 miles of temporary road would be constructed and 17.1 miles of road would be reconstructed. Treatments are expected to produce 9.4 million board feet (mmbf) of merchantable saw timber and 15,073 tons (bone dry) of biomass. The project would decommission 13.8 miles of road following completion of this project and close another 0.4 miles of road. The proposed **Salt Timber Harvest and Fuel Hazard Reduction Project (Salt project)** is in Trinity County, 10 air miles south of Hayfork, California. The 4,278-acre project area is within the Hayfork Adaptive Management Area (AMA), and Management Area 19, Indian Valley/Rattlesnake, as described in the Shasta-Trinity National Forests Land and Resource Management Plan (Forest Plan).[2] The land allocations for the project area, as described in the Forest Plan include 52% matrix-roaded recreation,[3] 32% matrix-commercial wood products emphasis,[4] and 18% riparian management.[5] All numbers in this summary and throughout the document are approximations.

Competition for limited water, nutrients and sun in many highly stocked timber stands in the Salt project area has reduced the vigor, growth and resiliency of the mixed conifer species. Thinning is proposed in these overstocked stands where timber management is suitable and intended based on the Forest Plan. Thinning would improve tree resiliency to disturbances such as drought, insects, disease, and fire. Conversely, there are some stands that are understocked and are not growing well (not meeting their growth and yield potential[6]) because of heavy pathogen impacts. These stands will not meet their growth and yield potential unless regeneration occurs. Regeneration harvest with green tree retention and shelterwood harvest with green tree retention are proposed in these stands.

Fuel loading and ladder fuels within the project area have created the potential for crown fire initiation and spread, which could result in fires that pose a threat to National Forest System land as well as private land nearby. Reducing fuel loads and ladder fuels is proposed to help reduce the threat of wildland fire to forest resources, other public investments and local communities (Post Mountain, Peanut, Wildwood, Hayfork, and Platina).

[1] USDA 1995, page 4-158 states “Fifteen percent of all stands, when regenerated, are retained and managed to maintain or produce dispersed pockets of late-successional forests across the landscape.”
[2] USDA 1995, pages 4-157 and 4-160
[3] USDA 1995, page 4-64
[4] USDA 1995, page 4-67
[5] USDA 1995, page 4-59
[6] USDA 1995, page 3-21, 4-67, 4-159

Reducing fuels and stocking levels through thinning and regeneration harvests requires the removal of trees, some of which have commercial value. Providing wood products to meet regional and national needs is consistent with the goals described in the Forest Plan.[7]

The Salt project is part of a series of watershed scale analyses and projects occurring on the South Fork Management Unit, and is an integral component of implementing the South Fork Management Unit watershed-level restoration strategy.[8] A watershed scale analysis conducted in 2000[9] confirmed the need for vegetation treatments to meet desired conditions.

In October 2006 the Hayfork Ranger District asked the public to comment on proposed treatments in this area. Based on this initial scoping, which included interdisciplinary team review, public input, and agency consultations, the District modified the 2006 proposal and sent a new scoping letter to the public for comment in March 2008. A notice of intent to file an environmental impact statement was published in the Federal Register on March 26, 2008.

Comments received during scoping and information on how those comments influenced the project design, alternative development and need for effects analysis in the environmental impact statement are found in Appendix A and in Chapters 1.6 and 1.7 of this document.

Key issues were identified as a result of scoping, which drove the development of Alternative 3, a new alternative to the proposed action. Scoping also identified analysis issues which are considered and disclosed in the effects analysis of this environmental impact statement. Some comments raised through public scoping were not analyzed in detail in Chapter 3 but were considered, and the reason further analysis is not needed is presented in Appendix A.

Analysis shows that Alternative 1 does not meet the purpose and need for this project. Alternative 2 meets the purpose and need to a greater degree than Alternative 3. Alternative 2 would improve forest health to desired conditions on considerably more acres than Alternative 3. The reduction of the risk of crown fire and the reduction of potential fireline intensity is similar for both action alternatives. Alternative 2 would provide more forest products and likely result in a viable ground based timber sale; Alternative 3 would provide less forest products and would not have a viable timber sale component. Alternative 2 would cost $573,948 to implement all activities and Alternative 3 would cost $748,515.

The direct, indirect and cumulative effects analysis of key issues for each alternative concludes that the following perceived negative effects of implementing Alternative 2 would not occur. Regeneration harvest in Alternative 2 would not increase the risk from fire; it will reduce crown fire potential and fireline intensity for an estimated 20 years. Thinning to 50% canopy closure in Alternative 2 would not reduce or eliminate any acres of potential wildlife habitat compared to thinning to 60% canopy closure in Alternative 3. Thinning in riparian areas in Alternative 2 would have no measurable effect to stream sedimentation or fish habitat and would not eliminate any suitable wildlife habitat. The effect of temporary road construction on soil disturbance and wildlife

[7] USDA 1995, p. 4-5
[8] Harmon 2006. South Fork Ecosystem Management A Strategy for Restoration
[9] URS Greiner Woodward Clyde 2000 at http://www.fs.fed.us/r5/shastatrinity/publications/st-main/watershed-analysis/mid-hf-sc.shtml

habitat is not significant because it is very small in size, 0.3 miles (which equals 0.4 acres) and would not occur in sensitive areas, and would cause slightly less ground disturbance when compared to skidding impacts in Alternative 3.

Implementation of Alternative 2 would affect the following key issues. Alternative 2 would downgrade 28 acres of moderate nesting and roosting habitat for spotted owls and remove 5 acres of foraging habitat; Alternative 3 would not treat these 33 acres; therefore, there would be no removal or downgrading of spotted owl habitat. Construction of 0.3 miles of temporary road in Alternative 2 would generate a small, short-term increase of 1.9 tons of sediment which is more than 0.2 tons of sediment potentially generated by Alternative 3; both alternatives would result in a long-term decrease of 45.9 tons, annually through road decommissioning. And finally, Alternative 2 would thin three acres visible in the foreground of Highway 36; Alternative 3 would not treat those three acres so activity would not be noticeable in the foreground.

The responsible official is the Forest Supervisor, who will decide based upon the effects of the alternatives and public comment on the DEIS, whether to approve the proposed action or an alternative design to move the area toward desired conditions, or to not implement the project at this time.

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Chapter 1 – Purpose and Need for Action

1.1 Document Structure

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

- **Chapter 1. Purpose and Need for Action**: The chapter includes information on the history of the project proposal, the purpose 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 the issues identified through scoping.
- **Chapter 2. Alternatives:** This chapter provides a more detailed description of the agency's proposed action as well as an alternative method for achieving the stated purpose. The alternative to the proposed action was developed based on key issues raised by the public. This discussion also includes resource protection measures (design features and mitigation measures). Finally, this section provides summary tables of how well each alternative meets the purpose and need and how they address key issues.
- **Chapter 3. Affected Environment and Environmental Consequences**: This chapter describes the environmental effects of implementing the no action alternative, the proposed action and an alternative to the proposed action. This analysis is organized by resource area.
- **Chapter 4. Consultation and Coordination**: This chapter provides a list of preparers and agencies consulted during the development of the environmental impact statement.
- **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, available upon request. Footnotes are used throughout the analysis to provide further information, supporting information, or clarifications. For definitions of terms used in this document please refer to Appendix H.

1.2 Introduction & Background

The South Fork Management Unit of the Shasta-Trinity National Forest (Forest) is proposing the **Salt Timber Harvest and Fuels Hazard Reduction Project (Salt project)** in the Salt Creek watershed to improve forest health, reduce risks from fire, and provide forest products. The 4,278 acre project area, which is bounded on the east by State Highway 36 and on the west by Blue Point Ridge, is in

Trinity County, 10 air miles south of Hayfork, California (Figure 1).[10] Trinity County is a large remote county located in Northwestern California. The geography is rugged with heavily forested mountains.

This project is one of a series of watershed scale projects occurring in the South Fork Management Unit as part of the Unit's watershed level restoration strategy[11] (Figure 2). The restoration strategy is a concept developed from stakeholder input including: Trinity Fire Safe Council, Trinity County Resource Advisory Council (RAC), Trinity County Resource Conservation District (RCD), Watershed Research and Training Center (WRTC), Cottonwood Creek Fire Safe Council, Volunteer Fire Departments, Hayfork Action Teams (HATS), Post Mountain Public Utility District/Volunteer Fire Department (PUD/VFD), California Department of Forestry (CDF), Trinity County Weed Management Cooperative, and the Trinity County Board of Supervisors. These stakeholders and their neighbors want to be involved in the management of public lands and want the Forest Service's decision making processes to be transparent. The strategy includes treating watershed areas 'start to finish' in a series of steps which produce commodities, reduce hazards including fuel hazards, and improve the watershed condition. Trinity County RAC, WRTC, and RCD have brought outside funding and resources to assist with the implementation of projects including funding for restoration treatments for fuels, roads, trails, noxious weeds, and plants important to Native American.

Planning for the Salt project started in 2006 with requests to the public to provide comments on the proposal. Based on those comments and additional field work, modifications have been made. For public involvement information see Chapter 1.6 of this document. All Forest Plan standards and guidelines would be implemented, and additional site-specific resource protection measures were crafted to eliminate or reduce potential impacts to resources due to this project (Chapter 2.4.1).

[10] The project area is within the Hayfork Adaptive Management Area (AMA), and Management Area 19, Indian Valley/Rattlesnake, of the Shasta-Trinity Forest Plan (USFS 1995, p. 4-64 & 65) and includes treatment areas in T29N, R11W sections 4-9, T29N, R12W sections 1, 2 and 12, T30N, R11W sections 31 and 32, and T30N, R12W sections 25, 26, 35, and 36 M.D.M.

[11] Harmon 2006.

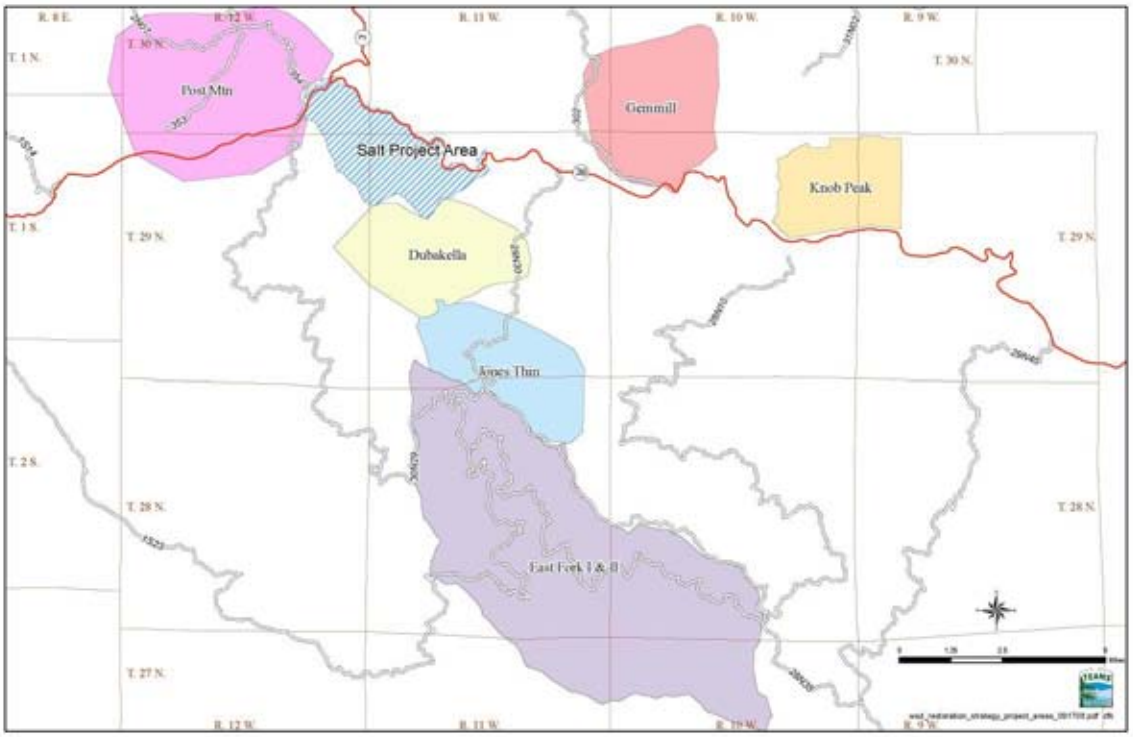

Figure 2: Salt Project relative to other projects in the South Fork Management Unit restoration strategy

1.3 Purpose and Need

The need for this project is evident when comparing existing site-specific conditions with the Forest Plan goals and desired conditions for Management Area 19 (Indian Valley/Rattlesnake), [12] Forest Plan management objectives, and current literature on forest management. The existing conditions were identified considering information in the Middle Hayfork Creek and Salt Creek Watershed Analyses,[13] site-specific field reviews by a Certified Silviculturist and 2008 stand exams in the project area, computer modeling of wildfire behavior/effects, and interdisciplinary planning.

The majority of the project area (83%) is within matrix land allocation as described in the Forest Plan[14] (Table 1). The remainder is within the riparian reserve land allocation (18%).[15] The portion of the project area that immediately borders State Highway 36 is managed as matrix-roaded recreation (51%). The rest of the matrix land is commercial wood products emphasis (32%). The objectives for these land allocations, as they relate to this project, are presented below. [16]

[12] USDA 1995, pages 4-158 through 4-160
[13] USR Griener Woodward Clyde 2000 at http://www.fs.fed.us/r5/shastatrinity/publications/st-main/watershed-analysis/mid-hf-sc.shtml
[14] USDA 1995, page 4-61
[15] USDA 1995, page 4-53
[16] USDA 1995, pages 4-53 through 4-71

Table 1: Forest plan land allocations in the project area

Forest Plan Land Allocations	Acres	Percent of Project Area
Adaptive Management/ Matrix Lands		
Roaded Recreation	2,161	51%
Commercial Wood Products Emphasis	1,361	32%
Other	5	0%
Riparian Reserves		
Riparian Management	751	18%
Total Project Area	**4,278**	**100%**

The purpose and need for the Salt project is reflected in the three following objectives:

- Improve forest health and resiliency
- Reduce hazardous fuels conditions to reduce the potential for adverse impacts from wildfire to the National Forest and neighboring land
- Provide timber products to help support the economic structure of local communities and supply regional and national needs

The following sections of this document compare and contrast the existing conditions with the desired conditions, concluding with a brief description of the actions needed to move the area toward the desired conditions for each of these objectives. Table 2, at the end of this section, summarizes each objective with the existing condition, the desired condition and the measures used to compare how well each alternative meets the purpose and need.

1.3.1 Improve Forest Health and Resiliency

The following information is summarized from the silvicultural analysis in Chapter 3.2 of this document. For more detailed information on forest health and resiliency please see Chapter 3.2.

Existing Condition

Dense/Overstocked Stands[17]

Individual tree growth is inversely proportional to stand stocking except at low stocking levels, meaning that trees generally grow faster when less crowded. Trees that are growing at greater rates are considered more vigorous and able to combat the effects of insects, diseases and drought. Increases in growth rates also mean that the time required to grow large trees is reduced. With the advent of fire suppression and minimal forest management in the early 1900s many stands have more trees with denser canopy closure than would be expected historically. When stands have more trees than desired we call them overstocked. Currently stands in the Salt project area range between 60 and

[17] Ninety six percent of the acres proposed for treatment (Alternative 2) are dense/overstocked stands.

78% canopy closure. The current stand density in proposed treatment stands ranges from 500 to 600 SDI (stand density index[18]). The desired SDI for stands within the project area is 200-250.[19] Data shows that tree density in the young plantations average in number from 1,000 to 1,210 trees per acre. Approximately 623 trees per acre are less than 10 inches in diameter at breast height.[20] These dense stands contain excessive forest floor fuels, ladder fuels consisting of dense midstory and understory trees and shrubs, and continuous canopies of hardwood and conifer overstory trees. Competition for limited water, nutrients and sun in these highly stocked stands has reduced the vigor, growth and resiliency of the mixed conifer species to the extent that individual tree mortality is higher than desirable for management. If left in place the high density of these trees in the suppressed and intermediate crown positions is expected to result in elevated tree mortality in these classes, increasing fuels available during future wildfires. Stand replacement fires pose a major threat to the sustainability of coniferous forests and current stand conditions in the project area are predisposed to undesirable fire behavior under adverse weather conditions. These stands and the understory vegetation evolved with frequent interval (1-25 years), moderate to low intensity fires; generally, not stand replacement fires.

The riparian reserve stands adjacent to intermittent and ephemeral streams are also densely stocked. The stand density is suppressing growth and it is reducing the vigor and resiliency of the riparian trees. One of the nine Aquatic Conservation Strategy[21] (ACS) objectives is "Maintain and restore the species composition and structural diversity of plant communities in riparian areas … provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, band erosion, and channel migration, and supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability."[22] The density of near stream conifers reduces sunlight to and competes with riparian vegetation such as willow; therefore, these areas are currently moving away from this ACS objective. See Appendix D for consideration of all nine ACS objectives.

[18] Reineke 1933
[19] Oliver and Uzho 1997
[20] Petersen 2007, Table 7.
[21] The Aquatic Conservation Strategy is a science-based plan that outlines protective measures for ensuring that healthy aquatic habitat is maintained in the rivers and streams that flow through the 24.5 million acres governed by the 1994 Northwest Forest Plan. All projects must achieve ACS objectives in riparian reserves, USDA 2004.
[22] USDA FS, USDI BLM 1994

Figure 3: Example of an overstocked stand (Unit 2A in Proposed Action).

Plantations proposed for thinning are single storied young growth stands, the result of reforestation in the 1970s and 1980s. Some of these plantations are now in an overstocked condition and are stressed due to overcrowding. These stands often contain between 1,000 to 1,200 trees per acre, which is considerably more than the 150 trees per acre that is preferred for optimal stand vigor, resistance to insects and disease, and tree growth.

Understocked / Overmature Stands[23]

The project area also contains some stands which have understocked, overmature[24] mixed conifers which have had previous harvest entries. They contain areas of younger growth in patchy, dense thickets. They are often fragmented and are not growing well. Trees in these stands are dying due to a number of biological agents (insects and disease). These stands are impacted by dwarf mistletoe in the ponderosa pine, Jeffery pine, Incense-cedar, white fir and Black oak. Mountain pine beetle is active in the Jeffery pine, ponderosa pine and sugar pine stands, killing both individual and groups of these species. Fir engraver beetle is active in the white fir stands, especially in overstocked mixed conifer stands with a substantial white fir component. White pine blister rust is a serious and

[23] Four percent of the acres proposed for treatment (Alternative 2) are understocked / overmature stands
[24] Overmature refers to the stage at which trees exhibit a decline in growth rate, vigor, and soundness as a result of old age

continuing problem, affecting primarily younger age-class sugar pine. These stands have little or no manageable understories.

Figure 4: Example of an overmature stand to be treated by shelterwood with green tree retention (Unit 18 in Proposed Action)

Insects and disease are a natural part of forest ecosystems; however, these stands are in the portion of the National Forest allocated as matrix lands suitable for timber harvest.[25] Because of the current stand conditions they are not currently meeting the growth and yield potential desirable for lands that are part of the suitable timber base.[26]

Landscape Restoration Strategy

The South Fork Management Unit has an ecosystem restoration strategy that focuses on improving forest and watershed health, reducing the threat of wildfire to forest resources and local communities, and developing and maintaining community relationships and partnerships.[27] The context for this strategy is that the area has a variety of ecosystems, is sparsely populated with rural communities and energetic and determined partners. The Salt project area is an integral part of this larger ecosystem

[25] USDA 1995, page 3-20, 4-61 through 4-67
[26] USDA 1995, page 3-21, 4-67, 4-159
[27] Harmon 2006

restoration strategy and links to other similar projects on the South Fork Management unit. The other projects include East Fork I and II, Jones Thin, and Dubakella all in watersheds to the south of the Salt project; Gemmill and Knob Peak in watersheds to the east of Salt; and, Post Mountain to the northwest of Salt (Figure 2).

Desired Condition

The need to improve forest health in the Salt project area is a desired condition of the Forest Plan as reflected in its goals and objectives including:

- Forest Wide Goal #34: *"Implement practices designed to maintain or improve the health and vigor of timber stands, consistent with the ecosystem needs of other resources"*. [28]
- Forest Wide Standard: *"During ecosystem analysis, consider opportunities to maintain stocking levels that will reduce susceptibility to bark beetle attack to move toward the desired future conditions."* [29]
- Riparian Reserve (IX) Standard and Guideline: *"Apply silvicultural practices for Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives."* [30]
- Roaded Recreation Objective: *"obtain stocking control (thinning), and minimize mortality (pest management) within the context of the Matrix Standards and Guidelines…."*[31]
- e. *"Emphasize the regeneration harvest of understocked and poorly-growing stands, whether using even or uneven-aged systems. Intermediate cuttings in overstocked stands (thinning) and the salvage of dead and dying trees will also be emphasized."*[32]
- Desired Condition for Management Area 19: *"Forest stand densities are managed at levels to maintain and enhance growth and yield to improve and protect forest health and vigor recognizing the natural role of fire, insects and disease and other components that have a key role in the ecosystem"*[33]

Desired Condition for Management Area 19

*"Forest **stand densities are managed** at levels to maintain and enhance growth and yield **to improve and protect forest health and vigor** recognizing the natural role of fire, insects and disease and other components that have a key role in the ecosystem"*

Shasta-Trinity Forest Plan 1995, p. 4-159

In July 2004 the Regional Forester directed Forest Supervisors and Directors to design thinning activities to "achieve the multiple objectives of increased resistance to damage from crown fires, reduced surface/ladder fuels, reduced insect damage, and inter-tree competition, and restoration of

[28] USDA 1995, page 4-5
[29] USDA 1995, page 4-18
[30] USDA 1995, page 4-54
[31] USDA 1995, page 4-67
[32] USDA 1995, page 4-27
[33] USDA 1995, page 4-159

densities more characteristic of the past under the influence of natural fire regimes." [34] He also included direction to design projects that would be "effective for longer timeframes" by designing thinning to ensure "that density does not exceed an upper limit (for example…60% of maximum stand density index)" and "that this level will not be reached again for at least 20 years after thinning."

Actions Needed

In dense/overstocked mixed conifer stands and appropriate stands within intermittent or ephemeral riparian reserves, thinning to a stand density index of approximately 200-250 is needed to improve tree resiliency to natural disturbance factors such as drought, insects, disease, and fire. Thinning within the riparian reserves will reduce the potential of crown fires by reducing understory tree density and will help retain and protect the species composition and structural diversity of plant communities which is an ACS Objective. Thinning also maintains stand growth toward late-successional conditions by giving individual trees more room to grow.

Thinning in plantations to approximately 150 trees per acre is also needed to improve tree growth and improve resiliency to natural disturbance factors such as drought, insects, disease, and fire.

Where stands within the suitable timber base as allocated in the Forest Plan[35] are not growing well (not meeting the growth and yield potential) and there is not a manageable understory,[36] regeneration through timber harvest and planting is needed to accelerate the establishment of future forest growth and yields.[37] Retention of 15% of the overstory is required.[38]

See Table 2 (in Section 1.3.4) for a comparison of the exiting and desired conditions, and the measurement criteria we used to determine how well each alternative moves the area toward the desired conditions.

1.3.2 Reduce Hazardous Fuels Conditions

The following information is summarized from the fire and fuels analysis in Chapter 3.3 of this document. For more detailed information on fire and fuels please see Chapter 3.3.

Fire Hazard

Currently 88% of the Salt Project Area has a Moderate to High Potential for Crown Fires.

Control of a Fire would Likely be Ineffective in 69% of the Project Area

Existing Condition

Fire Hazard

The project area receives high concentrations of dry lightning and is immediately adjacent to Highway 36 providing the potential for human caused fires.

Eighty-eight percent of the Salt project area currently has

[34] Blackwell 2004
[35] USDA 1995, page 4-65 and 4-67.
[36] USDA 1995, page C-3
[37] USDA 1995 page C-1
[38] USDA 1995, page 4-61

moderate to high potential for crown fires (Chapter 3.3.2). This is significant because crown fires normally are highly destructive, difficult to control, and present the greatest safety hazard to firefighters and the public. High intensity crown fires were rare in the Salt project area historically, and would generally have been small in size. Pre-fire suppression era stands consisted of fewer trees and were healthier than today's stands that are overly dense. Almost a century of fire exclusion through successful fire suppression has altered the historical fire regime from frequent low-to-moderate intensity fires to one of infrequent, moderate to high severity partial stand-replacement fires, which includes areas of high and low severity.

Fuel management should reduce the factors that contribute to the initiation and spread of crown fires. These factors include height of the forest canopy above the ground, density of the canopy, stand density, and basal area.[39] In general, crown fires burn hotter and result in more severe effects than surface fires. Crown fires generally spread at least two to four times faster than surface fires.[40] Fires that spread quickly with high intensity pose a greater risk to firefighters and the public.

Sixty-nine percent of the project area has fuel levels that would result in flame lengths eight feet or greater if a fire occurred under adverse weather conditions. This is significant because flame length influences suppression strategy and tactics, and is also an indicator of intensity at the head of the fire (fireline intensity). Flame lengths of eight feet or greater make fire control problematic, with torching, crowning, and spotting; control efforts at the head of the fire are likely ineffective.[41]

Shaded Fuel Break

A fuel break extends for approximately three miles along Blue Point Ridge on the western boundary of the project area. These stands are have been thinned in the past but currently the overstory canopy closure is closing in and the understory vegetation has developed into potential fuel ladders. These are not desirable characteristics for maintaining an effective fuelbreak. The Trinity County Community Wildfire Protection Plan identifies this fuel break as important to protecting community values. [42] Maintenance treatments are needed to keep fire intensity within the desired range and to maintain the integrity of the fuel break to provide firefighters with a strategic place to defend against an oncoming fire.

Landscape Restoration Strategy

Part of the South Fork Management Unit ecosystem restoration strategy is to reduce the threat of wildland fire to forest resources, private investments and local communities.

Communities

The Salt project area is within three miles of three dispersed residential communities that the Trinity County Community Wildfire Protection Plan[43] identifies as having values "at risk" from wildfire.

[39] Omi and Martinson 2002; Agee 1996
[40] Rothermel 1983
[41] Rothermel 1983
[42] Trinity County Fire Council 2005, page 53, 54, 63
[43] Trinity County Fire Council 2005, page 53, 61, 62

These communities include Trinity Pines/Post Mountain - one mile west of the project; Peanut - three miles north; and, Wildwood - three miles east. Two additional communities, Hayfork[44] and Platina are 10 miles north and 12 miles east of the project area respectively. In order to effectively protect a community located in a high fire hazard environment, it is desirable to perform fuel treatment projects at a range of distances from homes. Treatments at some distance from the developed portion of a community (a few to several miles) can reduce the risks to things the residents said they value such as water supplies, power and communications lines, wildlife habitat and recreation sites.[45]

Forest Resources / High Investment Situations (utilities, plantations)

As stated earlier, the majority of the project area (83%) is within matrix land allocation as described in the Forest Plan and the remainder is within the riparian reserve land allocation. Matrix lands are lands managed for multiple uses including timber harvest. The risk of high intensity wildfire threatens these forests and their multiple uses.

Dense fuels also exist within intermittent and ephemeral riparian reserves in the project area, making the riparian zone susceptible to stand replacing crown fires. These riparian areas and their current cover are important habitat for wildlife species, particularly late-successional dependent species (Chapter 3.5).

Plantations make up 12% of the project area and are in a well stocked[46] or overstocked condition (Chapter 3.2.2). The Forest Service has made a considerable investment in plantations, estimated at $1,000 to $3,000 per acre, for the future benefit of productive timber stands.[47] A study assessing the damage the 1987 fires caused to plantations on the Hayfork Ranger District concluded that "...for the short interval, low to moderate severity fire regimes studied … if fuels [surface, ladder] are left untreated, damage from wildfires could increase significantly."[48] The study also found that fire damage to plantations was strongly associated with damage in the adjacent stand in the direction, which the fire apparently came. The greater the damage in the adjacent stands the greater the damage in the plantation.[49]

The Bridgeville-Cottonwood 60 KV transmission line transects the project area, which is a private investment that could be threatened by high severity fires.

Desired Condition for Management Area 19

"Stand understories appear more open with less ingrowth particularly in stands on sites where wild fire plays a key role in stand development"

Shasta-Trinity Forest Plan 1995, p. 4-159

Desired Condition

Fire has and will continue to play an important role in the Salt

[44] Hayfork is listed as an interface community in the Federal Register , January 4, 2001 (66 FR 753)
[45] Trinity County Fire Council 2005, page 10
[46] Well stocked is the stand density at which trees are spaced widely enough to prevent competition, yet closely enough to fully use site resources.
[47] Clark 1995
[48] Skinner and Weatherspoon 1995
[49] Skinner and Weatherspoon 1995

project area ecosystem.[50] The recurrence of fire and the recovery of the ecosystem from fire are important mechanisms that determine ecosystem health; those processes have historically maintained forest structural diversity and ecosystem health.[51] It is not the desired condition for this project or the Forest Plan to eliminate fire from the landscape.

In the Salt project area, however, fuels are uncharacteristically high. Active management can mimic the effects of wildfire, reducing fuels in a controlled method. Mimicking fire through thinning will help move the landscape toward historic structure and health; consequently, reducing the potential for uncharacteristically severe fires to threaten communities, forest resources, and other public investments. Desired fuel conditions include reduction of surface, ladder, and crown fuels to lower the potential for crown fire and stand mortality, while providing for diversity within the stands. Stands would be converted from high and moderate fire potential to low, where surface fuels are light and ladder fuels are not widespread, and canopy density is reduced. Fuel loading would be reduced in fire-prone forests to protect people and sustain resources as directed by the National Fire Plan[52] and A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Strategy Implementation Plan.[53] Desired conditions include fuel conditions that would result in flame lengths of 4 feet or less and that are unlikely to initiate or carry a crown fire.

The need to reduce hazardous fuel conditions in the Salt project area is consistent with the desired condition of the Forest Plan as reflected in its goals and objectives including:

- Forest Wide Goal #3: "*…Reduce biomass to natural levels.*" [54]
- Forest Wide Goal #10: *"Restore fire to its natural role in the ecosystem when establishing the Desired Future Condition of the landscape."* [55]
- Forest Wide Goal #11: *"Achieve a balance of fire suppression capability and fuels management investments that are cost effective and able to meet ecosystem objectives and protection responsibilities".*[56]
- Forest Wide Standard and Guideline 3.a: *"Incorporate biomass opportunities into … project proposals that meet ecosystem objectives, such as dead/down material for wildlife and ground cover for soil protection, and to reduce fuel loading to complement the natural fire regime…"*[57]
- Forest Wide Standard and Guideline 3.d, e, and f: *"Plan and implement fuel treatments emphasizing those treatments that will replicate fires natural role in the ecosystems. Natural fuels will be treated in the following order of priority: (I) public safety: (2) high investment situations (structural improvements, powerlines, plantations, etc.); (3) known high fire occurrence areas; and (4) coordinated resource benefits, i.e., ecosystem maintenance for natural fire regimes. Consider fuel break construction investments when they compliment*

[50] URS Greiner Woodward Clyde 2000, page 3-42
[51] URS Greiner Woodward Clyde 2000, page 3-42
[52] USDI and USDA 2001
[53] USDI and USDA 2002: USDI and USDA 2005
[54] USDA 1995, page 4-4
[55] USDA 1995, page 4-4
[56] USDA 1995, page 4-4
[57] USDA 1995, page 4-14

Forest health/biomass reduction needs, very high and extensive resource values are at risk and to protect Forest communities". [58]

- Riparian Reserves – Standard and Guideline*: "Design fuel treatment … to meet Aquatic Conservation Strategy objectives, and to minimize disturbance of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuels management activities could be damaging to long-term ecosystem function."* [59]
- Roaded Recreation – Management Practices Emphasized: *"Fuels Reduction and Management"*[60]
- Commercial Wood Products Emphasis – Management Practices Emphasize: *"Fuels Reduction and Management"* [61]
- Desired Condition for Management Area 19: *"Stand understories appear more open with less ingrowth particularly in stands on sites where wild fire plays a key role in stand development"*[62]

The Trinity County Resource Conservation District 2006 -2011 Strategic Plan identified as a desired condition: *"Reduced risk of catastrophic fire by implementation of fuels reduction projects."* One of their objectives is to coordinate management of fire safety/forest policy on public and private lands.[63] Reduction of hazardous fuels in and around the communities located near the Salt project area is a key desired condition of the Trinity Community Wildfire Protection Plan.[64]

Actions Needed

There is a need to decrease fuel loadings and ladder fuels to help reduce the potential of a crown fire moving through the area, and to reduce the threat of wildfire to local communities, forest resources, and other public investments.

The shaded fuel break needs to be reconstructed to serve as a point of control and a safety area for fire suppression forces in the event of a wildland fire, or to provide a potential anchor point for future prescribed burning operations.

See Table 2 (in Section 1.3.4) for a comparison of the exiting and desired conditions, and the measurement criteria we used to determine how well each alternative moves the area toward the desired conditions.

1.3.3 Provide Timber Products

The following information is summarized from the silvicultural and economic analyses in Chapter 3.2 and 3.4 of this document. For more detailed information on commercial timber products please see Chapter 3.2 and 3.4.

[58] USDA 1995, page 4-18
[59] USDA 1995, page 4-56
[60] USDA 1995, page 4-64
[61] USDA 1995, page 4-64
[62] USDA 1995, page 4-159
[63] Trinity County Resource Conservation District 2006, page 4
[64] Trinity County Fire Council 2005, pages 61, 62

Existing Condition

To meet the first two objectives of this project, (1 - Improve forest health and resiliency, and 2 - Reduce hazardous fuels conditions to reduce the potential for adverse impacts from wildfire to National Forest System land and neighboring land), trees and biomass that have commercial value will be removed from treatment units. Providing timber products is the third objective of this project.

Since one of the Forest wide goals is to "Provide a sustained yield of timber and other wood products to help support the economic structure of local communities and to supply regional and national needs" we looked at the existing condition of the local timber industry.

There is currently one large production sawmill operating in Trinity County (in the town of Weaverville). This mill is the largest non-government employer in the county, with 138 employees, and a design capacity of 134 million board feet of timber (MMBF) per year.[65] The timber industry currently provides about 50% of the manufacturing jobs in Trinity County. Historically, this percentage was higher; it declined significantly during the late 1990s with the implementation of the Northwest Forest Plan. Continued reduction in timber harvest from the Federal lands reduced the raw material supply for the industry, resulting in the closure of the mill in Hayfork in 1996.

Land management activities such as hazardous fuels reduction under the National Fire Plan, and the Healthy Forest Restoration Act would be more difficult and expensive without an existing timber industry infrastructure.

Desired Condition

The sustainable supply of timber from suitable lands to support local or regional markets is a desired condition as reflected in the goals and objectives of the Forest Plan, including:

- Forest Wide Goal #3*: "Encourage the commercial use of biomass that is excess to silvicultural, ecological, wildlife, and personal needs, instead of burning the excess material. Reduce biomass to natural levels."*[66]
- Forest Wide Goal #35: *"Provide a sustained yield of timber and other wood products to help support the economic structure of local communities and to supply regional and national needs."* [67]
- Roaded Recreation Standard and Guideline: *"Timber yields will result from activities required to attain the desired future condition of the landscape."*[68]
- Roaded Recreation Standard and Guideline: *"Dispersed openings created by timber harvesting through project areas. Size of openings will average 5 acres or less."* [69]

Desired Condition for Management Area 19

"As a by product of ecosystem management it is expected that suitable lands will yield approximately 72 million boardfeet per decade of commercial wood fiber including biomass from this MA"

Shasta-Trinity Forest Plan 1995, p. 4-159

[65] Trinity River Journal 2008
[66] USDA 1995, page 4-4
[67] USDA 1995, page 4-5
[68] USDA 1995, page 4-65
[69] USDA 1995, page 4-65

- Commercial Wood Product Emphasis – Objective: *"The purpose of this prescription is to obtain an optimum timber yield of wood fiber products from productive forest lands within the context of ecosystem management…Timber stands will be managed to obtain optimum growth and yields using cultural practices which control competing vegetation (release and weeding), obtain stocking control (thinning), and minimize mortality (pest management) within the context of the Matrix Standards and Guidelines described above."* [70]
- Management Area 19: *"As a by product of ecosystem management it is expected that suitable lands will yield approximately 72 million board feet per decade of commercial wood fiber including biomass from this MA"*.[71]

Actions Needed

Provide commercial sawtimber and biomass to local markets. See Table 2 for a comparison of the exiting and desired conditions, and the measurement criteria we used to determine how well each alternative moves the area toward the desired conditions.

1.3.4 Summary of Purpose & Need, Existing Conditions & Measures of Success

In order to compare how well the alternatives meet the purpose and need identified for this project, measures of success were identified and analyzed. These measures indicate whether the alternative moves conditions in the project area toward the desired conditions. These indicators are used to compare and contrast the alternatives.

Table 2: Summary of purpose and need, existing conditions and measures of success for moving toward desired conditions

Purpose & Need	Existing Condition	Measures of Success (Desired Condition)
Improve forest health and resiliency	Dense/Overstocked Stands (stand density index ranges from 490-590)	Acres of overstocked stands thinned to a stand density index of approximately 200-250
	Dense/Overstocked Plantations (1000-1210 trees per acre)	Acres of overstocked plantations thinned to approximately 150 trees per acre
	Understocked / Over Mature Stands – not meeting growth and yield potential due to heavy pathogen impacts	Acres not meeting growth and yield potential due to heavy pathogen impacts regenerated to provide future yields.
Reduce hazardous fuels	80% of area high to moderate (active & passive) crown fire potential	Reduction in acres of active crown fire potential
		Reduction in acres of passive crown fire potential
	69% of area would have flame lengths greater than or equal to 8 feet in a fire = fire control problematic.	Reduction in acres requiring indirect fire attack methods (flame length reduced to 8 feet or less)
		Increase in acres that could be direct attacked with hand crews (flame length reduced to 4 feet or less)
Provide timber products	Timber products exist on site and the removal of some will meet other Forest objectives (forest health and hazardous fuel reduction)	Merchantable timber harvested (million board feet - MMBF)
		Merchantable biomass harvested (bone dry tons – BDT)

[70] USDA 1995, page 4-67
[71] USDA 1995 page 4-59

Purpose & Need	Existing Condition	Measures of Success (Desired Condition)
	The market requires a sale to be economically viable to sell.	Timber sale viability for ground based system (Pond log value minus stump to Mill costs per ccf. Positive number = viable sale).
		Timber sale viability for helicopter unit (pond log value minus stump to mill costs per ccf. Positive number = viable sale)

1.4 Proposed Action Summary

For more detail on the proposed action please see Chapter 2.2.2. The actions listed below are proposed by the Forest to meet the purpose and need. Figure 5 displays a map of treatments and activities for Alternative 2. Table 3 displays a summary of activities and Table 4 displays prescriptions by unit. The proposed action encompasses approximately 1,619 acres and includes the following:

- 963 acres of intermediate thinning from below, 30 units
- 31 acres of shelterwood harvest with green tree retention, 2 units
- 27 acres of regeneration harvest with green tree retention, 2 units
- 14 acres of hand fuels treatments, 1 unit
- 481 acres of pre-commercial thinning (plantations), 59 units
- 103 acres of intermediate thinning (shaded fuel break), 1 unit

Sub-merchantable fuels will be reduced to desired levels in all treatment units. The actions are expected to produce approximately 9.4 million board feet of merchantable saw timber and 15,074 tons (bone dry) of biomass. Forest Service crews, service contracts, and /or commercial timber sales may be used to implement these actions.

Three tenths of a mile of temporary road would be constructed to access treatment units, and would be obliterated when the project is completed (See Chapter 2.4, #26). Approximately 17.1 miles of existing Forest System roads would be reconstructed, and five miles of existing Forest System roads would be maintained. Approximately 13.8 miles of road (4.3 miles of Forest System road and 9.5 miles of unauthorized routes) would be decommissioned after the timber harvest and fuel reduction actions are completed. Some of the decommissioning will occur as part of vegetation treatment contracts and some will require additional funding. A 0.4 mile road accessing the electric transmission line will be closed.

1.5 Decision Framework

The Forest Supervisor will review the proposed action, the other alternatives, public and agency input, and the environmental consequences in order to decide whether to:

- Implement the proposed action (Alternative 2)
- Implement Alternative 3
- Modify the proposal to address potential unresolved conflicts and disputes with the proposed action
- Take no action at this time

1.6 Public Involvement

Public involvement for this project started in October 2006. At that time the Forest was preparing an environmental assessment to consider the impacts of the proposed action and determine if an environmental impact statement was necessary. A scoping letter was mailed to eighteen individuals and organizations. In addition, a legal notice was published in the Trinity Journal – a local newspaper. The project was listed quarterly beginning in May 2006 in the Schedule of Proposed Actions, a Shasta-Trinity National Forest publication. The US Fish and Wildlife Service (USFWS) were consulted regarding the proposed action in the scoping process as part of Endangered Species Act consultation. Members of the interdisciplinary team met to discuss the proposal with the National Marine Fisheries Service (NMFS), California Regional Water Quality Control Board (North Coast Region), and the American Forest Resource Council. The project was also presented to the Trinity County Fire Safe Council as part of collaboration for the South Fork restoration strategy. Three responses were received during this 2006 scoping period. A summary of those comments and their disposition appears in Appendix A.

The Forest modified the proposal and decided to prepare an environmental impact statement based on the initial scoping and interdisciplinary team review, field work, analysis, and inter-agency consultations. Public comment on this draft environmental impact statement will be considered and integrated into the final environmental impact statement and the responsible official's decision.

Another scoping period was initiated in 2008; a legal notice soliciting comments from the public published in the Record Searchlight on March 25, 2008 and the Trinity Journal on April 2, 2008. A Notice of Intent (NOI) to prepare an environmental impact statement was published in the Federal Register on March 26, 2008. The NOI asked for public comment on the proposal from within 30 days after the publication in the Federal Register.

Comments were received from eight individuals and organizations. All comments were considered, including comments received from the 2006 scoping, and a summary of those comments and information about how they influenced the project design, alternative development, and effects analysis is found in Appendix A.

1.7 Issues

An issue is defined as a point of discussion, debate, or dispute concerning environmental effects of an action. Issues were identified by the interdisciplinary team through the public scoping process and by review from other agencies. The scoping process was used not only to identify important environmental issues, but also to identify and eliminate issues that do not pertain to the action, thus narrowing the scope of the environmental documentation process accordingly.

To identify issues specific to the Salt project, the responsible official and the interdisciplinary team reviewed all public comments (Appendix A) and available information about historical and current conditions within the project area. They also reviewed the Forest Plan and other site-specific planning documents relevant to the Salt project area to refine the list of issues.

The responsible official and the interdisciplinary team sorted the issues into three categories. Key issues drove the alternative development process. Analysis issues are recognized as important but did not drive alternative development. In addition, the team classified some issues as issues not addressed in detail.

1.7.1 Key Issues

Key issues are those considerations, specific to the proposed action and this analysis area, which drove the development of Alternative 3. Key issues are important in evaluating and comparing the alternatives, sharply defining important potential effects of the alternatives and displaying where the effects analysis does not support preliminary concerns. The following key issues were identified through the analysis process and were determined to warrant more significant analysis. The issue indicators help the responsible officer to judge differences in consequences between alternatives.

Regeneration Harvest - Green Tree Retention

The proposed action would harvest two units, totaling 27 acres, with a regeneration harvest – green tree retention prescription (Unit 37 and 40). Members of the public expressed general opposition to green tree retention harvest and a specific concern that ***regeneration harvest – green tree retention could increase the risk from fire after treatment.***

Issue Indicators: To analyze potential effects of regeneration harvest on fire behavior the analysis considers the change in crown fire potential and flame length within those treatment units due to project actions.

Canopy Closure Retained After Thinning

The proposed action will retain 50% canopy closure in the intermediate thinning units[72] and the hand fuel treatment unit and 40% canopy closure in the shaded fuel break unit. A member of the public expressed concern that ***retaining less than 60% canopy closure after thinning could affect wildlife habitat.***

Issue Indicators: To analyze potential effects of canopy closure to wildlife the acres of suitable threatened, endangered, sensitive and management indicator habitat eliminated[73] due to change in canopy closure was assessed.

Thinning in Riparian Reserves

The proposed action would thin dense stands within intermittent and ephemeral riparian reserves to 60% canopy closure. [74] No thinning would occur within an equipment exclusion zone.[75] Members of

[72] Within the ephemeral and intermittent riparian reserves and in visually sensitive units along Highway 36 60% canopy cover would be retained (Section 2.4, #19 and #39).
[73] This issue indicator (if suitable habitat would be eliminated by thinning to 60% canopy closure, instead of 50%) was considered for all threatened, endangered, sensitive and management indicator wildlife species habitat assemblages analyzed in detail in Chapter 3.
[74] No thinning would occur within perennial stream riparian reserves (Section 2.4, #18).

the public expressed concern that ***thinning in riparian reserves may have unintended effects on the watershed, fisheries and wildlife.***[76]

Issue Indicators: To analyze the effects of thinning within riparian reserves the tons of potential sedimentation, short-term and long-term[77], due to this action will be considered. Measurable changes in fish habitat (pool depth, channel form, temperature) will be compared between alternatives. Suitable wildlife habitat that would be eliminated due to thinning in intermittent and ephemeral streams will also be assessed. [78]

Nesting/Roosting Spotted Owl Habitat

A member of the public expressed concern that ***changes to stand structure by treatments in the proposed action would remove or downgrade foraging (portion of Units 37) and moderate quality nesting and roosting habitat (portions of Units 33C and 32)***.

Issue Indicators: To analyze potential effects of the alternatives on spotted owl habitat the acres of northern spotted owl foraging or nesting and roosting habitat removed or downgraded were considered.

Temporary Roads

A member of the public commented that ***the construction of new [temporary] roads may negatively impact hydrology, soils and wildlife.***

Issue Indicators: To analyze potential effects of temporary roads the number of new stream crossings, estimated tons of potential sedimentation, the acres of detrimental soil disturbance and the acres of wildlife habitat affected were considered.

Visual Impacts

Internal scoping identified that ***thinning next to Highway 36 in Unit 45, the fuel break, may be noticeable in the foreground of this travel corridor***.

Issue Indicator: To analyze potential effects of the alternatives to scenery, acres in visible foreground of Highway 36 affected were assessed.

1.7.2 Analysis Issues

Analysis issues are part of the effects analysis but are not significant.[79] Some of these issues or potential impacts are limited through project design or mitigation, collectively called resource

[75] The EEZ is a portion of the riparian reserve defined for this project as the area that extends 50 feet (slope distance) from the high watermark on slopes greater than 30% and extends 25 feet (slope distance) on slopes less than 30% OR extends to the inner gorge, which ever is greater (Chapter 2.4, #20).
[76] Sedimentation, water temperature, suitable wildlife habitat were mentioned (Appendix A)
[77] For the sedimentation analysis short-term = 1 to 5 years, during the period of project implementation; long-term = greater than 5 years.
[78] This issue indicator (habitat eliminated by thinning in riparian reserves) was considered for all threatened, endangered, sensitive and management indicator wildlife species habitat assemblages analyzed in detail in Chapter 3.
[79] Agencies shall reduce excessive paperwork by…discussing only briefly issues other than significant ones… Using the scoping process not only to identify significant environmental issues deserving of study, but also to

protection measures in this document (Chapter 2.4). Potential effects related to analysis issues are covered in the effects analysis section (Chapter 3) however analysis may not be as in-depth as for key issues. Tracking of comments or issues raised by the public during scoping, and a summary of responses are presented in Appendix A. Analysis issues include:

Air Quality

- Removing trees may affect climate change

Fire/Fuels/Silviculture:

- Canopy removal may increase fuel hazard issues
- Decommissioning roads may have negative impacts on future fire suppression and vegetation management efforts

Soils:

- Yarding with tractors could negatively impact soil heath and productivity

Economics:

- Helicopter yarding can make a unit financially unfeasible
- Completing all work planned including mitigations may exceed the cost of the timber products

Wildlife:

- Treatments may destroy, alter or fragment forest habitat suitable for fishers
- Thinning within the project area, when considered cumulatively with other effects to Neotropical bird habitat, may contribute to declining populations
- Treatments, when considered cumulatively with past projects in the watershed may fragment habitat
- Vegetation treatments may impact management indicator species and threatened, endangered and sensitive species habitat and ability to survive
- Removing old legacy trees may impact wildlife habitat including future snag habitat

Aquatics (Watershed & Fisheries):

- Landings and use of roads for this project could contribute to sedimentation and cumulative impacts leading to degradation of riparian areas and the watershed

1.7.3 Issues Not Addressed in Detail

Some issues and comments received during scoping are not analyzed in detail in Chapter 3. These issues are not addressed in detail because they are either not relevant to the project or its resources (i.e. not a cause and effect relating to this specific project), are beyond the scope of this project, are already decided by law, regulation, Forest Plan, or other higher level decision, are irrelevant to the decision to be made, or they have been addressed by virtually eliminating any potential effects through project design. Appendix A responds briefly to all comments or identifies where information is found in the environmental assessment or project file, or, where appropriate, explains why no further analysis was necessary.

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deemphasize insignificant issues, narrowing the scope of the environmental impact statement process accordingly (FSH 1909.15, Chapter 10, 12.4)

Chapter 2 – Alternatives

2.1 Introduction

This chapter describes and compares alternatives considered in detail for this project. Reasonable alternatives are explored and objectively evaluated including those alternatives eliminated from detailed study.[80] The end of this chapter presents the alternative activities in tabular format for comparison. Also for comparison Table 11 displays how well each alternative meets the purpose and need for this project using measures of success, and Table 12 summarizes the environmental consequences related to key issues using issue indicators.

2.2 Alternatives Considered in Detail[81]

2.2.1 Alternative 1 – No Action

The no action alternative provides a point of reference from which to evaluate the action alternatives. This alternative would result in no activity at this time. Existing conditions, which are inconsistent with the desired conditions for this area, would remain unchanged by management action (Chapter 1.3).

2.2.2 Alternative 2 – Proposed Action

This alternative was designed to meet the identified purpose and need which is to improve forest health and resiliency, reduce hazardous fuels conditions to reduce potential adverse impacts of future wildland fire to National Forest System land and neighboring land and to provide timber products.

As part of the project design, all unstable or potentially unstable areas, based on site-specific geologic and geomorphic field surveys, were identified, flagged and deleted from Alternative 2.[82]

Table 3 summarizes the actions to be taken with Alternative 2 and Table 4 shows vegetation treatment prescriptions, sub-merchantable fuel treatments, acres, logging systems, and the Forest Plan land allocations for each unit. Figure 5 displays a map of the proposed actions.

[80] 40 CFR 1502.14
[81] 40 CFR 1502.10 requires that an agency identify their preferred alternative(s), if one or more exists, in the Draft Environmental Impact Statement. Alternative 2 is the preferred alternative.
[82] Jasso 2007, page 7

Table 3: Vegetation treatments, logging systems and connected road activity for Alternative 2

Timber Stand Activity	Alternative 2
Proposed Vegetation Treatments (acres)	
Intermediate Thinning	963
Shelterwood Harvest – Green Tree Retention	31
Shaded Fuel Break Thin	103
Regeneration Harvest - Green Tree Retention	27
Hand Fuel Treatment	14
Pre-commercial Thin	481
Total Proposed Treatments (acres)	**1,619**
Yarding Systems (commercial saw-timber acres)	
Tractor Yarding	986
Helicopter Yarding	138
Sub-merchantable Fuel Treatment (acres)	
Treat on Site	1,306
Tractor Site Prep and Burn Piles	58
Hand Pile, Burn Piles	152
Tractor Jackpot Pile and Burn Piles	103
Tree Planting (acres)	27
Landings constructed (and existing)	38 (19)
Estimated Biomass (dry tons)	15,073
Estimated Timber Harvest Volume (thousands of board-feet, MBF)	9,365
Road Activities (miles)	
Roads constructed	0
Roads maintained	5.0
Roads reconstructed	17.1
Temporary roads constructed	0.3
Roads closed	0.4
Roads decommissioned (miles)	
Unauthorized routes decommissioned	9.5
Classified roads decommissioned	4.3
Total Miles of Roads Decommissioned	**13.8**
Borrow pit expanded for road surfacing (acres)	1

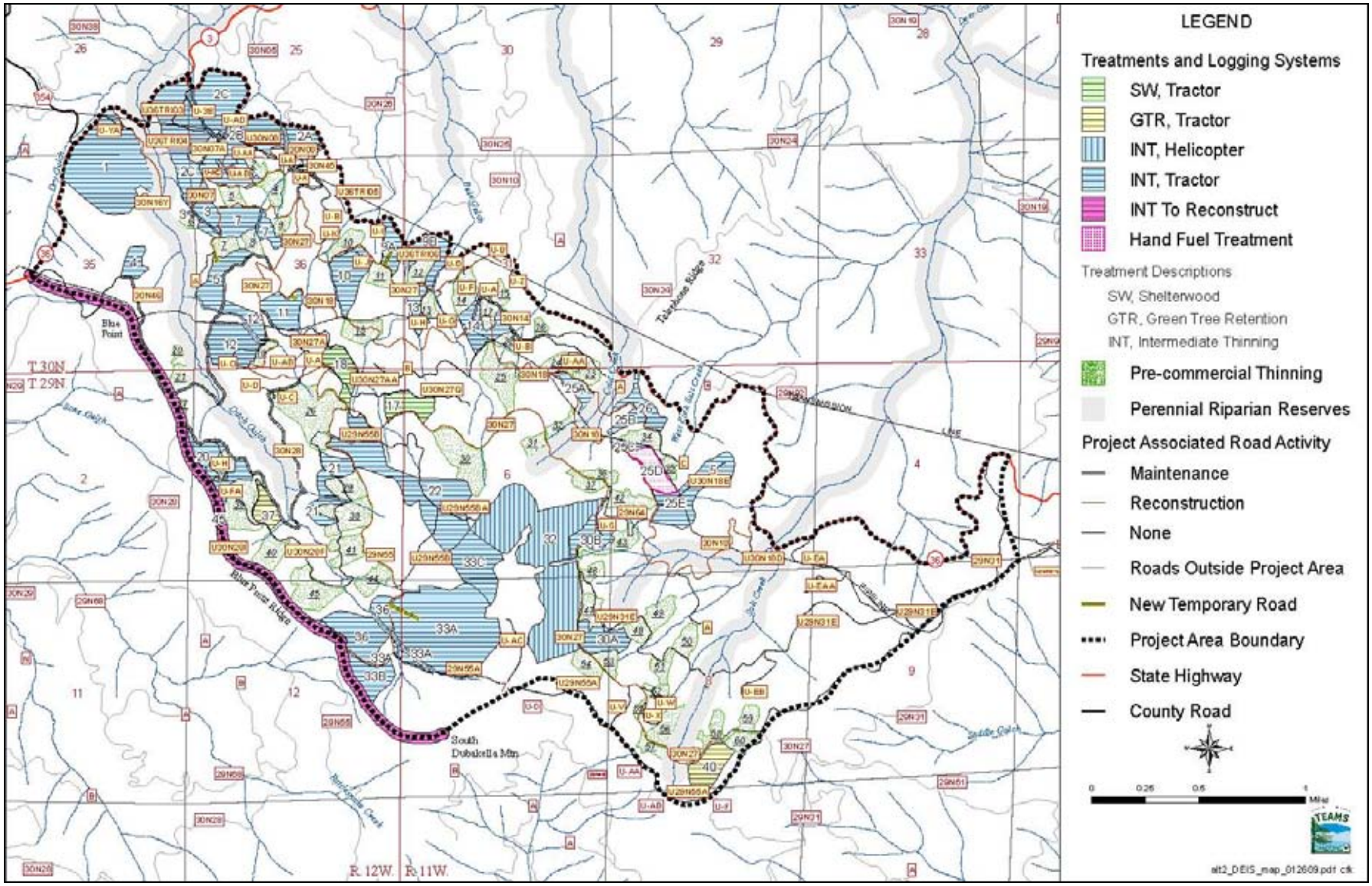

Figure 5: Map of Alternative 2 - Proposed Action

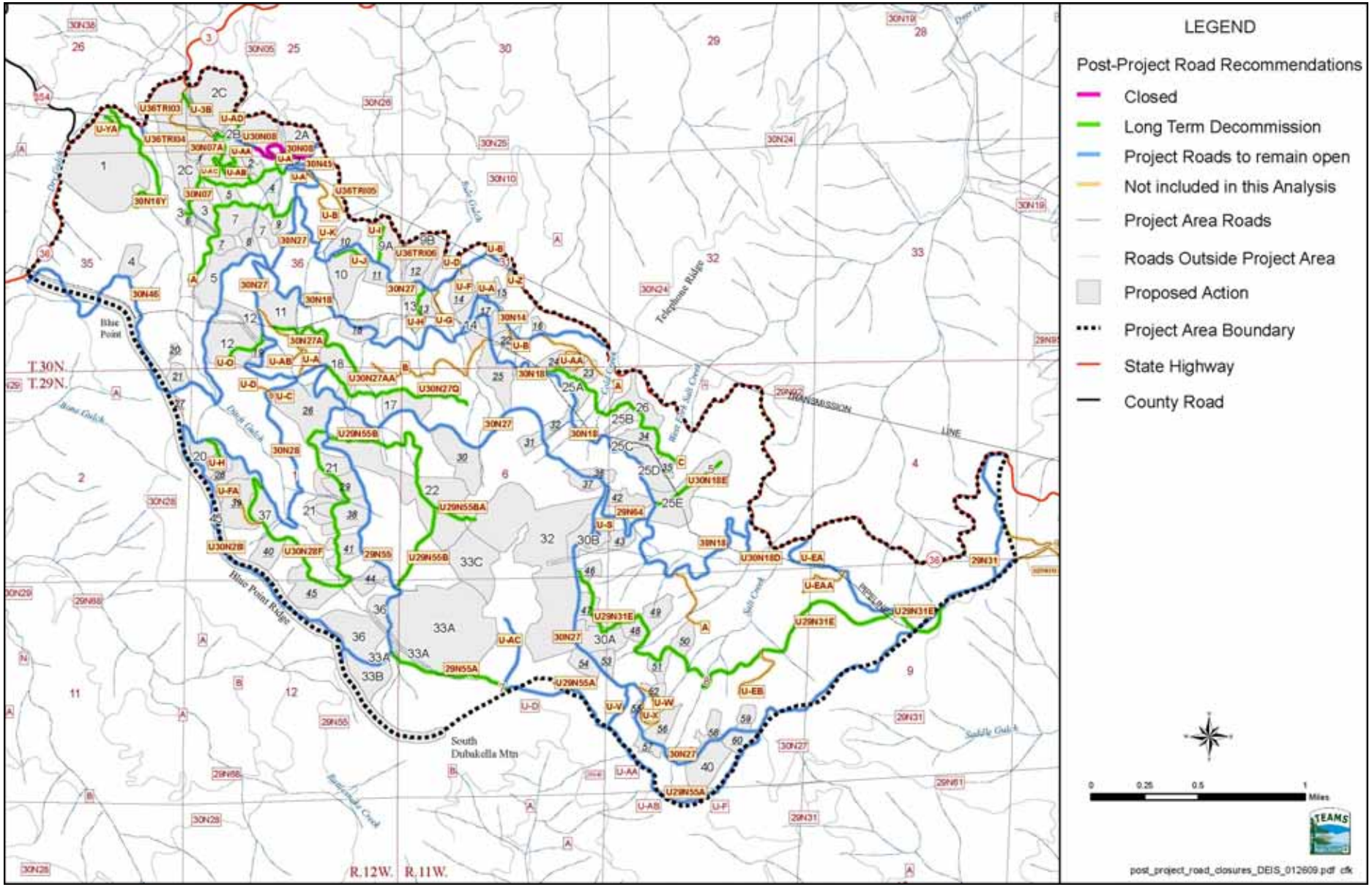

Figure 6: Map of Alternative 2 and Alternative 3 proposed road actions

Table 4: Alternative 2 - proposed treatments by unit

Unit	Acres	Treatment Prescription*	Yarding System	Biomass*	Sub-merch. Fuels Treatments	Forest Plan Land Allocation**
1	84	Intermediate Thin	Tractor	Yes	TOS	RRec
2A	10	Intermediate Thin	Tractor	Yes	TOS	RRec & RR
2B	50	Intermediate Thin	Tractor	Yes	TOS	RRec & RR
2C	87	Intermediate Thin	Tractor	Yes	TOS	RRec & RR
3	12	Intermediate Thin	Tractor	Yes	TOS	RRec & RR
4	8	Intermediate Thin	Tractor	Yes	TOS	RRec
5	19	Intermediate Thin	Tractor	Yes	TOS	RRec, RR & Wood
7	21	Intermediate Thin	Tractor	Yes	TOS	RRec & RR
9A	12	Intermediate Thin	Tractor	Yes	TOS	RRec
9B	17	Intermediate Thin	Tractor	Yes	TOS	RRec & RR
10	24	Intermediate Thin	Tractor	Yes	TOS	RRec & RR
11	17	Intermediate Thin	Tractor	Yes	TOS	Wood & RR
12	35	Intermediate Thin	Tractor	Yes	TOS	Wood & RR
13	9	Intermediate Thin	Tractor	Yes	TOS	RRec & RR
14	19	Intermediate Thin	Tractor	Yes	TOS	RRec
17	15	Shelterwood – Green Tree Retention	Tractor	--	TSP/BP	RRec
18	16	Shelterwood – Green Tree Retention	Tractor	--	TSP/BP	RRec
20	19	Intermediate Thin	Tractor	Yes	TOS	RRec & Wood
21	19	Intermediate Thin	Tractor	Yes	TOS	Wood & RR
22	76	Intermediate Thin	Tractor	Yes	TOS	RRec & Wood
25A	8	Intermediate Thin	Tractor	Yes	TOS	RRec
25B	5	Intermediate Thin	Tractor	Yes	TOS	RRec
25C	4	Intermediate Thin	Tractor	Yes	TOS	RRec
25D	14	Hand Fuel Treatment	None	--	HP/BP	RRec
25E	34	Intermediate Thin	Tractor	Yes	TOS	RRec
26	12	Intermediate Thin	Tractor	Yes	TOS	RRec
30A	17	Intermediate Thin	Tractor	Yes	TOS	RRec & Wood
30B	13	Intermediate Thin	Tractor	Yes	TOS	RRec
32	138	Intermediate Thin	Helicopter	Yes	HP/BP	RRec, RR & Wood
33A	109	Intermediate Thin	Tractor	Yes	TOS	Wood & RR
33B	16	Intermediate Thin	Tractor	Yes	TOS	Wood
33C	31	Intermediate Thin	Tractor	Yes	TOS	Wood
36	35	Intermediate Thin	Tractor	Yes	TOS	Wood & RR
37	10	Regeneration – Green Tree Retention	Tractor	--	TSP/BP	Wood
40	17	Regeneration – Green Tree Retention	Tractor	--	TSP/BP	Wood
45	103	Thin shaded fuel break	Tractor	--	TSJ/BP	RRec, RR & Wood
***	481	Thinning in Plantations	None	--	TOS	
	1,619					

*Treatment Prescriptions, biomass and sub-merchantable fuel treatments are described later in this section of the document. Intermediate Thin[83] would retain 50% canopy closure in this alternative. TOS – Treat on site; TSP – Tractor site prep; BP – Burn piles; HP – Hand pile; TSJ – Tractor jackpot pile. ** Forest Plan Land Allocations are described later in this document. RRec = Matrix-roaded recreation; Wood = Matrix-commercial wood products emphasis; RR = Riparian reserve.
*** Plantation thinning would occur in sixty different units throughout the project area.

A description of each of the proposed vegetation treatments and connected actions, including how the treatments meet the purpose and need moving the area toward desired conditions, is explained below.

Improve Forest Health and Resiliency

Intermediate Thinning (963 acres; 59% of treatments)

Intermediate thinning retains the major stand components and does not regenerate the stand. Intermediate treatments will occur in overstocked stands in the project area. Proposed thinning would remove smaller trees to provide more growing room and site resources for residual trees, improving their overall health and ability to withstand future drought conditions, insect attacks, and fires.[84] Approximately 50% canopy closure would remain after treatments (stand density index of 200 – 250[85]), and generally the largest healthiest trees would be retained. Within the context of a thin-from-below treatment, management objectives involving restoring fire to its natural role, and improving stand health, would mean that at times smaller trees of fire-resistant species-such as ponderosa pine, Jeffery pine, and sugar pine-would be retained over larger non-fire-resistant species-such as white fir. Some large, dominant or co-dominant) trees may be removed if they are in skid trails, temporary road locations, immediately adjacent to a larger healthier tree of a desirable species, or in landing locations. Understory hardwood species would be retained as a stand component.

Forty-one acres of intermediate thinning would occur within intermittent or ephemeral stream riparian reserves to improve resistance to drought, insect attacks and fire. Thinning is excluded immediately adjacent to the stream channel within the equipment exclusion zone (Figure 7). The equipment exclusion zone is a portion of the riparian reserve defined for this project as the area that extends 50 feet (slope distance) from the high watermark on slopes greater than 30% and extends 25 feet (slope distance) on slopes less than 30% or extends to the inner gorge, which ever is greater (Chapter 2.4, #20, Figure 7). Thinning would enhance desired riparian vegetation structure and composition as well as maintain or improve Aquatic Conservation Strategy objectives described in the Forest Plan. Thinning would occur only within riparian reserves associated with ephemeral and intermittent streams. Intermittent streams generally flow only during the wet season (50% of the time or less) and ephemeral streams flow generally for a short time after extreme storms and the channel is not well defined. Sixty percent canopy closure would be retained in riparian reserves and other resource protection measures are designed to protect riparian and aquatic resources (Chapter 2.4, #19,

[83] A three acre intermediate thinning unit was dropped from the proposal due to soil concerns after all other analysis was completed. Total treatment acres for Alternative 2 include these three acres throughout this document and the specialist reports, but reference to the unit has been eliminated in the DEIS.
[84] Oliver and Uzoh 1997
[85] Currently the canopy closure ranges from 60 – 78% and the SDI ranges from 490 to 590.

20). See Appendix D for the evaluation of how these treatments specifically address the nine Aquatic Conservation Strategy objectives.

Three tenths of a mile of temporary road would be needed to minimize skidding impacts within treatment units (Units 5, 9A and 33A). Temporary roads would be constructed by clearing debris from the forest floor, removing the stumps and then blading it flat. The temporary roads would be contour ripped (with winged subsoiler to 18 inches deep) seeded and mulched after completion of harvest activities (Chapter 2.4, #26). Approximately 32.6 miles of road would be used for hauling. See road work description in Table 5 and Table 6 for details of road work planned. All landings (57 landings planned, 38 of which would be newly constructed) used to aid in timber harvest would be shaped to disperse drainage and direct run-off away from watercourses (Chapter 2.4, #14). All units but one would be tractor yarded. One unit is planned for helicopter yarding because it is not accessible by existing roads. One rock pit would be expanded to approximately 1 acre to provide source material for road reconstruction activities.

Hand Fuel Treatment (14 acres; 1% of treatments)

This unit is too steep for ground based yarding and would have been the only skyline cable unit in the project area. Cable yarding for a commercial timber sale was determined to be economically un-feasible so proposed treatments will be implemented by crews with hand tools. The unit would be hand thinned to about 150 trees per acre.[86] Suppressed and intermediate crown class trees would be removed if they are contributing to increased fire-hazard through ladder-fuel effects. Generally the trees that would be removed would be 10 inches diameter at breast height or less and larger diameter trees would be retained.[87] No merchantable harvest of larger trees would occur.

Pre-commercial Thinning (plantations, 481 acres; 30% of treatments)

Pre-commercial thinning is proposed in overstocked stands planted primarily in the 1970s and 1980s. The objective for thinning these stands is to improve stand health, vigor and growth, making them more resilient to drought, insects, disease and fire. Stands would be thinned from 1,000 -1,200 trees per acre to about 150 trees per acre. Large conifers and hardwoods would be retained for species and structural diversity. Units may be hand piled and burned or masticated.

[86] The average number of trees per acre in the project area is 703 based on 2008 stand exam data (Petersen and Amell 2009, Table 7).
[87] The average number of trees per acre under 10 inches in diameter at breast height is 623 based on 2008 stand exams (Petersen and Amell 2009, Table 7).

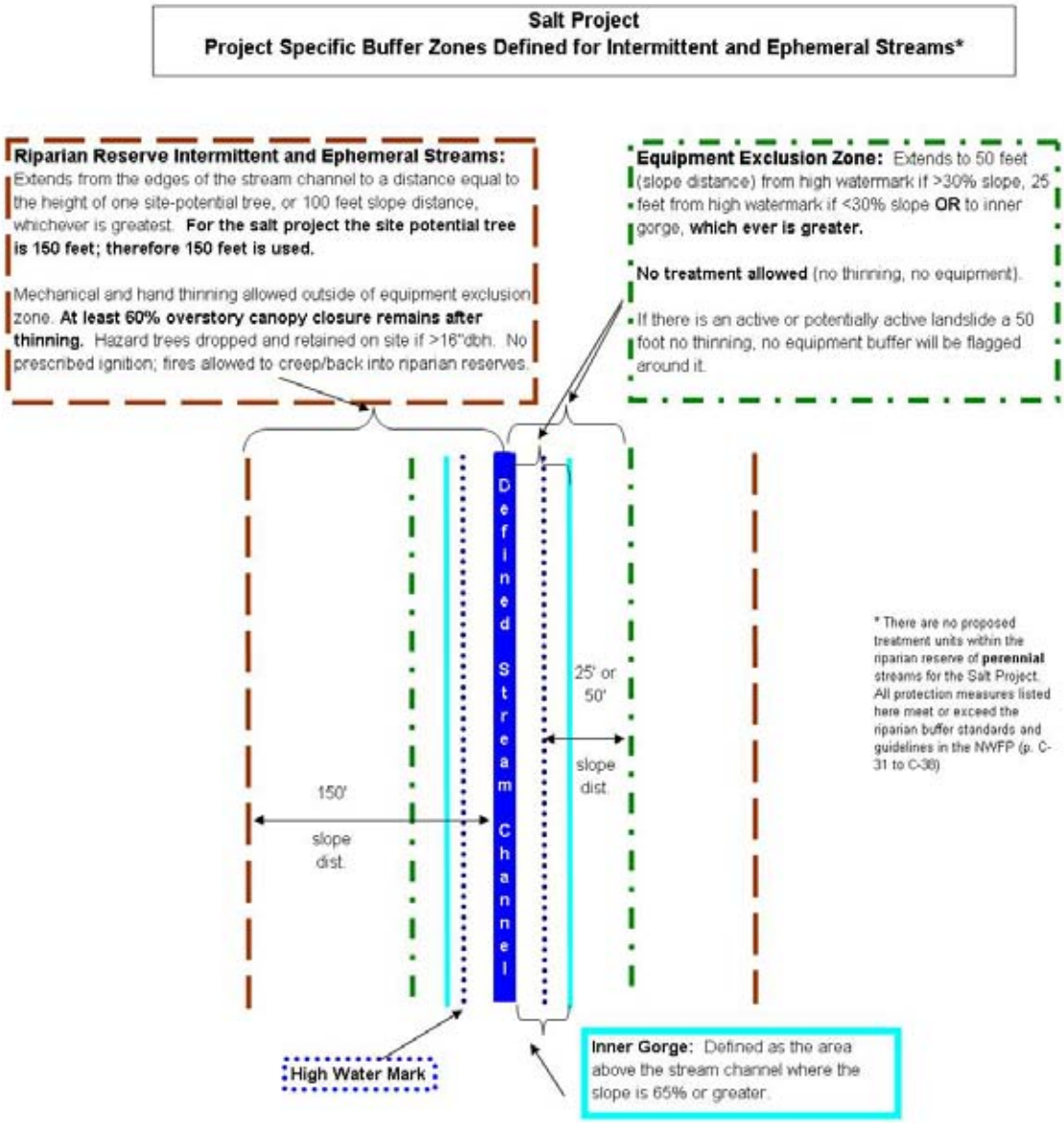

Figure 7: Salt project specific riparian reserve buffer zones and thinning restrictions

Intermediate Thinning (shaded fuel break, 103 acres; 6% of treatments)

The project would restore functionality of this shaded fuelbreak by removing most understory vegetation within the approximately 200 to 330 foot fuel break and retaining approximately 40% canopy closure (reduced from current 50-70%) and most understory vegetation would be removed. Canopies of the remaining trees would provide enough shade to inhibit ingrowth of brush and understory species. Following the thinning, woody debris would be tractor jackpot piles and burned. Thinning will restore its functionality as an effective point of control for wildland fires, a safety area for fire suppression forces, and/or its use for prescribed burning operations.

Two acres of the fuel break thinning would occur within the headwaters of densely stocked stands in intermittent or ephemeral stream riparian reserves. These treatments would be designed to be

consistent with the nine Aquatic Conservation Strategy objectives described in the Forest Plan (Appendix D).

Shelterwood Harvest with Green Tree Retention (31 acres; 2% of treatments)

These units are within the matrix-roaded recreation land allocation as described in the Forest Plan, where "Timber yields will result from activities required to attain the desired future condition of the landscape."[88] There is no riparian reserve land allocation in these stands. The size of openings on lands allocated to matrix-roaded recreation must average five acres or less.[89] A shelterwood harvest with green tree retention would meet this requirement. The objective of this prescription is to remove diseased and excess trees, creating favorable growing space for the regenerated disease-resistant trees, while retaining fire and disease resistant, larger overstory trees. These stands are experiencing high levels of mortality and increased decadence; however some large live relatively healthy trees do exist in these units to provide seed and shelter for natural regeneration. The overmature condition of these stands makes them susceptible to increased activity (outbreaks) of insects and disease. Shelterwood harvest will regenerate younger trees that are more resilient to drought, insects, disease and fire.

All merchantable sugar pine, Jeffery pine, ponderosa pine and incense-cedar would be retained in the treatment units unless the tree is in poor health and is not expected to survive for 15 years or more. [90] Poor health could be caused by blister rust infections, disease, insect attacks or weather damage such as lighting or snow breakage.

Hardwoods would also be retained (Chapter 2.4.1, #6). Green tree retention areas will be maintained on 15% of the unit area to provide older-stand components for late successional species habitat requirements[91] and replacement snags. [92] All other trees would be removed.

Following harvest, fuels reduction and site preparation for natural regeneration would be by tractor piling of debris followed by burning of the debris piles. The units would be allowed to naturally regenerate using the residual shelterwood trees as a seed source. Stocking exams would be done to determine if stocking is adequate to meet Forest stocking standards, and if stocking is unsuccessful at the end of 5 years, the units would be planted with disease-resistant species such as sugar pine, ponderosa pine or incense cedar the actual species composition used being determined on a unit-specific basis. Either container or bare root stock would be used. The trees would be planted at densities determined on a unit and site-specific basis, and would usually vary between 222 TPA (14' spacing) and 436 TPA (10' spacing).

Regeneration Harvest with Green Tree Retention (27 acres; 2% of treatments)

These units are within the matrix-commercial woods products emphasis land allocation in the Forest Plan where "The purpose of this prescription [land allocation] is to obtain an optimum timber yield of wood fiber products from productive forest lands within the context of ecosystem management."[93]

[88] USDA 1995, page 4-64 through 4-66
[89] USDA 1995, page 4-65
[90] Petersen 2008b
[91] USDA 1995, page 4-61
[92] USDA 1995, page 4-14, 4-63
[93] USDA 1995, page 4-67

There is no riparian reserve land allocation in these stands. These stands are exhibiting poor growth, high levels of tree mortality and increased decadence. Due to the degree of decadence and disease presence, an intermediate treatment (thinning) would not meet management objectives to manage for healthy and vigorous stands. Regeneration of these stands is needed to develop vigorous stands that would be resilient to drought, insects, disease and fire. As requested by the District Ranger, only understocked and overmature stands that needed to be treated in this management cycle (within the next 3 to 20 years) were identified at this time. If the stands are healthy enough to be managed in 20 years or more, or if thinning would effectively move the stand toward desired future conditions they were not included for this treatment. These stands are experiencing increased activity from insects and diseases. Regeneration of these stands is needed to develop vigorous stands that become resilient to drought, insects, disease and fire over time.

All merchantable sugar pine, Jeffery pine, ponderosa pine and incense-cedar would be retained in the treatment units unless the tree is in poor health and is not expected to survive for 15 years or more. Hardwoods would also be retained. Green tree retention areas will be maintained on 15% of the unit area to provide older-stand components for late successional species habitat requirements[94] and replacement snags.[95] All other trees would be removed.

Adequate large, relatively healthy trees capable of providing seed for natural regeneration do not exist in the stands. Following harvest, fuels reduction and site preparation for natural regeneration would be by tractor piling of debris followed by burning of the debris piles. The units would be planted with disease-resistant species such as sugar pine, ponderosa pine or incense cedar the actual species composition used being determined on a unit-specific basis. Either container or bare root stock would be used. The trees would be planted at densities determined on a unit and site-specific basis, and would usually vary between 222 TPA (14' spacing) and 436 TPA (10' spacing). Stocking exams after five years will determine if stocking is adequate to meet Forest Service stocking standards. If stocking is inadequate then the units would be inter-planted.

Reduce Hazardous Fuels Conditions

Each of the vegetation treatments described above will reduce fuel loadings and ladder fuel to reduce the potential for crown fire initiation (ladder fuels) and spread (moving from tree canopy to tree canopy). In units treated through a timber sale contract the purchaser will be responsible for disposing of all activity fuels. In the biomass removal units (Table 4), material down to 5 inches will be removed, while retaining required downed woody debris levels (Chapter 2.4, #4 and #5, #5a).

After the purchaser removes activity fuels in commercial units, there may still be residual fuels on site that exceed desired levels as required in the resource protection measures (small sub-merchantable trees, larger trees that are non-merchantable because of defects or, biomass if there is not a commercial market for it). These fuels are collectively referred to as sub-merchantable fuels. Sub-merchantable fuels will also be removed to reduce fuel loading and/or fuel continuity, however, desirable amounts of downed woody debris and snags will be retained for wildlife habitat and other

[94] USDA 1995, page 4-61
[95] USDA 1995, page 4-14, 4-63

resource benefits. All snags and down logs greater than 19 inches diameter will be retained (unless they are safety concerns or within a skid trail, temporary road location, or landing site) and a minimum of 1.5 snags per acres greater than 15 inches in diameter and 20 feet in height will also be retained. Snags felled for safety reasons will be left on site (Chapter 2.4, #4). An average of 5 logs per acre will be retained. Additionally an average of 5 or 10 tons of downed material, depending on the unit's Forest Plan land allocation, will be retained on slopes less than 40% with a preference to have 4 to 6 logs per acre at the largest available diameter (Chapter 2.4, #5, #5a). Planned sub-merchantable fuel treatment for Alternative 2 includes treatment on site for 1,306 acres or 81% of all treatments (Table 3). Treatment on site includes any combination of the following depending on site-specific conditions after the thinning is completed: no additional treatment necessary, cutting down small or un-merchantable trees that would act as ladder fuels, mastication, chipping, lopping and scattering, concentrating fuels and burning concentrations, or under-burning. Mastication reduces forest vegetation in the stand by grinding, shredding or chopping material, and may be used in conjunction with any other fuel treatments. Mastication can lower fuel bed depth, raise crown base height, and increase fuel-ground (soil) contact to promote decomposition of fuels. The goal is to create fuelbeds that support slowly spreading fires that are easily controlled.

If burning is used a specific burn plan would be developed and approved prior to implementation. The burn plan would minimize the potential for adverse effects to human health and forest resources. This plan would include prescribed fire prescriptions, firing/ignition procedures, smoke management and air quality requirements, holding procedures, signing, traffic controls, and an escape fire contingency plan.

Provide Forest Products

The treatments described above are expected to produce approximately 9.4 million board feet of merchantable saw timber and 15,074 tons (bone dry) of biomass to local markets.

Road Work

The proposed action would decommission approximately 13.8 miles of road after use for vegetation treatments for the Salt project (Table 5, Figure 6). Approximately 9.5 miles proposed for decommissioning are unauthorized routes, meaning they are not officially within the Forest road system and are not included in the Forest Transportation Atlas. The remaining 4.3 miles are classified roads, meaning they are currently maintained and tracked as Forest Service System roads. A list of the roads to be decommissioned appears in Table 5. Road 30N08, 0.4 miles, which accesses the electrical transmission line would be closed to public access. [96]

Approximately 32.6 miles of road will be used to haul commercial timber and biomass from the project. Roads will receive some level of reconstruction, pre-haul maintenance, or reopening prior to use (Table 6). Reconstruction activities may include culvert upgrades, grading, rocking, paving, and drainage. Generally, reconstruction activities take place within the existing road prism. Maintenance

[96] The current management intention for this route is for it to be closed to the public (Harmon 2007, p. 7-26) but there is currently no barrier to public access on the ground (Paulo 2008).

is defined as work needed to bring the road back into its original condition. Maintenance activities include brushing, culvert replacement, grading, and rocking. Reopening of roads applies to the unauthorized routes. Road reopening activities include barrier removal, brushing, grading, and temporary culvert installation.

Table 5: Roads proposed for decommissioning in Alternative 2 (Same roads proposed for decommissioning in Alternative 3)

Road Number*	Road Segment (miles)
29N55A	0.6
30N07	0.7
30N07A	0.4
30N16Y	0.7
30N18C	1.0
30N45A	0.9
U29N31E	2.8
U29N55B	1.3
U29N55BA	0.2
U30N07A	<0.1
U30N07AA	0.1
U30N07AB	<0.1
U30N07AC	0.1
U30N07AD	0.2
U30N16YA	0.1
U30N18E	0.4
U30N27AA	0.6
U30N27H	0.2
U30N27I	0.2
U30N27J	0.1
U30N27O	0.2
U30N27Q	0.8
U30N28F	1.9
U30N28H	0.1
U36TRIO3B	0.1
TOTAL MILES	**13.8**

*Roads starting with a U are unauthorized routes; all others are classified roads.

Table 6: Miles of road pre-use work needed by type

Road Type	Pre-use Work Needed	Miles
System	Maintenance	5.0
System	None Needed	2.3
System	Reconstruction	17.1
Unauthorized	Reopen	8.1
TOTAL	**--**	**32.6**

Implementation

If approved, the actions would begin within one year of issuing the decision for this project. Forest Service crews, service contracts, and/or commercial timber sales may be used to implement these actions. Harvest operations will take approximately three years to complete, with possible contract extensions if deemed appropriate.

Following the completion of any timber sale contract requirements and close of the contract, subsequent actions can take place including sub-merchantable fuel treatments within the treatments with a commercial element, planting in the regeneration units and road decommissioning.

Design Features, Mitigation and Monitoring

Chapter 2.4 of this document describes the design features, mitigation measures, and monitoring for Alternative 2.

2.2.3 Alternative 3

This alternative was designed to address key issues identified during public and internal scoping. A key issue is a perceived or actual undesirable effect that would be caused by implementing the proposed action. We state that these issues were perceived because further analysis has determined that some of the anticipated effects of implementing Alternative 2 would not occur, while other anticipated effects would occur (Chapter 2.5 and Chapter 3). The differences in actions between Alternative 3 and Alternative 2 are summarized in the following bullets. See Chapter 1.7.1 for discussion of key issues that drove the development of Alternative 3.

- No regeneration harvest – green tree retention treatment: Units 37 and 40 eliminated
- Retain 60% canopy closure rather than 50% in all thinning units
- No thinning in ephemeral or intermittent riparian reserves: Sixteen units totaling 41 acres eliminated from intermittent thinning plus an additional 60 acres in plantation thinning units.
- No removal or downgrading of spotted owl habitat: 31 acres of Units 32 and 33C eliminated and five acres in Unit 37 already dropped above
- No construction of new temporary roads: 0.3 miles of temporary road eliminated
- No harvest where actions may be noticeable in the visible foreground of Highway 36: Three acres of Unit 45 eliminated

All other actions are the same between Alternative 2 and 3. Table 7 displays Alternative 3 activities. Table 8 shows vegetation treatment prescriptions, sub-merchantable fuel treatments, acres, logging systems, and the Forest Plan land allocation for each unit in Alternative 3. Figure 8 displays a map of the action proposed in Alternative 3.

Table 7: Vegetation treatments, logging systems, and connected road activity for Alternative 3

Timber Stand Activity	Alt. 3
Proposed Vegetation Treatments (acres)	
Intermediate Thinning	850
Shelterwood Harvest – Green Tree Retention	30
Shaded Fuel Break Thin	100
Regeneration Harvest - Green Tree Retention	0
Hand Fuel Treatment	14
Pre-commercial Thin**	421
Total Proposed Treatments (acres)	**1,415**
Yarding Systems (acres)	
Tractor Yarding	867
Helicopter Yarding	113
Sub-merchantable Fuel Treatment	
Treat on Site	1,158
Tractor Site Prep and Burn Piles	30
Hand Pile, Burn Piles	127
Tractor Jackpot Pile and Burn Piles	100
Tree Planting	0
Landings constructed (and existing)	9 (11)
Estimated Biomass (dry tons)	4,680
Estimated Timber Harvest Volume (thousands of board feet, MBF)	3,305
Road Activities	
Roads constructed (miles)	0
Roads maintained (miles)	5.0
Roads reconstructed (miles)	17.1
Temporary roads constructed (miles)	0.0
Miles of road closed	0.4
Miles of roads decommissioned	
Unauthorized roads decommissioned	9.5
Classified roads decommissioned	4.3
Total Miles of Roads Decommissioned	**13.8**
Borrow pit expanded for road surfacing	1

** Although we show that Alternative 3 would pre-commercial thin 421 acres, most plantation thinning activities would be precluded because most of the plantation stands are currently below 60% canopy closure and Alternative 3 would not thin below 60% canopy closure. Those that are over 60%canopy closure are only slightly over, and pre-commercial thinning them to 60%canopy closure would accomplish very little stocking reduction.

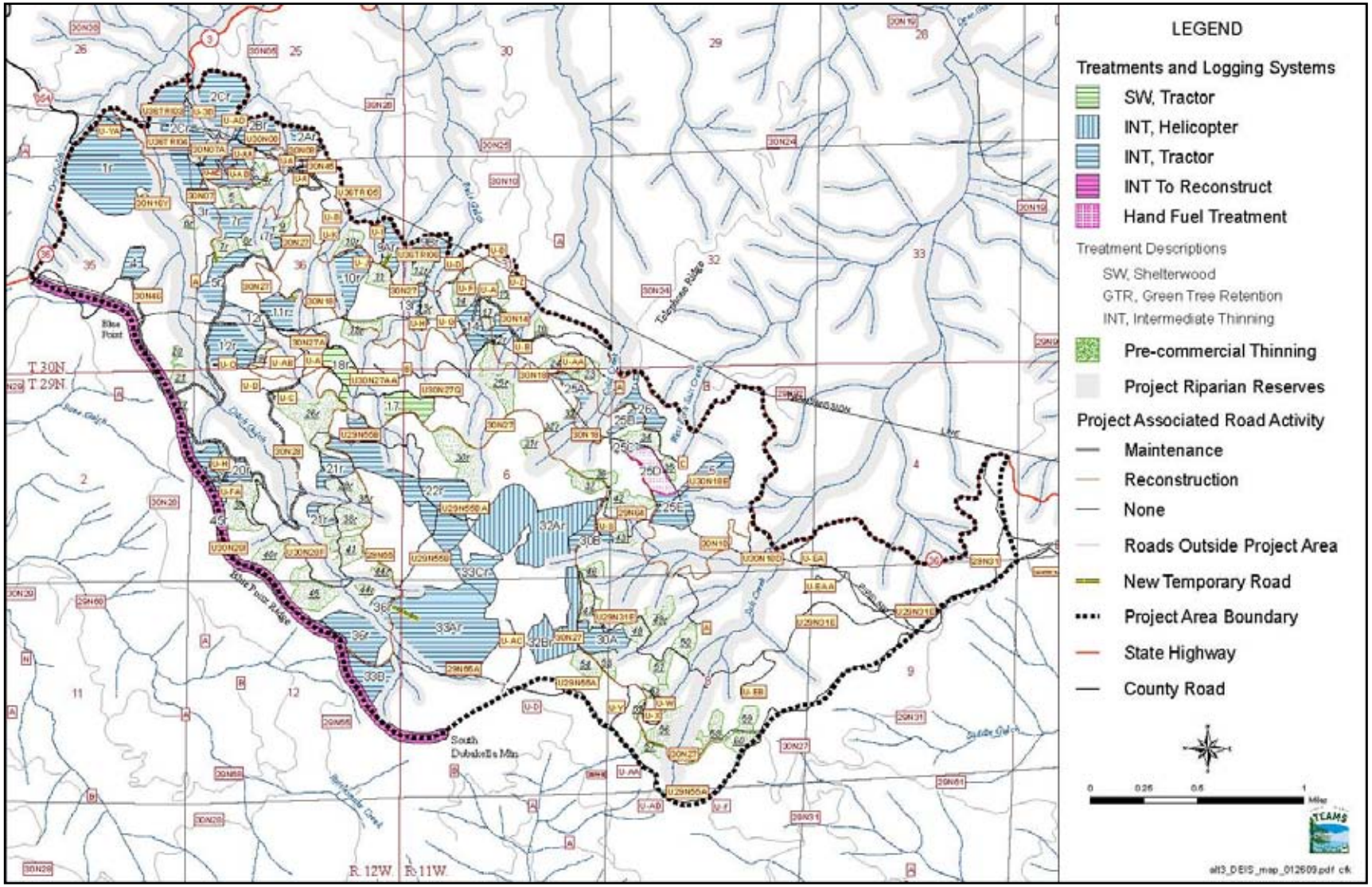

Figure 8: Map of Alternative 3 Units

Table 8: Alternative 3 - proposed treatments by unit

Unit****	Acres	Treatment Prescription*	Yarding System	Biomass *	Sub-merch Fuels Treat. *	Forest Plan Land Allocation **
1r	82	Intermediate Thin	Tractor	Yes	TOS	RRec
2Ar	9	Intermediate Thin	Tractor	Yes	TOS	RRec
2Br	44	Intermediate Thin	Tractor	Yes	TOS	RRec
2Cr	74	Intermediate Thin	Tractor	Yes	TOS	RRec
3r	7	Intermediate Thin	Tractor	Yes	TOS	RRec
4	8	Intermediate Thin	Tractor	--	TOS	RRec
5r	17	Intermediate Thin	Tractor	--	TOS	RRec & Wood
7r	17	Intermediate Thin	Tractor	Yes	TOS	RRec
9Ar	11	Intermediate Thin	Tractor	Yes	TOS	RRec
9Br	13	Intermediate Thin	Tractor	Yes	TOS	RRec
10r	19	Intermediate Thin	Tractor	Yes	TOS	RRec
11r	15	Intermediate Thin	Tractor	--	TOS	Wood
12r	30	Intermediate Thin	Tractor	--	TOS	Wood
13r	6	Intermediate Thin	Tractor	Yes	TOS	RRec
14	19	Intermediate Thin	Tractor	Yes	TOS	RRec
17	15	Shelterwood – Green Tree Retention	Tractor	--	TSP/BP	RRec
18r	15	Shelterwood – Green Tree Retention	Tractor	--	TSP/BP	RRec
20r	18	Intermediate Thin	Tractor	--	TOS	RRec & Wood
21r	16	Intermediate Thin	Tractor	--	TOS	Wood
22r	74	Intermediate Thin	Tractor	--	TOS	RRec & Wood
25A	8	Intermediate Thin	Tractor	Yes	TOS	RRec
25B	5	Intermediate Thin	Tractor	Yes	TOS	RRec
25C	4	Intermediate Thin	Tractor	Yes	TOS	RRec
25D	14	Hand Fuel Treatment	None	--	HP/BP	RRec
25E	34	Intermediate Thin	Tractor	Yes	TOS	RRec
26	12	Intermediate Thin	Tractor	Yes	TOS	RRec
30A	17	Intermediate Thin	Tractor	Yes	TOS	RRec & Wood
30B	13	Intermediate Thin	Tractor	Yes	TOS	RRec
32Ar	81	Intermediate Thin	Helicopter	--	HP/BP	RRec & Wood
32Br	32	Intermediate Thin	Helicopter	--	HP/BP	Wood
33Ar	97	Intermediate Thin	Tractor	--	TOS	Wood
33B	16	Intermediate Thin	Tractor	--	TOS	Wood
33Cr	21	Intermediate Thin	Tractor	--	TOS	Wood
36r	31	Intermediate Thin	Tractor	--	TOS	Wood
45r	100	Thin shaded fuel break	Tractor	--	TSJ/BP	RRec & Wood
***	421	Thinning in Plantations	None	--	TOS	
	1,415					

*Thinning prescriptions for Alt. 3 would retain 60% canopy closure. Further descriptions of treatments are fund under Alt. 2.
TOS – Treat on Site; TSP – Tractor site prep; BP – Burn piles; HP – Hand pile; TSJ – Tractor jackpot pile
** Forest Plan land allocations are described in Chapter 1.3 of this document. RRec = Matrix-roaded recreation; Wood = Matrix-commercial wood products emphasis.
*** Plantation thinning would occur in sixty different units throughout the project area.
**** “r” denotes the “remainder” of the unit - a smaller unit size then the same unit in Alternative 2.

2.3 Alternatives Considered But Not In Detail

2.3.1 Alternative 4

Alternative 4, which would treat over 2,300 acres within the analysis area, was considered by the interdisciplinary team to meet the purpose and need for this project but deleted from detailed analysis. This alternative would treat approximately 681 acres more than the proposed action (Alternative 2). The additional treatments included 370 acres of regeneration harvest with green tree retention, 247 additional acres of intermediate thinning, and 38 acres of overstory removal. This alternative would have done more to move the area toward the three objectives for this project (improve forest health and resiliency; reduce hazardous fuels; and, provide timber products). Preliminary review of this alternative, however, identified that some of the regeneration harvest with green tree retention stands could be deferred for treatment at another time. The District Ranger directed that if a stand was healthy enough to be managed in 20 years or more, or if thinning would effectively move the stand toward desired future conditions they were not to be prescribed for regeneration harvest in the final proposed action. Additionally some of the thinning and regeneration harvest planned in this alternative would occur over areas of potential soil instability, or there were public safety concerns. For these reasons the responsible official decided not to consider this alternative in detail.

2.4 Resource Protection Measures & Monitoring

2.4.1 Resource Protection Measurers

Project design features and mitigation measures, collectively called resource protection measures in this document are intended to avoid, eliminate or reduce unintended and undesirable effects of the proposed activities. A resource protection measure implemented in the earliest stages of project design excluded all unstable or potentially unstable areas from further consideration.[97]

Table 9 displays resource protection measures that would be an integral part of implementing Alternative 2 or 3.

[97] Jasso 2007, p. 7

Table 9: Resource protection measures

Resource Protection Measure	Units/Location*	Alt.	Resource Protection #
Wildlife			
Limited Operating Periods (LOPs) would be implemented to avoid direct adverse impacts to the northern spotted owl. These LOPs may be lifted if surveys using currently accepted protocols indicate specific areas are not occupied by breeding owls, or with the mutual consent of the U.S. Fish and Wildlife Service and the U.S. Forest Service. Feb 1 thru Sept 15: all vegetation removal/cutting/burning will be prohibited through September 15 within suitable nesting/roosting habitat.	32, 33C	2***	1
Limited Operating Periods (LOPs) Feb 1 thru July 10: all noise-and smoke generating activities will be prohibited within ¼ mile of suitable spotted owl nesting/roosting habitat.	30A, 30B, 32, 33C, 38 and 43. South Dubakella Mt. ridgeline just past the SE corner of unit 33B Plantations 30, 43, 46, 47, 53 and 54	2 & 3	2
Should a new goshawk territory be discovered prior to or during implementation, conferencing with a biologist will occur and a buffer zone and limited operating period will be established.	All units	2 & 3	3
Snags and Downed Woody Debris			
Existing snags and down logs greater than 19 inches in diameter will be retained (unless there are safety concerns or the snag is within a skid trail, temporary road location, or landing site).[98] An average of 1.5 snags per acre greater than 15 inches in diameter and 20 feet in height will also be retained.[99] Snags felled for safety reasons would be left on site.	All units	2 & 3	4
Maintain 5 logs per acres in contact with the soil surface.[100] Desired logs are about 20 inches in diameter, about 10 feet long and represent the range of decomposition classes.	All units		4a
Maintain an average of 10 tons of downed material per acre on slopes less than 40% with a preference to have 4 to 6 logs per acre at the largest available diameter. Where feasible, maintain the same amount on slopes over 40%.[101]	1, 2A, 2B, 2C, 3, 4, 5, 7, 9A, 9B, 10, 13, 14, 17, 18, 25A, 25B, 25C, 25E, 26, 30A, 30B	2 & 3	5
Maintain an average of 5 tons of downed material per acre on slopes less than 40% with a preference to have 4 to 6 logs per acre at the largest available diameter. Where feasible, maintain the same amount on	11, 12, 20, 21, 22, 32, 33A, 33B, 33C, 36, 37, 40, 45	2 & 3	5a

[98] USDA 1995, page 4-63 "..recommends that no snags over 20 inches dbh be marked for cutting." This protection measure exceeds that recommendation.
[99] USDA 1995, page 4-62
[100] USDA 1995, page O-1
[101] USDA 1995, page 4-65, D.16

Resource Protection Measure	Units/Location*	Alt.	Resource Protection #
slopes over 40%.[102]			
Retain hardwoods that have a reasonable chance of surviving and thriving after stand treatments.	All units	2 & 3	6
Aquatics and Soils			
All applicable Best Management Practices are included in Appendix C of the EIS	All units	2 & 3	7
No full bench skid trails would be constructed. Skid trails, when possible, would be located on ridge tops, flat benches, or existing skid trails to minimize soil displacement and enhance drainage.	All ground based units	2 & 3	8
For all ground-based operations skid trails the distance between skid trails will be a minimum of 100' measured center to center, except where converging. All material would be skidded with the leading end clear of the ground.	All ground based units	2 & 3	9
Access to skid trails that intersect Forest Roads would be blocked with available material (either large wood or boulders).	All ground based units	2 & 3	10
Excess activity created slash and existing surface fuels would be machined piled or masticated on slopes less than 35% and hand piled or lopped and scattered on slopes greater than 35%. All piles, except those designated for retention, would be burned.	Units where biomass will not be removed, (Alt. 2 -- 17, 18, 25D, 37, 40, 45); (Alt. 3 -- 4, 5, 11, 12, 17, 18, 20, 21, 22, 25D, 32, 33A, 33B, 33C, 36, 45)	2 & 3	11
Masticated material will be kept to a depth of 3 inches or less OR if the masticated material will be burned it will be burned in the spring (moist soil conditions).	Units where biomass will not be removed, (see above)	2 & 3	11a
Track line machines generally restricted to slopes less than 35%. End-lining will be used in those areas where skid trails may exceed 35%. Skid trails located on small inclusions of steep areas exceeding 35% would be covered with woody material larger than 9" to divert flow off the trail [C6.602 or equivalent].	All ground based units.	2 & 3	12
New or reconstructed landings would be shaped to disperse drainage and direct run-off away from watercourses at the time of construction. Rock armoring and/or silt fences with straw bales may be used as necessary to direct water to areas of suitable drainage and to capture sediment (all materials must be provided from weed-free sources). All new landing fill slopes and road fill slopes (greater than 100 sq. ft) would be mulched and the mulch would be maintained throughout the life of the project [C6.602 or equivalent].	Landings	2 & 3	14
Any landings used during wet weather would be adequately rocked to prevent erosion [See Shasta-Trinity National Forest Wet Weather/Winter Operating Procedures (WWOPs)].	Landings	2 & 3	15
When heavy equipment such as a harvester is used off a designated skid trail in the specified units (due to fine textured soils), limit the number of passes to 1 and no more than 2 passes, over the same piece of ground.	9A, 14, 17, 18, 25A, 25B, 25C, 25E, 30A, 30B, 26 and 40	2 & 3	16
Locate water drafting sites to minimize adverse effects on stream channel stability, sedimentation, and in-stream flows needed to maintain riparian resources, channel conditions, and fish habitat.[103]	All units	2 & 3	16a

[102] USDA 1995, page 4-67, D.7.
[103] USDA FS, USDI BLM 1994, page C-37

Resource Protection Measure	Units/Location*	Alt.	Resource Protection #
If water drafting occurs in coho slamon critical habitat (there is no critical habitat within the project area so this would occur outside of the project area) the National Marine Fisheries Service water drafting specifications[104] will be adhered to.	Miles outside of project area before reaching critical habitat[105]: Ditch Gulch - 0.4 miles; West Fork - 1.2 mi.; Salt Creek - 1.4 miles		
Riparian Reserves**			
Perennial and Non-perennial: No treatment or equipment within any of the riparian reserves.	All units in Alternative 3 only	3	17
Perennial: No thinning and no equipment in perennial stream riparian reserves. Riparian reserves for perennial streams for this project are 300 feet for fish bearing streams and 225 feet for non-fish bearing streams.	1, 2C, 4, 5	2***	18
Non-Perennial Streams: The non-perennial riparian reserve is defined for this project as a protection zone 150 feet wide measured along the slope from the high watermark up the hillslope. No new landings would be located inside of riparian researves. At least 60% of overstory canopy remains after thinning. Designate/approve riparian reserve crossings in coordination with the fisheries biologist and/or hydrologist. Equipment will be excluded from operating on active or potentially active landslides and thinning will be prescribed by a geoscientist. Selective commercial thinning within riparian reserves, adjacent to equipment exclusion zones (EEZs), would be accomplished through a combination of mechanical operations and hand thinning. Hazard trees within riparian reserves must be dropped and retained on site if greater than 16" dbh. Hand piles of thinned fuels would be placed outside of EEZs and burned in the riparian reserve in a manner that leaves at least 50% of the localized area unburned at any given time. In addition, hand piles would be placed in a checkerboard pattern whenever possible (not one pile directly above another). When fuels treatments involve area ignition, use backing fire in riparian reserves. There would be no ignition within riparian reserves associated with understory burning; however, fire would be allowed to creep into riparian areas.	1, 2A, 2B, 2C, 3, 4, 5, 7, 9B, 10, 11, 12, 13, 21, 25A, 26, 32, 33A, 36, 45	2***	19
Equipment Exclusion Zone: No equipment and no thinning allowed within the equipment exclusion zone (EEZ). The EEZ is a portion of the riparian reserve defined for this project as the area that extends 50 feet (slope distance) from the high watermark on slopes greater than 30% and extends 25 feet (slope	All units	2***	20

[104] NMFS 2001
[105] Location of coho salmon critical habitat is shown in the Fisheries Biological Assessment (Vanosdall 2009a)

Resource Protection Measure	Units/Location*	Alt.	Resource Protection #
distance) on slopes less than 30% OR extends to the inner gorge , which ever is greater.			
Erosion Control Measures			
Seed all appropriate decommissioned roads, temporary roads, landings, and primary skid trails with native grass seed and/or non-persistent cereal grains. Mulch all seeded areas with certified weed-free straw.	All units.	2&3	21
Dedicate no more that 15% of a harvest unit to primary skid trails and landings.	All units	2 & 3	22
Decommissioning of roads may include removing culverts, ripping road surfaces, out-sloping to maintain hill slope hydrology (hydrologic connectivity) as well as other measures to meet site-specific needs. The goal is to control surface runoff, erosion, and mass failure. Seed (with native grass seed and non-persistent cereal grains), and mulch on selected roads as needed.	Decommissioned roads	2 & 3	23
Minimize soil erosion by mulching primary skid trails with straw or fine slash (achieve 50% or more cover). Install waterbars at major breaks in slope and regular intervals along the trail.	All ground based units	2 & 3	24
At the end of project activities, a layer of ground cover should occur over at least 50% of the activity area. Forest Service Handbook 2509.18 (2.2.1 Soil Productivity)	All ground based units	2 & 3	25
Rip (with winged subsoiler to 18 inches deep) and mulch, all temporary roads, skid roads and temporary landings identified by the project soil scientist.	Temporary roads, skid roads and temporary landings	2 & 3	26
Reuse existing primary skid trails and landings whenever possible.	All ground based units	2 & 3	27
Slash and existing surface fuels must be hand piled or lopped and scattered on slopes greater than 35%.	All ground based units	2 & 3	28
Ground-based mechanical equipment will only operate in these specified units (fine-textured soils, non-rocky) when the soils are dry down to 8 inches.[106]	2A, 2B, 2C, 7, 9A, 9B, 10, 11, 13, 14, 17, 18, 25A, 25B, 25C, 25D, 25E, 26, 30A, 30B, 40.	2 & 3	29
Cultural			
Identified cultural/heritage sites will be flagged and avoided. If unanticipated discoveries are found, ground disturbing activities will stop until the Trinity Archeologist can assess the situation	All units	2 & 3	30
Sensitive Plants and Fungi, Forest Plan Endemics, and Preventing the Spread of Noxious Weeds			
Contract Provision C/Ct6.25# or equivalent would be included in all contracts. This provision extends protection to any Sensitive plants or fungi listed on the Regional Forester's Sensitive Species List and provides for halting operations in the vicinity of newly discovered populations after completion of the Biological Evaluation NEPA document.	All units	2 & 3	31
Exclude proposed treatments within buffered populations of clustered (brownie) and mountain lady's-slipper orchids in Unit 11, to avoid any impacts to these species. Exclude proposed treatments within buffered populations of Peanut sandwort in Units to avoid any impacts to this species	11 32, 33A	2 & 3	32

[106] The resource objective is to operate on dry soils. This may occur from June 1, through September 30 – but could occur outside of these dates as well.

Resource Protection Measure	Units/Location*	Alt.	Resource Protection #
Apply Aquatic Conservation Strategy objectives #8 and #9 for maintenance of riparian species diversity to maintain Sensitive fungi habitat components.	1, 2A, 2B, 2C, 3, 4, 5, 7, 9B, 10, 11, 12, 13, 21, 25A, 26, 32, 33A, 36, 45	2 & 3	33
Exclude treatments within population areas in Units to protect populations of serpentine goldenbush and Dubakella Mountain buckwheat.	14, 17, 18, 22, 30A, 32, 45 (and just outside unit 1) 21, 22, 45	2 & 3	34
Contract Provision C6.36/ (5/01) [equipment cleaning] or equivalent would be included in the contract to reduce introduction of noxious weeds.	All units	2 & 3	35
Avoid disturbance to Canada thistle populations in Units 2 and 22 to prevent spread of the weed.	2 and 22	2 & 3	36
Surface organic matter and large woody material (retained as listed elsewhere in this table) will maintain Sensitive fungi habitat components.	All units.	2 & 3	37
Geologically Sensitive Areas			
All geologically sensitive areas including unstable or potentially unstable areas have been field-verified by the project geologist and are excluded from proposed project activities through individual unit layout, prescription, and road location modification.	All units	2 & 3	38
Visual Resources			
Vegetation treatments within an approximately 100-foot visual corridor adjacent to Highway 36 have the following design features within this corridor: A 60% canopy closure with random tree spacing will be retained. Some small groupings of young conifers and deciduous vegetation will be retained. Marking will be done on the backsides of the trees away from Highway 36. Low stumps (less than 6 inches) parallel to the terrain and blacken the cut face within the visual corridor. A 'clean forest floor' look will be achieved adjacent to the highway by removing, chipping and/or masticating slash. Existing skid roads and existing landings will be used where possible. Locate new landings away from the highway. Trees and understory vegetation will be removed to enhance views of specimen (legacy) trees and hardwoods as seen from the highway.	1, 2C, 2B, 2A, 9A, 9B, 26	2 & 3	39
Air Quality			
Reduction of Fuels Loading - Pretreatment methods will be used to minimize smoke emissions and/or reduce fuel loadings, such as biomass removal, and public firewood utilization opportunities.	All units (if burning occurs)	2 & 3	40
Fuel Moisture Content - The burn prescription shall specify an acceptable range of fuel moisture contents	All units (if burning occurs)	2 & 3	41

Resource Protection Measure	Units/Location*	Alt.	Resource Protection #
for the burn to proceed. Allow for adequate cure time before igniting slash material, and cover hand-piled slash where necessary for more efficient burning conditions.			
Smoke Management - A Smoke Management Plan (contained in all prescribed fire plans) must be submitted and approved by the NCAQMD prior to using prescribed fire	All units (if burning occurs)	2 & 3	42
Burn Plan - All burning on Forest Service managed land must have an approved prescribed fire plan prior to any ignitions. Burning activities will be coordinated with affected landowners and control agencies.	All units (if burning occurs)	2 & 3	43
Fugitive Dust - Driving speeds on native surface roads are not expected to exceed 15 mph. This speed control is accepted fugitive dust mitigation. Native surfaced roadways will be watered to suppress dust when needed.	Haul Routes	2 & 3	44
The burns will be conducted when the prevailing wind direction is away from Class I area	All units (if burning occurs)	2 & 3	45

* In Alternative 3 some units are smaller in size than the corresponding unit in Alternative 2. In the unit table and map these units are denoted with an “r” after the name. For simplicity we have eliminated the “r” from this table. **See Figure 7 or Appendix D for riparian reserve zones graphic, a table of project specific riparian restrictions, and explanation of how the project meets Aquatic Conservation Strategy objectives. *** Only applies to Alternative 2 because units or area affected, such as riparian reserves, are not treated in Alternative 3.

2.4.2 Monitoring

Forest Plan implementation and effectiveness monitoring will occur as needed. The following specific monitoring will occur.

- Best Management Practices (BMP) and soil productivity: BMP implementation, effectiveness and soil productivity will be monitored during the project and post-project by project administrators. See Appendix C for more information about BMPs and their monitoring.
- Reforestation: A certified silviculturist or other qualified professional will monitor regeneration harvest units to verify that minimum stocking standards are achieved within 5 years of final harvest.

2.5 Alternatives Compared

This section summarizes the impacts and outputs of each alternative to compare and contrast their differences. Table 10 compares the activities proposed for each alternative.

2.5.1 Meeting the Purpose and Need

The analysis, which is summarized in Table 11 and Figure 9 through 10, show that Alternative 1 does not meet any of the purpose and need objectives for this project. Alternative 2 meets the purpose and need to a greater degree than Alternative 3 in every category. Alternative 2 would improve forest health by reducing considerably more acres to a desirable stocking level and by regenerating more acres that are no longer meeting their growth and yield potential (Figure 9). Alternative 2 would reduce hazardous fuels only slightly better than Alternative 3 by reducing the risk of crown fire on more acres and reducing potential fireline intensity on more acres than Alternative 3 (Figure 9). Alternative 2 would provide more forest products than Alternative 3 (Figure 11 and Figure 12). Alternative 2 would provide for a viable ground based timber sale, Alternative 3 would not (Figure 10). The helicopter portion of the timber sale would not be viable by itself with either alternative; however, the helicopter unit could be combined with helicopter units in a future project in an adjacent watershed, to make this unit more economically feasible.

Alternative 2 would cost $573,948 to implement all activities and Alternative 3 would cost $748,515.

Table 10: Comparison of vegetation treatments, logging systems, connected road activity by alternative

Timber Stand Activity	Alt. 1	Alt. 2	Alt. 3	Difference Between 2 & 3
Proposed Vegetation Treatments (acres)				
Intermediate Thinning*	0	963	850	113
Shelterwood – Green Tree Retention	0	31	30	1
Shaded Fuel Break Thin*	0	103	100	3
Regeneration Harvest – Green Tree Retention	0	27	0	27
Hand Fuel Treatment*	0	14	14	0
Pre-commercial Thin	0	481	421	60
Total Proposed Treatments (acres)	**0**	**1,619**	**1,415**	**204**
Yarding Systems (acres)				
Tractor Yarding	0	986	867	119
Helicopter Yarding	0	138	113	25
Sub-merchantable Fuel Treatment (acres)				
Treat on Site	0	1,306	1,158	148
Tractor Site Prep and Burn Piles	0	58	30	28
Hand Pile, Burn Piles	0	152	127	25
Tractor Jackpot Pile and Burn Piles	0	103	100	3
Tree Planting (acres)	0	27	0	27
Landings Constructed (and existing landings used)	0	38 (19)	9 (11)	29 (8)
Estimated Biomass (dry tons)	0	15,073	4,680	10,393
Estimated Timber Harvest Volume (thousands of boardfeet, MBF)	0	9,365	3,305	6,060
Road Activities				
Roads constructed (miles)	0	0	0	0
Roads reconstructed (miles)	0	17.1	17.1	0
Roads maintained (miles)	0	5.0	5.0	0
Temporary roads constructed (miles)	0	0.3	0	0.3
Roads decommissioned (miles)				
Unauthorized routes decommissioned		9.5	9.5	0
Classified roads decommissioned	0	4.3	4.3	0
Total Miles of Roads Decommissioned	**0**	**13.8**	**13.8**	**0**

* Though the name of the treatment is the same the amount of material removed would be less in Alternative 3 than in Alternative 2 – 50% canopy closure would be retained in Alternative 2; 60% canopy closure would be retained in Alternative 3.

Table 11: Comparison of alternatives in measures of success

Purpose & Need	Alt 1	Alt. 2	Alt. 3	Difference Between Alt. 2 & 3
Improve forest health and resiliency				
Acres of overstocked stands thinned to stand density index of 200-250	0	1,087	0	1,087
Acres of overstocked plantations thinned to approximately 150 trees per acres	0	481	0	481
Acres not meeting growth and yield potential that are regenerated by treatments	0	58	30	28
Reduce hazardous fuels				
Reduction in acres of Active Crown Fire Potential	0	5	5	0
Reduction in acres of Passive Crown Fire Potential	0	1,110	1,060	50
Reduction in acres requiring indirect fire attack methods (Flame length reduced to 8 feet or less)	0	780	770	10
Increase in acres that could be direct attacked with hand crews (Flame length reduced to 4 feet or less)	0	900	870	20
Provide timber products				
Merchantable Timber Harvested (MMBF)	0	9.4	3.3	6.1
Biomass Harvested (BDT)	0	15,073	4,680	10,393
Timber sale viability ground based only. Total Sale Value	0	Viable Timber Sale. Total Sale Value $316,767	Not a Viable Timber Sale. Total Sale Value -$33,355	Alternative 2 is Viable Alternative 3 is Not Viable
Total stumpage value for helicopter unit (Pond log value minus stump to Mill costs per ccf. Positive number = viable sale).	0	Not a Viable Timber Sale Total Sale Value -$20,682	Not a Viable Timber Sale. Total Sale Value -$281,981	Neither Alternative is Viable

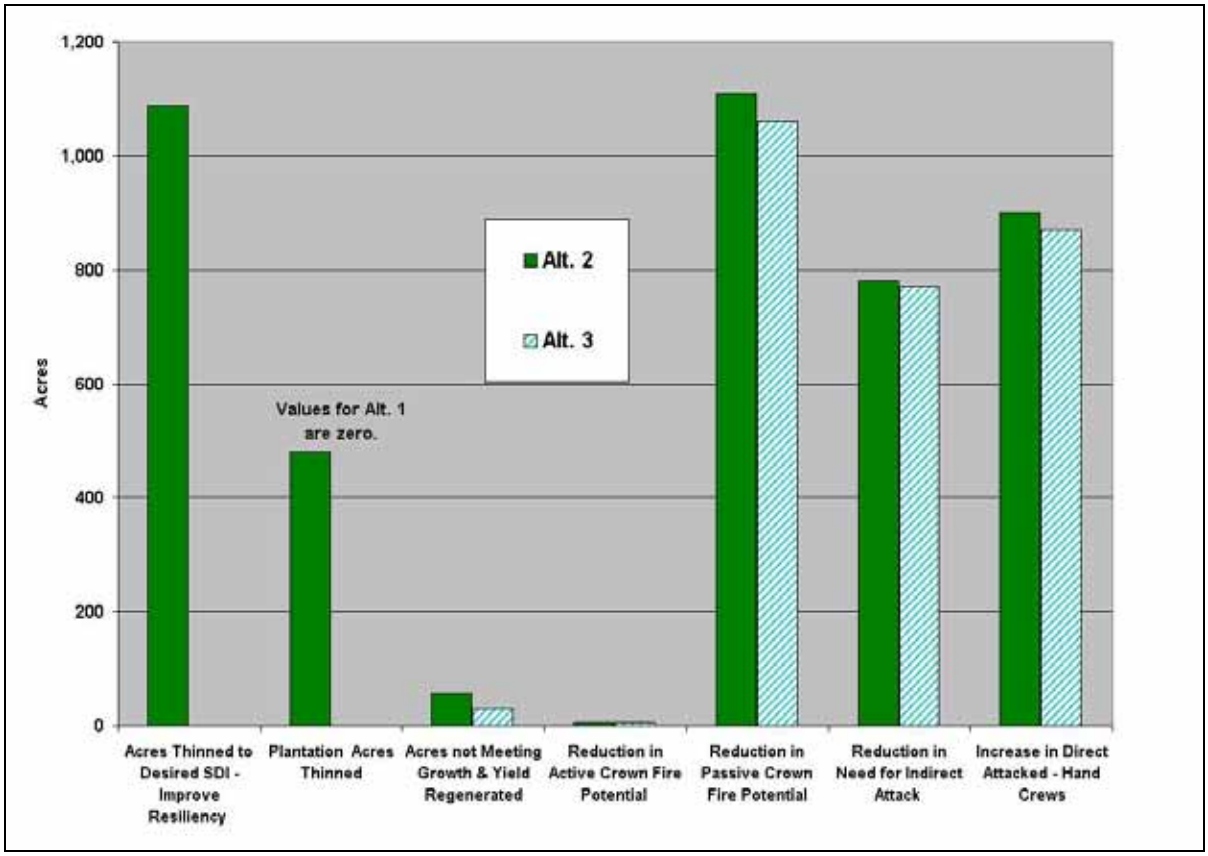

Figure 9: Forest health, resiliency and reduction hazardous fuels comparison by alternative

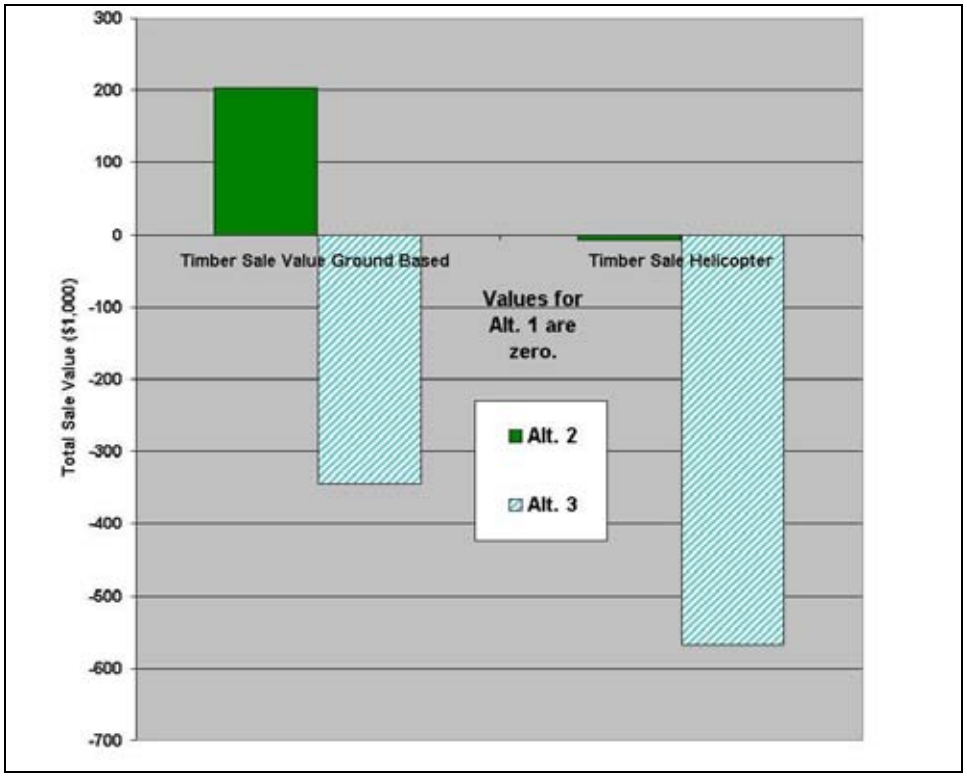

Figure 10: Timber sale viability comparison by alternative - meeting timber products objectives

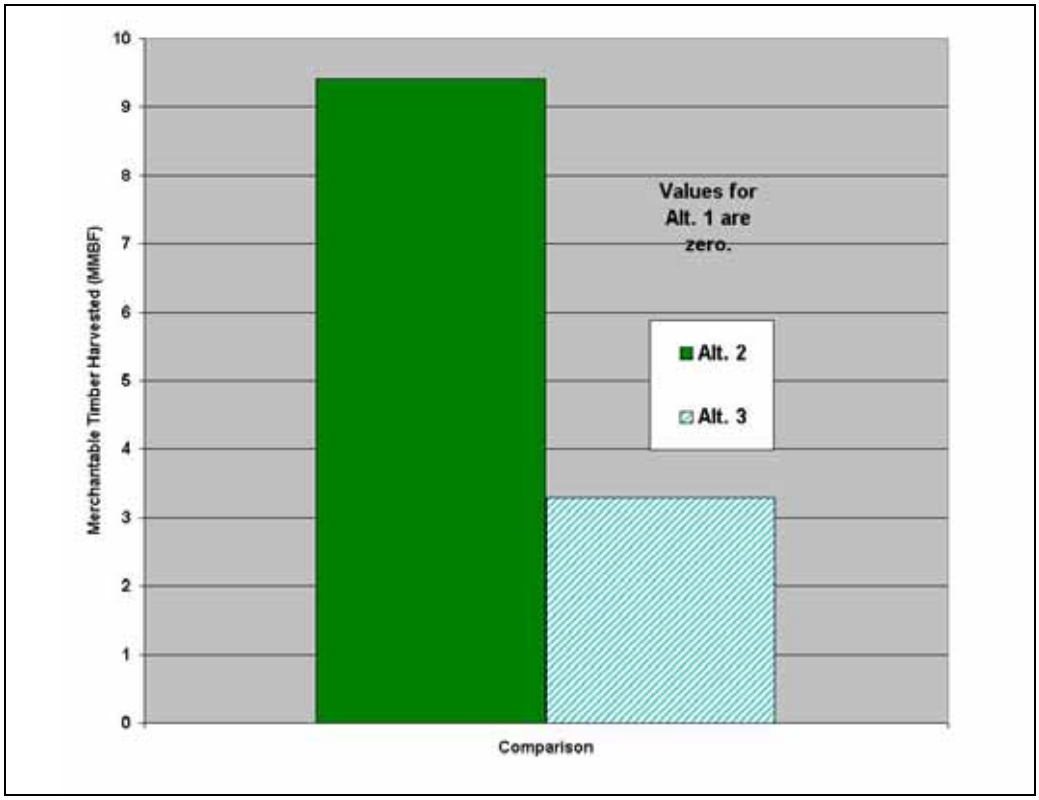

Figure 11: Timber volume comparison by alternative – meeting timber products objective

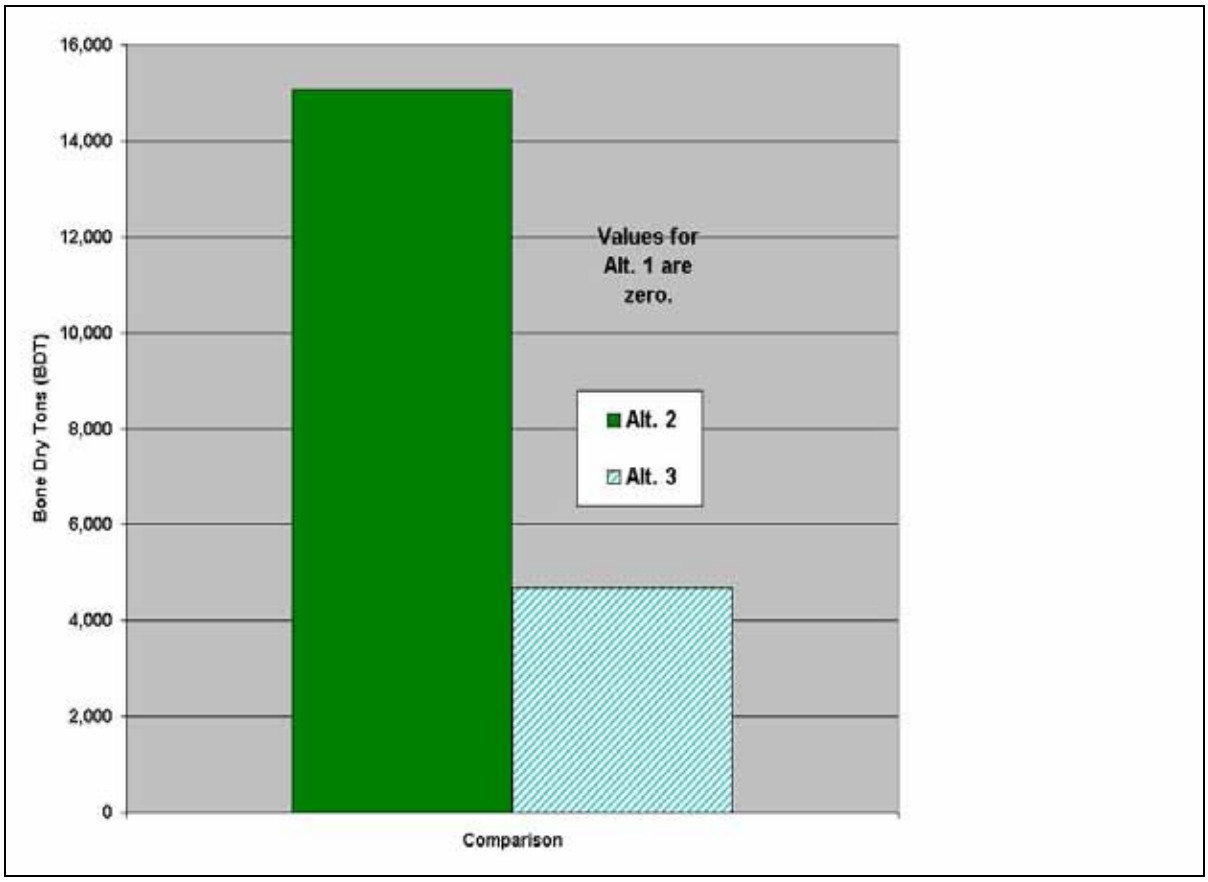

Figure 12: Biomass product comparison by alternative – meeting timber products objective

2.5.2 Summary Analysis of Key Issues by Alternative

For further analysis and support for conclusions summarized here please see Chapter 3. The direct, indirect and cumulative effects analysis of key issues for each alternative is summarized by issue indicators in Table 12. The analysis concludes that Alternative 1 will have no affect on any of the key issues. Analysis indicates that some of the perceived negative effects of implementing Alternative 2 would not occur. Proposed regeneration harvest in Alternative 2 would not increase the risk from fire; it would reduce crown fire potential and fireline intensity in Units 37 and 40. Thinning to 50% canopy closure in Alternative 2 would not reduce or eliminate any acres of potential wildlife habitat compared to thinning to 60% canopy closure in Alternative 3. Thinning in riparian areas in Alternative 2 will have no measurable effect to stream sedimentation, fish habitat or suitable wildlife habitat availability. The effect of temporary road construction on soil disturbance and wildlife habitat is not significant because it is very small in size, 0.4 acres and would not occur in sensitive areas, and would be replaced by wider skidding trails in Alternative 3 effecting approximately 0.6 acres, or slightly more acres (0.2 acres) more than Alternative 2.

Implementation of Alternative 2 would have effects on the following key issues. Alternative 2 would downgrade 28 acres of moderate nesting and roosting northern spotted owl habitat and remove 5 acres of foraging habitat. Alternative 3 would not treat these 33 acres therefore there would be no removal or downgrading of habitat. Construction of 0.3 miles of road in Alternative 2 would generate a small short-term increase of 1.6 tons of sediment over the life of the project. Alternative 3 would not construct temporary roads and would therefore not generate potential sediment from that action. Both alternatives would result in a long-term decrease of 45.9 tons of sedimentation annually through road decommissioning. And finally, Alternative 2 would result in visible disturbance on three acres in the visual foreground of Highway 36; Alternative 3 would not treat those three acres so activity would not be visible in the foreground.

Table 12: Comparison of alternatives by key issues

Issue Indicator	Alternative 1	Alternative 2	Alternative 3
Key Issue **Regeneration Harvest - green tree retention in the proposed action may increase risk from fire**			
Reduction in acres of Crown Fire Potential in Unit 37 and 40	0	27	0
Increase acres where direct attack is likely effective	0	10	0
Key Issue **Retaining less than 60% canopy closure after thinning could affect wildlife habitat**			
Acres of suitable threatened, endangered, sensitive or management indicator species habitat eliminated due to retaining 50% rather than 60% canopy closure	0	0	0
Key Issue **Thinning in riparian reserves may have unintended effects on the watershed, fisheries and wildlife.**			
Estimated tons of potential sedimentation due to riparian thinning.	0	No measurable sedimentation	0
Effects to fish habitat (pool depth, channel form, temperature) from thinning in riparian reserve	0	No direct effect to fish habitat (ephemeral and intermittent streams do not provide fish habitat) No indirect effect to downstream pool depth or channel form. Decreases in ephemeral and intermittent stream shade will remain too small to be measured and will not result in any measurable increases in water temperatures. Reduction in crown fire potential in approximately 100 acres of riparian reserves	No effect to pool depth, channel form or temperature No change in fire severity potential
Acres of suitable wildlife habitat eliminated due thinning in intermittent and ephemeral streams.	0	0	0
Key Issue **Treatments may remove or downgrade suitable northern spotted owl habitat or, when considered cumulatively with past projects, negatively affect spotted owls.**			

Issue Indicator	Alternative 1	Alternative 2	Alternative 3
Acres of northern spotted owl foraging or nesting and roosting habitat removed or downgraded	0	No critical owl habitat or high quality nesting and roosting habitat affected. 4 acres foraging habitat removed (portion of Unit 37) which is 0.2% of the foraging habitat available in the owl action area. 28 acres moderate quality nesting and roosting habitat downgraded (portions of Units 33C and 32) which is 3.4% of the moderate quality nesting and roosting habitat available in the area.	No critical owl habitat or high quality nesting and roosting habitat affected. No habitat removed or downgraded.
Key Issue **Construction of new temporary roads may negatively impact hydrology and soil health and could impact wildlife**			
Additional stream crossings.	0	0	0
Estimated tons of potential sedimentation due to temporary roads and all actions, short-term	0	Constructing 0.3 miles of road = potential short-term increase of 1.6 tons over the life of the project. All harvest activities = potential short-term increase of 1.9 tons over the life of the project	No temporary roads= 0 increase in sedimentation. All harvest activities = potential short-term increase of 0.2 tons over the life of the project
Estimated tons of potential sedimentation long-term.	0	Road decommissioning = long-term decrease of 45.9 tons.	Road decommissioning = long-term decrease of 45.9 tons.
Miles of temporary road and resulting acres of detrimental soil disturbance.		0.3 miles = 0.4 acres	0 miles temp rd. 0.6 acres of disturbance in four units from additional skid trails
Acres of wildlife habitat affected	0	. 0.4 acres in four different short linear areas, which in total is smaller than the area of a football field (1.3 acre)	0.6 acres of disturbance in four units from additional skid trails
Key Issue **Thinning in the visual foreground of Highway 36 in Unit 45, could be noticeable.**			
Acres in the visible foreground of Highway 36 affected.	0	3 VQO still met	0

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Chapter 3 – Affected Environment and Environmental Consequences

The environmental effects of each of the alternatives are discussed in relation to the resources affected to determine the significance of impacts expected. Comprehensive specialist reports were prepared for each affected resource and are available in the project record. Analyses and conclusions from specialist reports are discussed in this chapter of the EIS to provide the public and decision maker sufficient information to understand the potential and probable effects of the project. For definitions of terms used please see Appendix H of this document.

3.1 Approach to Cumulative Effects Analysis

Cumulative effects result from incremental effects of actions, when added to other past, present, and reasonably foreseeable future actions. Cumulative effects can result from individually minor, but collectively significant, actions taking place over a period of time.

The environmental analysis required under NEPA is forward-looking, in that it focuses on the potential impacts of the proposed action.[107] The past and present activities and natural events have contributed to creating the existing condition, as described in the affected environment sections of this environmental impact statement. These activities, as well as reasonably foreseeable activities, may produce environmental effects on resources relevant to the proposal.

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, the environmental impact analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

The cumulative effects analysis in each resource section does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach which are explained in Appendix B of this document. Appendix B also displays the activities that are known to have already occurred, are currently occurring, or are likely to occur in the vicinity of the proposed Salt project that may contribute to cumulative effects when considered in conjunction with the direct and indirect effects of the project. Effects of these activities are considered in the analysis for each resource as appropriate.

The cumulative effects analyses in this chapter are consistent with Forest Service National Environmental Policy Act (NEPA) Regulations.[108]

[107] Council on Environmental Quality, Guidance on the Consideration of Past Actions in Cumulative Effects Analysis, June 24, 2005 Memorandum.
[108] 36 CFR 220.4(f), July 24, 2008

3.2 Silviculture[109]

3.2.1 Methodology for Analysis

Purpose and Need Measure

Chapter 1.3 of this EIS describes the purpose and need and three objectives for the Salt project. One of those objectives is to: Improve forest health and resiliency. A second objective is to: Provide timber products to help support the economic structure of local communities and supply regional and national needs. To measure how well each alternative meets these two objectives the following measures of success, related to silviculture were used (Also presented in Table 2, Chapter 1.3.4). Please see Chapter 3.3 for measures and analysis related to reduction of hazardous fuels, and Chapter 3.4 for measures and analysis related to timber sale viability.

- Acres of overstocked stands thinned to a stand density index of approximately 200-250[110]
- Acres of overstocked plantations thinned to approximately 150 trees per acre
- Acres not meeting growth and yield potential due to heavy pathogen impacts regenerated to provide future yields
- Merchantable timber products harvested (million board feet – MMBF)
- Merchantable biomass harvested (bone dry tons – BDT)

Issues Addressed

The key issues identified during scoping related to silviculture questioned how prescriptions would affect specific resources (i.e., hazardous fuels, wildlife habitat including spotted owl habitat, soils, watershed and fisheries). The key issues are covered under those resource discussions. The following analysis issue was raised during public scoping related to silviculture: Decommissioning roads may have negative impacts on future fire suppression and vegetation management. This issue was considered in the following analysis.

Methods

Selected vegetation components were sampled in 2008 using standard Forest Service Region 5 stand exam protocol. A total of 160 field plots were taken in the major vegetation types found in the project area.[111] In addition to the stand exams, vegetation in the project area was reviewed using aerial photos and unit walk-through assessments. Specific field observations including stocking information and insect and disease activity for each stand was recorded.

The Forest Vegetation Simulator Version 6.21[112] was used to project future stand growth and development (crown canopy, stand density index and tree quadratic mean diameter) after treatments for each action alternative.

[109] Information in this Section is adapted from the Salt Silviculture Report, Petersen and Amell 2009
[110] Oliver and Uzoh 1997
[111] 98% of the project area is represented by the vegetation types sampled.
[112] USDA 1998

Available geographic information system (GIS) electronic files including cover types, contours, and Forest Plan land allocations were used in the analysis. Specific geographical information system (GIS) vegetation layers used for the Salt project include ExistingVeg 1980, allveg 1991.shp and seral_2005.shp.

Stand density index is chosen in this analysis as the preferred measure of stocking level for most stands because it is based upon both tree diameter-at-breast-height (DBH) and TPA and provides the best measure of the degree to which site resources are being utilized by trees. However, SDI does not well consider very small trees and so TPA is being used in this analysis for young plantations.

Initial and periodic review was made of the Forest Plan and the Northwest Forest Plan to ensure consistency of proposed activities and alternatives with these documents. See Chapter 3.2.4 for discussion of consistency with the Forest Plan and relevant laws, regulations and policies.

3.2.2 Affected Environment

The Salt project area was first settled by westerners in the 1850's and has experienced impacts to the forest vegetation since then. The advent of fire suppression and minimal forest management in the early 1900's has resulted in dense and overstocked conditions in many stands.

These dense stands contain well-developed surface fuels, ladder fuels consisting of dense midstory and understory trees and shrubs, and continuous canopies of hardwood and conifer overstory trees. These stand conditions are predisposed to intense fire behavior under extreme weather conditions. Stand replacement fires are likely to pose a major threat to sustainability of conifer forests that are important for forest vegetation as well as aesthetics, recreation, wildlife habitat, and watershed function on the Hayfork District.

Overstory vegetation types within the project area and proposed treatment units generally include an open Grey pine/live oak type, a well stocked mixed conifer type, and a Jeffery pine/ponderosa pine type on serpentine soils. The Grey pine/live oak type is typically found on low-elevation sites with shallow, rocky soils. As elevation increases, conifer species become more prevalent, primarily a function of more favorable environmental conditions. The deeper, more developed soils support mixed conifer stands of Douglas-fir, ponderosa pine, Incense-cedar, and sugar pine.

Hardwood species, predominately black oak, madrone, white oak, live oak and white alder comprise a substantial stand component throughout the assessment area. Black oak and madrone tend to occupy more productive sites while white oak and live oak are found on less productive sites. White alder is generally a substantial stand component along perennial streams and adjacent to year-round wet areas.

Table 14 displays the major vegetation types in the project area and their current stand densities expressed as stand density index, trees per acre and basal area.

Table 15 displays a summary of current tree data for the project area; understory brush species are not included.

Table 13: Description of the 3 positions in vegetation strata codes: forest type, size class and percent canopy cover

Position 1	Forest Type	Position 2	LRMP Size Class – Crown Diameter	Position 3	Percent Canopy Cover
M	Mixed Conifer	1	Sapling (less than 6 feet)	S	10-19 Percent
P	Pine (Ponderosa or Sugar pine)	2	Pole-size timber (6-12 feet)	P	20-39 Percent
XX#	Plantation (# is1, 2, or 3, and defines the age or size of trees)	3	Small sawtimber (13-24 feet)	N	40-69 Percent
NF	Non-forested	4	Medium/large sawtimber ((25+ feet)	G	70-100 Percent
GR	Grassland	6	Two-storied, understories size 1 of 2 (0 – 12 feet)		

Table 14: Major vegetation strata current stand density conditions in Salt project area*

Vegetation Assemblage	Strata	Percent Canopy Cover[113]	Stocking Level SDI	Stocking Level TPA	Stocking Level BA	Acres (Percent Forested Area)	Percent of all treatments proposed – Alt 2.
Open	M2G	78 %	590	1425	253	94 (2%)	5%
Late	M3N	66 %	548	862	269	3532 (84%)	67%
Open	M2N	68 %	492	1131	209	64 (2%)	2%
PCT	XX1	36%	164	1210	64	285 (7%)	15%
PCT	XX2	42%	164	1000	58	225 (5%)	10%

*Source: 2008 Stand Exams. SDI – Stand density index; TPA – Trees per acre; BA – Basal area

[113] Note that canopy density values in this table are expressed in terms of percent canopy cover. These values are FVS modeled "canopy cover" which is "proportion of the forest floor covered by the vertical projection of the tree crowns" (Jennings et al. 1999). For this project, tree canopy density criteria have been established in terms of percent "canopy closure" which is "the proportion of the sky hemisphere obscured by vegetation when viewed from a single point" (Jennings et al. 1999). These are two different measurements and the means to measure and model them can give greatly different values (Jennings et al. 1999, Fiala et al. 2006). Values of percent canopy cover modeled by Forest Vegetation Simulator have been shown to be much lower than measured canopy closure values produced by several different means (Fiala et al. 2006).

Table 15: Project area stand characteristic- diameter class of live, recently dead and older dead trees*

All Species Live					Recent Mortality				Older Dead			
Dia. Class	TPA	BA/A	SDI	Avg. HT	TPA	BA/A	QMD	Avg. HT	TPA	BA/A	QMD	Avg. HT
0.1-2	401	3	45	7								
2.1-4	103	7	22	16								
4.1-6	58	11	26	27								
6.1-8	31	11	22	34								
8.1-10	30	16	32	41	1	1	10	27	2	1	10	12
10.1-12	25	20	37	50		<1	12	43	2	2	12	16
12.1-14	16	17	30	59	2	2	14	59				
14.1-16	13	18	31	66					1	1	16	44
16.1-18	6	11	19	73		1	18	86	1	1	18	56
18.1-20	5	10	17	79	1	1	20	87		.5	20	31
20.1-22	5	14	23	89					1	2	22	55
22.1-24	3	9	14	90		1	24	94		.2	24	22
24.1-26	2	7	12	94						1	26	77
26.1-28	2	8	12	94		<1	28	91		1	28	73
28.1-30	1	6	10	110						<1	30	20
30.1-32	1	3	5	107						<1	32	92
32.1-34		2	4	114						1	34	37
34.1-36		2	4	101						<1	36	10
36.1-38		1	2	114		<1	38	125				
38.1-40		2	4	118						<1	40	56
40.1-42		1	2	142								
42.1-44		1	2	130								
44.1-46		1	1	138								
46.1-48												
48.1-50		1	1	123								
50.1-52		<1		140								
52.1-54		1	1	123								
54.1-56												
Totals**	**703**	**184**	**378**	**7**	**5**	**6**	**17**	**66**	**8**	**12**	**20**	**28**

*Source 2008 stand exams. **Numbers rounded to the nearest whole number. Rounding explains apparent discrepancies in totals. Dia. = Diameter at breast height in inches; TPA = Trees per acre; BA/A = Basal area per acre; SDI = Stand density index; Ave. HT = Average height; QMD = Quadratic mean diameter.

The existing condition of the vegetation within the proposed action units can be grouped into several general conditions.

- **Understocked / Overmature Stands (58 acres in proposed action, 3.6%):** These stands are in the matrix-roaded recreation (31 acres) and matrix-commercial forest productions emphasis (27 acres) Forest Plan land allocations. There is no riparian reserve land allocation within these areas. The stands are multi-aged, multi-storied understocked or overmature[114] mixed conifer

[114] Overmature refers to the stage at which trees exhibit a decline in growth rate, vigor, and soundness as a result of old age.

stands which have had previous harvest entries. They contain areas of younger growth in patch, dense thickets. They are often fragmented and are not growing well. These stands are exhibiting moderate mortality and increasing decadence due to a number of biological agents. Stands are impacted by dwarf mistletoe in the ponderosa pine, Jeffery pine, Incense-cedar, white fir and Black oak. Mountain pine beetle is active in the Jeffery pine, ponderosa pine and sugar pine stands, killing both individual and groups of these species. Fir engraver beetle is active in the white fir stands, especially in overstocked mixed conifer stands with a substantial white fir component. White pine blister rust is a serious and continuing problem throughout the assessment area, affecting primarily younger age-class sugar pine. Because of the current stand conditions they are not meeting the growth and yield potential desirable for lands that are part of the suitable timber base. As requested by the District Ranger, only understocked and overmature stands that needed to be treated in this management cycle (within the next 3 to 20 years) were identified at this time. If the stands are healthy enough to be managed in 20 years or more, or if thinning would effectively move the stand toward desired future conditions they were not included in this general vegetation description.

- **Dense / Overstocked Stands (977 acres in proposed action, 60%):** Single storied intermediate sized young growth mixed conifer stands which have had previous harvest entries. Many of these stands have trees that currently exhibit a live crown ratio of 30-40%, a level that is considered the minimum to maintain adequate tree growth and vigor. Currently the average number of trees in the project area is 703 trees per acre (Table 15) and the stands range from 300 to 500 SDI, where an SDI of 200 – 250 is desirable.[115] The high density of these trees in the suppressed and intermediate crown positions is expected to result in high tree mortality in these classes ("zone of imminent mortality"[116]), increasing fuels available during a wildfire. These stands are also subject to the same insect and disease conditions that the older stands are but are impacted to a lesser degree.
- **Dense / Overstocked Plantations (481 acres in proposed action, 30%):** Single storied, young growth stands that are the result of site prepared and planted units that were reforested in the 1970's and 80's. These resulting plantations are now in a well stocked to overstocked condition and are being stressed due to overcrowding. These stands currently contain between 1,000 to 1,200 trees per acre and are generally free of serious insect and disease issues.
- **Overgrown Shaded Fuel Break (103 acres, 6%):** An old fuel break extends for approximately three miles along Blue Point Ridge on the western boundary of the project area. These stands are multi-aged, multi-storied mixed conifer stands that have been thinned in the past but currently overstory canopy closure in the fuelbreak is increasing and understory vegetation has developed into potential fuel ladders. These are not desirable characteristics for maintaining a functional fuelbreak.

Summary of Existing Vegetation Condition vs. Desired Condition

As summarized in Chapter 1.3.1, the need for the project is evident when comparing the existing site specific conditions with the goals and desired future conditions for healthy forests in Management Area 19 (Indian Valley/Rattlesnake),[117] overall Forest Plan objectives and literature on forest management.[118] The Forest Plan states that the desired condition for this area includes that the "forest stand densities are managed at levels to maintain and enhance growth and yield to improve

[115] Reineke 1933
[116] Long 1985
[117] USDA 1995, page 4-158 through 4-160 – See Section 1.3.1 and 1.3.3 for specific Forest Plan goals and objectives related to forest health and forest products.
[118] Oliver and Uzoh 1997; Reineke 1993

and protect forest health and vigor recognizing the natural role of fire, insects and disease and other components that have a key role in the ecosystem. Stand understories appear more open with less in-growth particularly in stands on sites where wildfire plays a key role in stand development ..."[119]

Table 16 summarizes the existing forest health and resiliency condition compared to the desired condition.

Table 16: Forest health desired condition vs. existing condition summary

Purpose & Need	Existing Condition	Desired Condition (Measures of Success)
Improve forest health and resiliency	Dense and overstocked stands that are stressed and susceptible (Stand density index ranges from 490 – 590).	Forest stand densities are at levels that maintain and enhance forest health, vigor and growth.[120] (Acres of overstocked stands thinned to a stand density index of approximately 200-250).
	Dense and overstocked plantations that are not growing to potential (1000-1210 trees per acre)	Acres of plantations thinned to approximately 150 trees per acre)
	Understocked and over mature stands that are not meeting growth and yield potential (Culmination of mean annual increment reached).	Stands were diseased and excess trees are removed, creating favorable growing space for the regenerated disease-resistant crop trees, while retaining disease resistant, larger overstory trees. [121] (Acres not meeting growth and yield potential due to heavy pathogen impacts regenerated to provide future yields).

3.2.3 Environmental Consequences

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

Alternative 1 would not thin any acres to the desired stand density index and none of the acres currently not meeting growth and yield potential would be regenerated. No forest products would be provided.

No action in the project area ensures that forest vegetation would continue to decline in vigor and health due to heavy site occupancy (stocking) relative to available resources, primarily water. In timber stands in the project area we can expect mortality in the conifers to increase, primarily due to beetle mortality. Stands are at increased risk to catastrophic stand replacement events such as fire.

Understocked and overmature decadent conifer stands would continue to decline in growth and yield. The opportunity to accelerate the growth of trees would be foregone. Net stand growth and yield would continue to be at less than site capacity. The opportunity to provide for increased vigor,

[119] USDA 1995, page 4-159
[120] USDA 1995, pages, 4-5, 4-18, 4-54, 4-67, 4-159

[121] USDA 1995, pages, 4-5, 4-67, C-1

increased resistance to insects and disease impacts, and increased growth through conversion to a young stand would be foregone within these stands.

There would be no harvest of merchantable timber and biomass from the assessment area during this planning period.

Medium-sized young growth mixed conifer and ponderosa pine stands would not be thinned. The opportunity to improve stand vigor, and resistance to drought and insects and disease impacts would not be realized within the stands. The ability of trees to withstand future drought conditions, especially drought sensitive species such as white fir, would continue to decrease. There would be increased risk of widespread insect attack in the project area, especially from the fir-engraver beetle, western pine beetle, and turpentine beetle. These stands would continue to be at high risk to fires. Hardwood species would diminish as a stand component due to increased overstory crown competition.

Young conifer plantations and riparian areas around ephemeral and intermittent streams would not be thinned. The opportunity to improve stand vigor, and resistance to insects and disease impacts would not be realized within the stands. Increased competition for sunlight, nutrients, and soil moisture would decrease stand vigor, increase individual tree mortality, and increase susceptibility to primary and secondary insect and disease effects. Stand vertical structural diversity will not be maintained or improved. The opportunity for treated stands to respond to release would not be realized.

Fuel reduction activities associated with timber harvest and hand fuel work would not occur. Opportunities to reduce fire risk with the development of fuel breaks and hand fuel work would be foregone.

Table 17: Alternative 1-Vegetation strata attribute in the year 2029 and 2059 with no action.

Vegetation Strata	SDI in 2029*	QMD for Trees ≥ 8" DBH in 2029	Percent Canopy Closure in 2029	QMD Growth for Trees ≥ 8" DBH in Inches from 2009 to 2029	QMD for Trees ≥ 8" DBH in 2059	Percent Canopy Closure in 2059	Years to achieve 30 inch QMD for Trees ≥ 8" DBH
Open M2G	494	16	86	1.4	17	78	>100
Late M3N	566	21	80	3.3	24	77	>100
Open M2N	555	18	81	3.2	22	73	>100

* Future projections assume that no other future activities or natural disturbances such as wildfires, insect activity, or wind-throw events would occur.

As a means of comparison with Alternative 2 and 3, Table 17 displays selected strata attributes for the year 2029 and 2059 for the strata with no treatment. We also display the growth in quadratic mean diameter (QMD[122]) for trees larger than 8 inches DBH for the 20 years following treatment and

[122] Quadratic mean diameter is the average diameter of the trees in the stand expressed as the diameter of the tree of the mean basal area. Quadratic mean diameter gives greater weight to large trees and is equal to or greater than the arithmetic mean.

the number of years for the stand to achieve a 30 inch QMD assuming no other activities or natural disturbances.

Alternative 2 – Proposed Action

Direct, Indirect and Cumulative Effects

The direct effect of implementing Alternative 2 would be removal of trees creating more open stands. Disease presence would be reduced due to the selective removal of diseased trees. Regeneration treatments would create 58 acres of very open stand areas which are necessary for the establishment and growth of a new cohort of trees. About 9.4 MMBF of merchantable timber volume would be harvested and 15,073 oven-dry tons of biomass would be available for removal and utilization. For economic and job related impacts see Chapter 3.4. For fire and fuels related impacts see Chapter 3.3.

Alternative 2 would result in increased growth and yield over time on 14 acres of hand fuel treatment units, 1,087 acres of harvest units including the shaded fuelbreak, 58 acres of regeneration and 481 acres of pre-commercial thinning units. The greatest increases would result from the combination of commercial thinning and non-commercial thinning in the intermediate treatments (Table 18). Table 18 displays selected strata attributes for the year 2029, 20 years following the thinning treatment and 2059, 50 years following the treatment. We also display the growth in QMD for trees larger than 8 inches DBH for the 20 years following treatment and the number of years for the stand to achieve a 30-inch QMD assuming no other activities or natural disturbances. Reducing stocking increases tree growth, resulting in increased yield of commercial wood products and reduces the time required to grow larger trees for wildlife habitat. Table 19 displays the QMD for all trees greater than or equal to 8 inches DBH for all alternatives in the year 2029 as well as the increase in QMD for those trees from 2009 to 2029. Both action alternatives would increase tree growth rates over Alternative 1, with Alternative 2, due to the heavier thinning regimes proposed, substantially higher than Alternative 3. Stand species composition would be modified to some degree by the intermediate treatments because the thinning regimes would favor retaining seral species such as Jeffery pine, ponderosa pine, and sugar pine over white fir.

The thinned stands would also be more resistant to diseases and insects, especially bark beetles, due to increased tree vigor. Post treatment SDI in intermediate thinning units would range from 200 to 250 making the stands resistant to epidemic levels of bark beetles.[123] Canopy closure immediately following treatments would be about 50%. Thinning would be needed again in 20 years, 2029 because at that time stand stocking will have increased, however, stocking would still be considerably less than the current condition, and tree vigor, growth rates, and resistance to insects and disease would still be higher than before the treatment (Table 20).

[123] Oliver and Uzoh 1997

Table 18: Alternative 2 vegetation strata attributes in 2029 and 2059 with intermediate thinning

Vegetation Strata	SDI in 2029*	QMD for Trees ≥ 8" DBH in 2029	Percent Canopy Closure in 2029	QMD Growth for Trees ≥ 8" DBH in Inches from 2009 to 2029	QMD for Trees ≥ 8" DBH in 2059	Percent Canopy Closure in 2059	Years to achieve 30 inch QMD for Trees ≥ 8" DBH
Open M2G	423	23	73	8.3	27	86	90
Late M3N	380	25	62	7.7	29	68	70
Open M2N	344	19	65	4.7	21	70	>100

* Future projections assume that no other future activities or natural disturbances such as wildfires, insect activity, or windthrow events would occur.

Table 19: Intermediate thinning strata QMD in 2029, QMD growth from 2009-2029 by alternative

	Alt 1	Alt 2	Alt 3	Alt 1	Alt 2	Alt 3
Vegetation Strata	QMD for Trees ≥ 8" DBH in 2029	QMD for Trees ≥ 8" DBH in 2029	QMD for Trees ≥ 8" DBH in 2029	QMD Growth for Trees ≥ 8" DBH in Inches from 2009 to 2029	QMD Growth for Trees ≥ 8" DBH in Inches from 2009 to 2029	QMD Growth for Trees ≥ 8" DBH in Inches from 2009 to 2029
Open M2G	16	23	20.3	1.4	8.3	2.8
Late M3N	21	25	22.4	3.3	7.7	3.1
Open M2N	18	19	17.1	3.2	4.7	2.9

Table 20: Intermediate thinning strata stand density index post-thinning and in 2029 by alternative

	Alt 1 (No Action)	Alt 1	Alt 2	Alt 2	Alt 3	Alt 3
Vegetation Strata	SDI in 2008 (current condition)	SDI in 2029	SDI in 2009	SDI in 2029	SDI in 2009	SDI in 2029
Open M2G	590	494	200	423	265	526
Late M3N	548	566	250	380	294	508
Open M2N	492	555	250	344	402	507

Regeneration treatments would result in increased growth and yield over time on 58 acres because the current stands are slowly growing and the new stands would be young and vigorous with high growth rates. The treatments would also greatly change tree species composition because most of the white fir, which currently comprises most of the stocking, would be removed and the stands regenerated to Jeffery pine, ponderosa pine, sugar pine and incense cedar. Some dominant or co-dominant trees, of less desirable species may be thinned if they are encroaching on a healthy desirable species.

Alternative 2 would thin 481 acres of plantations to the desired stocking level for growth and health of 150 trees per acre.

Ten routes (29N55A, 30N07, 30N07A, 30N16Y, 30N18C, 30N45A, U29N31E, U30N28F, U30N28H, U36TRIO3B) totaling 9.2 miles will be decommissioned with Alternative 2 that are

considered to provide some, though minor value for future commodity production and or vegetation management access (Table 5 and Figure 5 in Chapter 2). Access to all of the units proposed for regeneration or shelterwood harvest with green tree retention with this entry would still exist so no affect to management of these units would occur. Only two of the routes (30N07 and 30N07A) have significant value for access from a commodity output perspective, however closure of these routes will have benefits to water quality and hydrologic processes. The effect of decommissioning these roads would not preclude future vegetation management in the areas accessed by these routes, but it may increase the costs.

Alternative 3

Direct, Indirect and Cumulative Effects

The direct effect of implementing Alternative 3 would be removal of trees but not to the desired stocking level. Disease presence would be reduced due to the selective removal of diseased trees. Regeneration treatments would create 30 acres of very open stand areas which are necessary for the establishment and growth of a new cohort of trees. About 3.3 MMBF of merchantable timber volume would be harvested and 4,680 oven-dry tons of biomass would be available for removal and utilization. For economic and job related impacts see Chapter 3.4. For fire and fuels related impacts see Chapter 3.3.

Alternative 3 would result in increased growth and yield over time on 14 acres of hand fuel treatment, 950 acres of intermediate thinning units (Table 21) including the shaded fuelbreak, 30 acres of regeneration and 421 acres of pre-commercial thinning units. Due to the relatively light nature of the treatments, the increases in growth would be relatively moderate and short-term (Table 19).

Table 21: Alternative 3 vegetation strata attributes in 2029 and 2059

Vegetation Strata	SDI in 2029	QMD for Trees ≥ 8" DBH in 2029	Percent Canopy Closure in 2029	QMD Growth for Trees ≥ 8" DBH in Inches from 2009 to 2029	QMD for Trees ≥ 8" DBH in 2059	Percent Canopy Closure in 2059	Years to achieve 30 inch QMD for Trees ≥ 8" DBH
Open M2G	526	20.3	80	2.8	24	87	>100
Late M3N	508	22.4	77	3.1	27	75	>100
Open M2N	507	17.1	74	2.9	19	82	>100

Alternative 3 would not thin any stands to the desired stand density index level of 200 – 250 (Table 20). Post-treatment SDIs would range from about 265 to 402 in the intermediate thinning units (Table 20). Stands in the M2G (265 SDI) and M3N (294 SDI) strata would be below the zone of imminent mortality and into the zone of "full site occupancy.[124]" Stands in the M3N strata would still

[124] Long 1985

be somewhat at risk to bark beetles. Stands in the M2N strata, with the 402 post-treatment SDI, would still be in the zone of imminent mortality and high risk to insect activity.

By maintaining 60% canopy closure in all treatment stands, many units would have few, if any, dominant or co–dominant trees thinned because the thin-from-below treatment would meet the minimum 60% canopy closure before thinning these trees. Stand species composition would be modified to some degree by the treatments because the thinning regimes would favor retaining seral species such as Jeffery pine, ponderosa pine, and sugar pine over white fir.

Two regeneration units (37, 40), portions of units 32 and 33C, and riparian reserves would not be treated in Alternative 3, resulting in 204 acres not being treated for forest health concerns. Thirty acres would receive a shelterwood regeneration treatment and would result in increased growth and yield over time on 30 acres because the current stands are slowly growing and the new stands would be young and vigorous with high growth rates. The treatments would also greatly change tree species composition because most of the white fir, which currently comprises most of the stocking, would be removed and the stands regenerated to Jeffery pine, ponderosa pine, sugar pine and incense cedar.

Although we show that Alternative 3 would pre-commercial thin 421 acres, most plantation thinning activities in reality of implementation would be precluded because most of the plantation stands are currently below 60% canopy closure (Table 14), and Alternative 3 would not thin below 60% canopy closure. Stands that are over 60% canopy closure are only slightly over, and pre-commercial thinning them to 60% canopy closure would be costly and accomplish very little stocking reduction. None of the pre-commercial thinning stands in Alternative 3 would be thinned to the desired stocking level of 150 TPA.

The effects of road decommissioning are the same for Alternative 2 and 3.

3.2.4 Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Alternative 1 (no action) does not meet the identified purpose and need to maintain and improve the health and vigor of forested areas and does not reduce the risk of stand replacing fires.[125] Alternative 1 would not provide for commercial use of biomass or other wood products that would help to support the local or regional economy

Findings Pertinent to NFMA, Certification of Stocking and CMAI

Timber Harvest on Lands Classified as not suited for Timber Harvest

All stands proposed for harvest treatment under all alternatives are classified as suitable.[126]

Adequate Restocking of Lands within 5 Years after Final Harvest (16USC 1604g 3e ii)

Reforestation will occur within five years of final harvest. Any stand that receives any harvest activity will not be maintained as a permanent opening and will be fully stocked, or can be adequately

[125] USDA 1995, page 4-5
[126] USDA 1995, page 4-26

restocked with natural regeneration within five years of harvest. Any live green trees retained on each unit will serve as seed sources where regeneration is inadequate.

Timber Resource Sale Schedule-Culmination of Mean Annual Increment

The Forest Plan[127] requires that even-aged stands of timber must have reached at least 95 percent of culmination of mean annual increment (cubic measure) prior to regeneration harvest (final harvest). Stands scheduled for regeneration cut for timber purposes have reached CMAI.

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.

To improve forest health and resiliency and reduce fuel hazards (two of the projects objectives): trees and biomass with commercial value will need to be removed, creating product value.

Authorize clearcutting only where determined to be the optimum method; authorize shelterwood cutting only where 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 and the regeneration and shelterwood with green tree retention units meet these criteria.

3.2.5 Summary of Measures of Success

Table 22: Measure of success – forest health, resiliency and forest products

Purpose & Need	Alt. 1	Alt. 2	Alt. 3	Difference Between Alt. 2 & 3
Improve Forest Health and Resiliency				
Acres of overstocked stands thinned to stand density index of 200-250	0	1,087	0	1,087
Acres of plantations thinned to approximately 150 trees per acre	0	481	0	481
Acres not meeting growth and yield potential that are regenerated by treatments	0	58	30	28
Provide Forest Products				
Merchantable Timber Harvested (MMBF)	0	9.4	3.3	6.1
Biomass Harvested (BDT)	0	15,073	4,680	10,393

[127] USDA 1995, page 4-27

3.3 Fire and Fuels[128]

3.3.1 Methodology for Analysis

Purpose and Need Measures

Chapter 1.3 of this EIS describes the purpose and need and three objectives for the Salt project. One of those objectives is to: Reduce hazardous fuels conditions to reduce the potential for adverse impacts from wildfire to the National Forest and neighboring land. To measure how well each alternative meets this objective the following measures of success were used.

- Reduction in acres of active crown fire potential
- Reduction in acres of passive crown fire potential
- Reduction in acres requiring indirect fire attack methods (flame length reduced to 8 feet or less)
- Increase in acres that could be direct attacked with hand crews (flame length reduced to 4 feet or less)

Issues Addressed

Public scoping identified the following Key Issue: ***Regeneration Harvest - green tree retention in the proposed action may increase risk from fire***. To analyze this issue the following issue indicators were used. These are the same measures used to assess how well the alternatives reduce fuel throughout the project area but the analysis will also look specifically at the regeneration harvest-green tree retention units to assess this issue.

- Reduction in acres of moderate or high crown fire potential in Unit 37 and 40
- Increase in acres where direct attack is likely effective in Unit 37 and 40

Also during public scoping the following analysis issues were identified and were considered in the effects analysis: Canopy removal may increase fuel hazard issues; and, decommissioning roads can have negative impacts on future fire suppression and vegetation management efforts.

Methods

An analysis conducted by the California Department of Forestry and Fire Protection, Fire and Resource Assessment Program (FRAP), was examined to determine the current fire regime and condition class for the project area.[129] Field observations were made and timber stand exam data was collected within the analysis area in 2008. See Chapter 3.2 for more detailed explanation on stand exam data collection. Photo series handbooks[130] and ocular estimating were also applied. Stand exam and fuels data were processed through Forest Vegetation Simulator and Fire & Fuels Extension (FVS-FFE) by vegetative strata to derive data used for modeling in the fire behavior software package FlamMap. Please see the silviculture section for more information on vegetative strata (Chapter 3.2) and limitations and assumptions of FVS-FFE. Fire behavior characteristics and hazard were derived

[128] Information in this Section is adapted from the Salt Fire and Fuels Report, Lewis 2009b
[129] California Department of Forestry and Fire Protection 2003
[130] Maxwell and Ward 1980.

for the proposed treatment areas by placing forest vegetation types into nationally accepted fire fuel model groups that describe the potential fire behavior within defined weather variables. The fuel model groups were used as a measure to estimate changes in fuel profile by alternative. Fuel models for the Salt project area were taken from the National Landfire database and compared to information gathered during field walkthrough surveys by fuels specialists. The Landfire fuel models were found to give a good representation of the existing conditions during field reviews. For the proposed action FVS was again used to determine the effects of treatment by vegetation type (strata).

FlamMap is a fire behavior mapping and analysis program that computes potential fire behavior characteristics over an entire landscape for given weather and fuel moisture conditions. FlamMap uses GIS-based raster inputs for terrain and fuel characteristics (elevation, slope, aspect, fire behavior fuel models, and canopy characteristics). FlamMap computes fire behavior outputs for a given landscape using standard fire behavior prediction models, and generates raster maps of potential fire behavior characteristics (spread rate, flame length, crown fire activity, etc.) over an entire landscape.

The 90th percentile weather was chosen for modeling because it is the accepted weather parameters used for fuels planning. The 90th percentile weather represents the “average worst” conditions that can be expected on 90% of all the days that fires occur. Weather parameters used for the Salt project area are found in Table 23. More severe conditions would likely result in more severe fire behavior and fire effects to the site.

Table 23: 90th Percentile weather for Yolla Bolla RAWS, California

FUEL/WEATHER VARIABLE	90th PERCENTILE VALUES
1 Hour Fuel Moisture, %	4
10 Hour Fuel Moisture, %	5
100 Hour Fuel Moisture, %	8
1000 Hour Fuel Moisture, %	10
Herbaceous Fuel Moisture, %	30
Woody Fuel Moisture, %	70
20 Foot Wind Speed, MPH	20
Dry Bulb Temperature, Degrees F	85

FlamMap employs the Rothermel fire behavior model which makes several assumptions including: [131]

- The fire is free-burning
- Fire behavior is predicted for the flaming front of a surface fire
- Fine fuels are the primary carrier of the initial fire front
- Fuels are continuous and uniform

FlamMap then utilizes a crown fire initiation model, crown fire spread model, and dead fuel moisture model to model both passive and active crown fire.[132] Passive crown fires do not carry

[131] Rothermel 1972
[132] VanWagner's 1977, Rothermel 1991, Nelson 2000.

continuously through the crown fuels; they burn crown fuels intermittently such as when individual trees or groups of trees torch. Active crown fire carries continuously through the crown fuels. Additional assumptions and limitations of FlamMap are included in the Salt Fuels Report.[133]

The area of analysis for this report was the Salt project area, unless otherwise noted.

3.3.2 Affected Environment

Fire History and Occurrence

There have been 15 fire starts within the approximately 4,300 acre project area, 11 lightning caused fires and 4 human caused fires since 1918. The largest fire on record was approximately ¼ acre. Fire size limitations can be attributed primarily to swift detection and successful initial attack fire suppression tactics. Plummer Peak Lookout is approximately 4.5 air miles to the north of the project area. Initial attack forces from Hayfork, Forest Glen, Post Mountain, and Harrison Gulch can access most of the area in less than an hour if they are available (Figure 1). Currently when a large number of lighting fire starts or a single start exceeds the capabilities of the initial attack forces the fires get larger. If available, air attack fire suppression forces dispatched from Redding, California are able to attack the fire in less than 30 minutes.

In 2008 the Telephone wildfire occurred outside but directly adjacent to the northeast edge of the project area. Even though this is outside of the analysis area it is considered in the cumulative effects analysis.

Fire Regime and Condition Class

A fire regime is a generalized description of the role fire plays in an ecosystem. It refers to the pattern and variability of fire occurrence and its effect on vegetation. Fire regime typically is a description of fire frequency, predictability, intensity, seasonality, and size characteristics of fire in a particular ecosystem.

Coarse scale definitions for natural (historical) fire regimes have been developed by Hardy et al.[134] and Schmidt et al.[135] and interpreted for fire and fuels management by Hann and Bunnell. [136] The five natural (historical) fire regimes are classified based on average number of years between fires (fire frequency) and the severity of the fire on the dominant overstory vegetation (Table 24).

Table 24: Fire regime class descriptions

Fire Regimes
I – 0 to 35-year frequency and low- (surface fires most common) to mixed-severity (less than 75% of the dominant overstory vegetation replaced);
II – 0 to 35-year frequency and high (stand-replacement) severity (greater than 75% of the dominant overstory vegetation replaced);

[133] Lewis 2009a, Appendix A
[134] Hardy et al. 2001
[135] Schmidt et al. 2002
[136] Hann and Bunnell 2001 In Press

Fire Regimes
III – 35 to 100+-year frequency and mixed-severity (less than 75% of the dominant overstory vegetation replaced);
IV – 35 to 100+-year frequency and high (stand replacement) severity (greater than 75% of the dominant overstory vegetation replaced);
V – 200+-year frequency and high (stand-replacement) severity.

Historically the Salt project area is best described as having a moderate to low intensity, frequent interval (1-25 years) regime with large fires. This means the area historically was primarily in fire regime I.

The National Fire Management Plan (NFMP) has three different condition classes that represent the degree of departure from historical fire regimes. This departure results in alterations of key ecosystem components such as species composition, structural stage, and stocking levels. One or more activities such as fire exclusion, insects and disease, and past management activities can cause a change in condition classes.[137] The three condition classes are described as follows: [138]

- **Condition Class 1:** Fire regimes are within an historical range and the risk of losing key ecosystem components is low. Vegetation attributes (species composition and structure) are intact and functioning within their historical range.
- **Condition Class 2:** Fire regimes have been moderately altered from their historical range. The risk of losing key ecosystem components is moderate. Fire frequencies have departed from historical frequencies by one or more return intervals (either increased or decreased), resulting in moderate changes to one or more of the following: fire size, intensity and severity and landscape patterns. Vegetation attributes have been moderately altered from their historic range.
- **Condition Class 3:** Fire regimes have been significantly altered from their historical range. The risk of losing key ecosystem components is high. Fire frequencies have departed from historical frequencies by multiple return intervals. This results in dramatic changes to one or more of the following: fire size, intensity, severity, and landscape patterns. Vegetation attributes have been significantly altered from their historical range.

A large percentage of the Salt project area is classified as condition class 2 or 3. [139]

Managing Risk to Communities

The Salt project is in an area identified by the Trinity County Community Wildfire Protection Plan as important for the protection of communities at risk, such as the community of Peanut located approximately 3 miles north of the project area and Post Mountain, located 1 mile to the northwest (Figure 1). Spotting and or fire brands from the Salt project area could put structures in these communities at risk.[140] Vegetation treatments are needed to reduce fire intensity, reduce the potential for the initiation and spread of crown fires and firebrands that can reach the communities.

[137] Schmidt et al. 2002
[138] California Department of Forestry and Fire Protection 2003
[139] California Department of Forestry and Fire Protection 2003
[140] Cohen and Butler 1998

Vegetation and Fuel Loading

The composition and structure of forest vegetation as well as the arrangement of dead material within the forest are major factors in influencing the frequency and intensity of wildfire activity. The Salt project area consists primarily of mixed conifer with ponderosa pine, Douglas-fir, white fir and other conifer species. Random sampling plots, using the Photo Series for Quantifying Natural Forest Residues In Common Vegetation Types of the Pacific Northwest[141] were taken to determine existing fuel loadings within the project area. Existing dead and down fuel loadings currently range from less than 7 tons per acre to over 68 tons per acre, with an overall average of approximately 37 tons per acre on most of the project area. The desired condition is to maintain 5-10 tons of logs per acre (Chapter 2.4.1, #5, 5a). Fuel loading in the project area is largely a product of successful fire suppression activity that has allowed natural fuel loadings to accumulate and past untreated logging slash, most of which is from harvesting in the 1970's and 80s. Although some slash deterioration is evident, remaining slash loadings and natural fuels are of sufficient quantity and condition that high intensity fire is possible under adverse weather conditions.

Existing Fire Behavior

The fire behavior potential was modeled for the project area. The results were categorized as low, moderate or high for both crown fire behavior and flame length. For the purposes of analysis, crown fire was rated as high when active crown fire was predicted, moderate for passive crown fire, and low for surface fire. The results are displayed in Table 25, Table 27, and Table 28.

Table 25: Existing crown fire potential expected throughout the project area

Acres of Crown Fire Potential, and Percentage of Area		
Low Potential	**Moderate Potential**	**High Potential**
525 12%	3,710 85%	70 2%

Although the model shows the amount of high crown fire danger is limited, the amount of passive crown fire is a concern. If the wind speed is increased, as is common in a wildfire situation, many areas would be classified as high. Crown fires normally are highly destructive and difficult to control. Crown fires generally spread at least two to four times faster than surface fires.[142] Fires that spread quickly and at higher intensities can pose a greater risk to firefighters, the public and forest resources when they occur. Agee[143] states that crown fire potential can be managed through prevention of the conditions that initiate crown fires and allow crown fires to spread. Main factors contributing to crown fire behavior include height of the forest canopy above the ground, density of the canopy, stand density, and basal area.[144]

[141] Maxwell et al. 1980
[142] Rothermel 1983
[143] Agee 1996
[144] Omi and Martinson 2002

Flame length has significance for suppression strategy and tactics, and is also an indicator of intensity at the head of the fire (fireline intensity). Table 26 displays fireline intensity and flame length as it relates to suppression difficulty.[145] Table 25 shows the existing condition for flame length in the Salt project area.

Table 26: Fireline intensity interpretations

Intensity	Flame length (feet)	BTU/feet/second	Interpretations
Low	Less than 4	Less than 100	Direct attack at head and flanks with hand crews, handlines should stop spread of fire
Low–Moderate	4–8	100–500	Employment of engines, dozers, and aircraft needed for direct attack, too intense for persons with hand tools
Moderate	8–11	500–1,000	Control problems, torching, crowning, spotting; control efforts at the head are likely ineffective
High	Greater than 11	Greater than 1,000	Control problems, torching, crowning, spotting; control efforts at the head are ineffective

Table 27: Flame length class existing condition throughout the project area

Existing Acres and percentage of area in each Flame Length Class			
0-4 Feet	**4-8 Feet**	**8-11 feet**	**11+ feet**
1,030 (24%)	290 (6%)	1,075 (25%)	1,910 (44%)

Summary of Existing Fuels and Fire Behavior Conditions vs. Desired Conditions

Desired fuels conditions include reduction of ladder, crown, and surface fuels to lower the potential for crown fire and stand mortality (Table 28). Reduced flame lengths, with the ideal being 4 feet or less, are also desired.

Table 28: Fuels and fire behavior existing condition vs. desired condition summary

Purpose & Need	Existing Condition	Desired Condition (Measures of Success)
Reduce hazardous fuels	80% of area high to moderate (active & passive) crown fire potential. Crown fires spread quickly and at high intensities posing risk to firefighters, public and resources.	Stands that would carry surface fires, not crown fires. (Reduction in acres of active crown fire potential)
		Stands that would carry surface fires, not crown fires. (Reduction in acres of passive crown fire potential)
	69% of area would have flame lengths greater than or equal to 8 feet in a fire which means fire control would be problematic.	Reduction in acres requiring indirect fire attack methods (flame length reduced to 8 feet or less)
		Increase in acres that could be direct attacked with hand crews (flame length reduced to 4 feet or less)

[145] Rothermel 1983

3.3.3 Environmental Consequences

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

The fire behavior effects of the no action alternative is considered the same as described under the existing condition and summarized in Table 29 and Table 30.

Surface, ladder, and crown fuels would continue to accumulate in the absence of fire or treatment. With no modification of forest structure and fuels, fire behavior under 90th percentile conditions would persist as described under the existing condition, threatening resources within the project area. Eighty-eight percent of the area would continue to be susceptible to crown fire activity and 69% of the project area would continue to have control problems (flame length 8 feet or greater) with torching, crowning, and spotting. Control efforts at the head of a fire would likely be effective in only 24% of the project area and would be ineffective in 44% of the area. Fires that escape initial attack, usually those burning under severe conditions are likely to become large and damaging crown fires. Direct suppression tactics would not be effective in most circumstances.

In the absence of any kind of human-caused or natural disturbance, indirect effects would occur from the natural progression of forest growth and change. The result would be increased surface and ladder fuels that affect flame length, reduced canopy base heights that affect torching of trees, and increased crown density that make crown fire probable.[146] Fire risk in the project analysis area would likely increase and contribute to severe wildfires that could destroy important resources and habitat.

No progress would be made towards initiating the restoration of ecological processes that include the natural fire regimes, moderate to low intensity, frequent interval (1-25 years) regime. Stands would continue to shift in species composition from pine to white fir increasing the risk of loss due to wildfire because white fir are more susceptible to fire caused mortality than pine due to their branch characteristics and bark qualities.

Alternative 1 would not contribute to the desired condition, purpose and need, or respond to the National Fire Plan goals. Suppression operations would continue to occur, however, control options may be limited. The ability of firefighters to safely and effectively suppress wildland fire would become more difficult as fire behavior intensifies.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Ladder and crown fuels would be reduced through thinning of the stands. Activity fuels (slash generated from harvest and thinning activities) would be treated through a variety of methods including yarding methods, mastication, biomass, and piling and burning. The reduction of surface fuels would reduce the potential flame length within the proposed treatment units compared to the no action (Table 29). This when combined with the raising of the canopy base heights by reducing the

[146] Peterson et al. 2005, Graham et al. 2004

ladder fuels would in turn, reduce the ability of a fire to transition into a crown fire. Table 30 shows a reduction in crown fire potential compared to no action.

The reduction in potential flame length would reduce the area that would likely have control problems (flame length 8 feet or greater) from 69% of the project area down to 51% of the area (Table 29). Alternative 2 would keep the fuels profile at a level that reduces fireline intensity allowing suppression resources to more safely use direct suppression tactics (flame length 0 – 8 feet) on 48% of the project area (Table 29). With no action direct suppression tactics could safely be used on only 30% of the area (Table 29). The percentage of the project area where efforts at the head of a fire would be ineffective (flame length 11 feet or greater) would be reduced from 44% of the area, to 35% of the area (Table 29).

The reduction of flame lengths has a cascading effect on fire behavior. As a result of lower flame lengths, it is less likely that the crowns of trees become involved in the fire, reducing the amount of embers produced from individual and or groups of trees burn intensely. Burning embers can produce spots at distances over ¼ mile. The increased fire behavior associated with the burning of tree crowns further complicates suppression action and makes direct attack unlikely to be successful.

Thinning of small-diameter understory trees within overstocked stands in Alternative 2 would reduce the ladder fuels allowing fire to remain in the surface fuels, and reducing the potential for crown fire. Canopy fuel treatments reduce the potential for crown fire at the expense of slightly increased surface fire spread rate and intensity.[147] Though surface intensity may be increased after treatment, a fire that remains on the surface beneath a timber stand is generally controllable.[148]

With Alternative 2, 38% of the area would be in the surface fire behavior category following treatment compared to 12% if no action was taken and 37% with Alternative 3 (Table 30).

A key issue was that the regeneration harvest-green tree retention Units 37 and 40 may increase the risk from fire. Under Alternative 2, substantial changes to post treatment fire behavior potential were predicted. For Unit 37 the predicted fire type went from mostly passive crown fire to surface fire following treatment. Also for Unit 37, flame lengths went from being classified as ineffective to direct attack control efforts to direct attack being effective. For Unit 40, much of the unit has relatively low flame lengths prior to treatment so only portions of the unit show reduced flame length. However, the lower canopy base heights within the unit predict passive crown fire for most of the unit with some active crown fire. Following treatment, the unit is predicted to have only surface fire.

Fire modeling results show a significant decrease in fire behavior compared with Alternative 1 (existing condition). All treated units would have reduced flame lengths, less crown fire activity, and less severe fire effects. The overall fire hazard would be reduced across the treatment units. Treatments would result in predicted fire behavior that is not likely to cause severe effects to forested stands.

The proposed fuel break along the edge of the project would provide firefighters with a strategic place to defend against an oncoming fire. Maintenance treatments would be required to keep fire

[147] Scott 2003
[148] Scott 2003

intensity within the desired range and to maintain the integrity of the fuel break. Mechanical treatments and low-intensity prescribed fire would be the likely methods used to maintain fuel breaks and reduced understory vegetation. The need for maintenance would be monitored by district fire personnel and performed as needed.

The following are types of treatments that are planned under Alternative 2 to treat both existing and activity generated fuels within the treatment units. Five to ten tons of downed/dead material, depending on land allocation, will be retained on site.

- **Treat on Site (TOS) on an estimated 1,306 acres**: After the purchaser's work is completed: surface and ladder fuels will be treated through any combination of the following depending on site specific conditions: no additional treatment necessary, conifers less than 6 inch dbh (small or un-merchantable ladder fuels) will be cut down or removed, mastication, chipping, lopping and scattering, concentrating the fuel for burning and burning concentrations, or under-burning. The objective of this treatment is to reduce fuel loading and reduce fire/fuel ladders that allow surface fires to transition to the crowns of overstory trees;
- **Hand Pile (HP) Burn Piles (BP) on an estimated 152 acres**: The objective of this treatment is to reduce fuel loading, while minimizing damage to the residual trees on steeper ground;
- **Tractor Jackpot Pile (TJP) Burn Piles (BP) on an estimated 103 acres:** The objective of this treatment is to reduce concentrated fuel loading, and reduce fire/fuel ladders within fuel break
- **Tractor Site Prep (TSP), Burn Piles (BP) on an estimated 58 acres**: to occur within the regeneration harvest with green tree retention and shelterwood harvest with green tree retention units for site-preparation and hazard reduction.
- **Pre-commercial Thin & Masticate 481 acres** of existing plantations.

Fuels (surface, ladder and canopy) will begin to accumulate after treatment. This is due to the growth of the forest over time. Historic fire regimes show that the area likely burned much more often than the current fire return interval (Chapter 3.3.2). While there will be some variability in how rapidly fuels accumulate throughout the project, it is anticipated that it will take approximately 20 years before fuels have accumulated to the extent that the treatments are no longer effective in the thinning and the regeneration and shelterwood green tree retention units. The exceptions will be areas such as the fuel break due to the heavier shrub component. Such areas would likely need some maintenance in approximately 10 years. Future maintenance treatments are not included in this analysis.

Table 29: Flame length class-acres and percentage of area by alternative

Flame Length Class-Acres and Percentage of Area by Alternative*				
	0-4 Feet	**4-8 Feet**	**8-11 feet**	**11+ feet**
Alternative 1	1,030 24%	290 6%	1,075 25%	1,910 44%

Flame Length Class-Acres and Percentage of Area by Alternative*				
	0-4 Feet	**4-8 Feet**	**8-11 feet**	**11+ feet**
Alternative 2	1,930 45%	170 3%	700 16%	1,505 35%
Alternative 3	1,900 44%	190 4%	735 17%	1,480 34%

* Approximately 1% of the project area is classified as unburnable (rock etc.) and therefore not quantified.

Table 30: Fire type acres and percentage of area by alternative

Fire Type Acres and Percentage of Area by Alternative			
	Surface	**Passive Crown**	**Active Crown**
Alternative 1	525 12%	3,710 85%	70 2%
Alternative 2	1,640 38%	2,600 60%	65 1%
Alternative 3	1,590 37%	2,650 61%	65 1%

* Approximately 1% of the project area is classified as unburnable (rock etc.) and therefore not quantified.

Cumulative Effects

See Cumulative Effects for All Alternatives below.

Alternative 3

Direct and Indirect Effects

The effects on the fuels profile, loading and fire behavior on treated stands are similar to Alternative 2, with less area converted to lower flame length classes and reduced crown fire activity. Under this alternative approximately 48% of the project area would be in the low flame length category (8 feet flame length or less) compared to 48% with Alternative 2 (Table 29). With Alternative 3, 37% of the area would be in the low crown fire behavior category following treatment compared to 38% with Alternative 2 (Table 30).

While the length of time that treatments would be effective may be slightly shorter under Alternative 3 than Alternative 2 in modifying fire behavior, they are not anticipated to be of sufficient scale or intensity to make an appreciable difference over the span of 20 years.

Cumulative Effects for All Alternatives

The cumulative effects area was determined to be the project analysis boundary because collective activities within this area can modify fire behavior. Although management activities and wildfire outside this boundary could notably influence fire behavior within the project boundary, the spatial magnitude (size) of this boundary was determined to be adequate from a fire management perspective.

The cumulative effects area has been managed through activities such as logging, most notably from the 1970s and 80s. Past activities include a variety of prescriptions associated with several projects such as commercial thinning, pre-commercial thinning, regeneration cutting, site preparation, and planting. A variety of treatment methods have included, mechanical piling, hand piling, and prescribed burning.

Within the project boundary, the existing condition reflects the effects of past activities, including fire suppression. Fuel models and stand conditions modeled reflect the changes associated with activities affecting fire behavior and hazard up to present.

In 2008, a wildfire occurred directly adjacent to the project area on the northeast edge. The Telephone fire burned under varying conditions and as a result had variable effects to the area. The fire reduced fuels in the short-term adjacent to the project area and therefore would reduce fire behavior. This would also reduce the likelihood that high intensity fire would enter the Salt project from this area, at least in the short-term. In areas of higher mortality, fuels can be expected to accumulate due to breakage and fall-down of the standing dead timber. Although this area is outside of the cumulative effects area, the fact that it escaped initial suppression action and reached over 5,500 acres in size is worth noting. A fire burning in the Salt project may or may not burn in the same manner as the Telephone fire. It would be based upon the conditions at the time of the fire.

Under Alternative 1, the cumulative effects of past management actions and the continuation of fire suppression without management action will result in the area trending toward increasing fire hazard.

Under the action alternatives (2 and 3), treatment would reduce the available fuels and therefore crown fire potential and fire intensity.

3.3.4 Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The Salt project is in compliance with the following laws, policies and plans:

The National Fire Plan, 10-Year Comprehensive Strategy[149] and National Fire Plan 10-Year Comprehensive Strategy Implementation Plan[150]

The Salt project directly addresses two of the four principle goals of the 10-year strategy: Reduce Hazardous Fuels and Restore Fire-Adapted Ecosystems.[151]

The Federal Wildland Fire Policy[152] guiding principles of the National Wildland Fire Policy

The Salt project is consistent with this policy, particularly in the fact that by reducing potential fireline intensities through fuel reduction, firefighter and public safety will be enhanced.

*The Healthy Forests Restoration Act and Healthy Forests Initiative*153

The Salt project complies with this direction because treatments would improve forest conditions through fuels reduction activities. This project is not within a designated wildland urban interface and is not using the special administrative authorities under the Healthy Forests Restoration Act.

Land Management Direction and Desired Condition

Chapter 1.3 of this EIS outlines how meeting the Forest Plan's goals, objectives and standards as they relate to fuel reduction is part of the basic purpose and need to do the fuel reduction work in the Salt project area.

3.3.5 Summary of Measures of Success and Key Issue Effect

Table 31: Measure of success – hazardous fuel reduction by alternative

Purpose & Need	Alternative 1	Alternative 2	Alternative 3	Difference Between Alternatives 2 & 3
Reduce Hazardous Fuels				
Reduction in acres of Active Crown Fire Potential	0	5	5	0
Reduction in acres of Passive Crown Fire Potential	0	1,110	1,060	50
Reduction in acres requiring indirect fire attack methods (Flame length reduced to 8 feet or less)	0	780	770	10
Increase in acres that could be direct attacked with hand crews (flame length reduced to 4 feet or less)	0	900	870	20

[149] USDI and USDA 2001
[150] USDI and USDA 2002: USDI and USDA 2005
[151] The other two goals are to improve fire prevention and suppression and to promote community assistance. While promoting prevention and community assistance is not a part of this proposed action it is a part of the National Forest fire prevention programs.
[152] USDI et al. 2001
[153] Healthy Forests Initiative 2002; Healthy Forests Restoration Act 2003

Table 32: Key issue: effects of regeneration harvest on fire hazard by alternative

Issue Indicator	Alternative 1	Alternative 2	Alternative 3
Key Issue **Regeneration Harvest - green tree retention in the proposed action may increase risk from fire**			
Reduction in acres of Crown Fire Potential	0	27	0
Increase acres where direct attack is likely effective	0	10	0

3.4 Economics[154]

3.4.1 Methodology for Analysis

Purpose and Need Measure

The purpose and need for this project has as one objective to: Provide timber projects. To measure how well each alternative meets this objective the following economic measures of success were used.

- Timber sale viability for ground based units and total sale value.
- Timber sale viability for helicopter based units and total sale value.

Issues Addressed

No key issues, relative to economics, were identified through public or internal scoping. The following analysis issues were identified during public scoping and were considered in this analysis.

- Helicopter yarding can make a unit financially unfeasible.
- Completing all of the work planned for, including mitigations, may exceed the value of the timber products.

Economic Costs and Benefits

The economic costs and benefits analysis consists of two separate calculations. The first part is calculating the economic viability of the proposed timber sale, or simply stated the anticipated stumpage value of the timber. The economic viability model is Region 5's Timber Sale Economic Evaluation spreadsheet which generates unit specific estimated stumpage values. Data sources for this model include logging cost inputs from LogCost 8.0, estimated road reconstruction and maintenance costs from the Forest, and estimated timber volumes, species distribution, and product sizes from the silvicultural information.

The second analysis is a calculation of the Present Net Value of the project. This calculation includes all monetary costs and benefits for the project. Future costs and benefits will be discounted back to 2008 dollars using a 4% discount rate. The monetary benefits are the estimated stumpage value for the timber sale. The monetary costs include the costs of planning, preparing, and administering the project, and the costs associated with the pre-commercial thinning portion of the

[154] Information in this Section is adapted from the Salt Economic Report, North 2009

project. The model used for this analysis is the Quicksilver Economic Analysis program. Data sources will include costs provided by the forest for each type of activity.

Social Impacts

The analysis will focus on the direct and indirect economic impacts of the Salt project on the citizens of Trinity County. The impacts will be measured in terms of the number of logging and sawmill jobs supported by the project, and the economic value of these jobs as compared to the overall economy of the county. It is recognized that the potential exists for entities outside of these counties to benefit from the project. However, restricting the analysis area to Trinity County does not detract from understanding or recognizing these benefits.

The data sources for this analysis include local, county, state and federal economic databases and reports. The limitations of these data sources are primarily due to the relative small size of Trinity County's population and economy. In many cases, there is not enough data available to be able to quantify the actual importance of an industry sector to the overall economy, making the effect of the economic impacts difficult to judge.

3.4.2 Affected Environment

The Salt project is located entirely within Trinity County. Trinity County is a large remote county located in Northwestern California. The county has a population of 14,313 (2006) over an area of 3,197 square miles. Most of the population lives in small towns, or on ranches or farms. Weaverville is the county seat and the largest city with a population of approximately 3,500.

The local economy in Trinity County has historically been based on government, forestry, light manufacturing, and tourism. The economic data available for Trinity County is limited due to the small size of the economy. Much of the gross revenue data is not available at the county level to maintain confidentially for businesses; however, the jobs and income data provide a reasonable overview of the economy. The economy of Trinity County is moderately diversified; it is more dependent on the service and government sectors than the production sector (79% by jobs, 61% by income).

Table 33: Trinity County economy by sector 2005

Economic Sector	Number of Jobs	Percent of Jobs	2005 Wages ($1000)	Percent of 2005 Wages
Production	863	20%	53,449	38%
Service	2282	52%	22,574	16%
Government	1262	29%	63,437	45%
Totals	4407	----------	139,460	----------

Source: US Department of Commerce, Bureau of Economic Analysis – Reports CA25 and CA06 for Trinity County, 2005

The production sector is defined as the business of extraction or processing raw materials, and includes agriculture, forestry, mining, and manufacturing industries. In 2005 there were 287 manufacturing jobs, a significant change from the 618 manufacturing jobs in 1995. The Trinity River

Lumber Company in Weaverville is the only large production sawmill operating in Trinity County. According to the Trinity Journal (January 2008), the Trinity River Lumber Mill has a design capacity of 134 MMBF per year, and is the largest non-government employer in the county, employing 138 people. These mill jobs are approximately one half of the manufacturing industry jobs in Trinity County, and are also very important to the economy of Weaverville.

Table 34: Trinity County jobs and wages by industry, 2005

Industry	Number of Jobs	Percent of Jobs	2005 Wages ($1000)	Percent of Wages
Farm employment	245	5.6%	38,530	27.1%
Forestry, fishing, related activities	(D)	0.0%	988	0.7%
Mining	(D)	0.0%	(D)	0.0%
Utilities	(D)	0.0%	(D)	0.0%
Construction	331	7.5%	3,690	2.6%
Manufacturing	287	6.5%	10,059	7.1%
Wholesale trade	(D)	0.0%	(D)	0.0%
Retail trade	546	12.4%	7,430	5.2%
Transportation and warehousing	80	1.8%	599	0.4%
Information	71	1.6%	1,363	1.0%
Finance and insurance	95	2.2%	1,496	1.1%
Real estate and rental and leasing	257	5.8%	352	0.2%
Professional and technical services	228	5.2%	2,866	2.0%
Management of companies and enterprises	0	0.0%	0	0.0%
Administrative and waste services	94	2.1%	88	0.1%
Educational services	(D)	0.0%	(D)	0.0%
Health care and social assistance	(D)	0.0%	(D)	0.0%
Arts, entertainment, and recreation	137	3.1%	1,047	0.7%
Accommodation and food services	466	10.6%	4,715	3.3%
Other services, except public administration	308	7.0%	3,474	2.4%
Government and government enterprises	1262	28.6%	65,427	46.0%
Total	**4407**	**100.0%**	**142,124**	**100.0%**

Source: US Department of Commerce, Bureau of Economic Analysis – Reports CA25 and CA06 for Trinity County, 2005.
Note: (D) indicates that these values can not be displayed due to confidentiality of data to protect businesses in these industries due to the small number of business in that sector.

The timber industry in Trinity County currently provides about 50% of the manufacturing jobs in Trinity County. Historically, this percentage was higher, but it declined significantly during the late 1990s with the implementation of the Northwest Forest Plan. The reduction in timber harvest from the federal lands reduced the raw material supply for the industry, which resulted in the closure of the mill in Hayfork in 1996. Figure 13 shows the general relationship between timber volumes harvested from the Forest, and the number of manufacturing jobs in Trinity County.

The trend is relatively clear; less volume harvested means fewer manufacturing jobs. There is 3 to 5 years lag in the effect of volume changes because the timber contracts run for that length of time, and there was timber available from other sources.

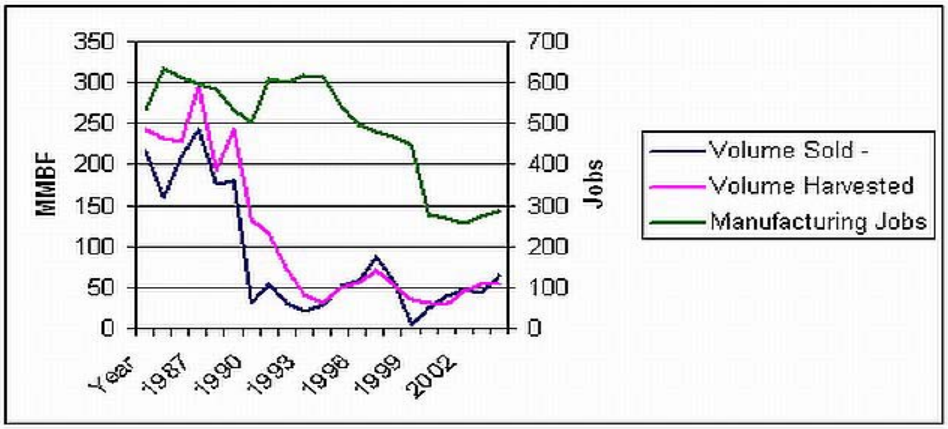

Figure 13: Shasta-Trinity National Forest volume sold versus Trinity County manufacturing jobs 1985 - 2005

Jobs in the timber industry fall into two general categories, logging and milling. The logging jobs, including trucking, tend to be very seasonal in nature. The logging season is late spring through early fall, depending on the amount of rain and snow. The milling jobs are year round jobs. Both types of jobs pay higher than the average income for Trinity County.

Table 35: Estimated annual income by job type in Trinity County, 2005

Job Type	Estimated Annual Income
Logging*	$38,620
Manufacturing**	$36,631
Average***	$27,846

*May 2005 State Occupational Employment and Wage Estimates – USDOL – California State weighted average for fallers and logging equipment operators. No local or regional data available.
**Source: Regional Economic Information System, Bureau of Economic Analysis, U.S. Department of Commerce – all manufacturing jobs including sawmilling. Sawmilling level data is not available.
***Source: Regional Economic Information System, Bureau of Economic Analysis, U.S. Department of Commerce

Summary of Existing Condition vs. Desired Condition

Table 36 displays a summary of the existing condition and the desired condition for economics and timber products.

Table 36: Economic/timber products existing condition vs. desired condition summary

Purpose & Need	Existing Condition	Desired Condition (Measures of Success)
Provide timber products	Timber products exist on site and the removal of some will meet other Forest objectives (forest health, resiliency and growth and hazardous fuel reduction)	Sustainable supply of timber from suitable lands to support local or regional markets and provide jobs. (Merchantable timber harvested (million board feet - MMBF)
		Sustainable supply of timber from suitable lands to support local or regional markets and provide jobs. (Merchantable biomass harvested (bone dry tons – BDT)
	A local/regional forest products market exists. A project needs to be economically viable to sell.	Viable timber sale. (Timber sale viability for ground based system (Pond log value minus stump to mill costs per ccf. Positive number = viable sale)).
		Viable timber sale. (Timber sale viability for helicopter unit (pond log value minus stump to mill costs per ccf. Positive number = viable sale))

3.4.3 Environmental Consequences

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

Under this alternative, no timber would be harvested, no pre-commercial thinning or fuel break maintenance would occur. With no timber harvest, no timber related jobs will be supported, nor any 25% stumpage sharing with Trinity County. There are no foreseeable cumulative effects for the no action alternative.

Alternative 2 – Proposed Action

Alternative 2 proposes to treat 1,619 acres within the project area. Treatments include commercial thinning of overstocked stands, regeneration of declining stands via shelterwood and green tree retention prescriptions, thinning an existing shaded fuel break, pre-commercial thinning of high risk plantations, and hand treatment of fuels in a visually sensitive area.

Table 37: Alternative 2 proposed activities.

Harvest Activity	Timber Sale Related Acres	Non-Commercial Acres
Intermediate Thinning	963	0
Shelterwood – Green Tree Retention	31	0
Regeneration Harvest – GTR	27	0
Fuel Break Maintenance	103	0
Totals	**1124**	**0**

Slash Treatment Activity	Timber Sale Related Acres	Non-Commercial Acres
Hand Pile and Burn	138	14
Treat Slash On Site	1,306	0
Tractor Site Prep, Burn Piles	58	0
Tractor Jackpot Pile, Burn Piles	0	103
Total	**1,502**	**117**
Other Activities	**Timber Sale Related**	**Non-Commercial**
Pre-commercial Thinning	0	481 Acres
Decommission Roads	0	13.8 Miles

Direct and Indirect Effects

Commodity Production

The proposed action will result in the production of timber commodities. In addition to sawlogs, this project could also produce fuel for the biomass industry. However, the closest facility capable of utilizing the fuel is in Anderson, California, and the cost of removing, processing, and transporting the fuel exceeds the current delivered fuel price.

The proposed harvest removal methods include ground based and helicopter yarding. The ground based system used for this analysis is mechanized falling (feller buncher) and tractor skidding. The analysis assumed that the tops would be left attached, skidded to the landing for processing and disposal. If no biomass market exists at the time of harvest, the tops and slash would be piled and burned at the landing. The helicopter yarding analysis showed that it is less expensive to hand pile and burn the slash in the unit than to fly the tops out with the sawlogs.

Table 38: Alternative 2 - acres, volumes, and harvest costs by logging system

Harvest System	Acres	Sawlog Volume MBF*	Sawlog Volume CCF**	Biomass Volume BDT***	Stump to Mill Costs per CCF****
Ground Based	986	8,137	15,886	12,945	$141.04
Helicopter	138	1,228	2,417	0	$293.01
Totals	**1124**	**9,365**	**18,303**	**12,295**	**---**

*MBF = Thousand Board Fee; **CCF = Hundred Cubic Feet; ***BDT = Bone Dry Ton; ****Stump to Mill Cost: Source Salt Alt2 R5_sale_eval_V1_02_02_09.xls. Costs include all cost centers including harvest, load, trucking, road construction, reconstruction, slash disposal, and erosion control.

The timber harvested under this alternative consists of small and medium sawtimber. The fuel being harvested consists of the limbs and tops of the merchantable trees. To meet fuel loading objectives, the cost of yarding the tops is included in the cost of removing the sawtimber. The additional biomass costs include chipping, and transportation to the biomass plant.

Table 39: Timber characteristics and delivered product values

Product	Species	Volume CCF	Pond Log Value*
Sawlog	Ponderosa Pine	5,490	$139.33
Sawlog	Sugar Pine	1,829	$153.31
Sawlog	Douglas-Fir	5,494	$165.81
Sawlog	White Fir	4,576	$138.91
Sawlog	Incense-Cedar	914	$312.50
Total/Weighted Average		18,303	$157.22
Product	**Volume CCF**	**Landing to Plant Cost**	**Pond Log Value****
Biomass	4,707	$61.95	$43.15

*Source: Oregon Department of Forestry, Klamath Region, 2nd Quarter 2008 prices. Pond Log Value is the price paid at the mill for delivered logs. **Source: Region 5 TEA Spreadsheet. Pond Log Value is the price paid at the mill for delivered fuel.

Comparing the average Pond Log Value to the average Stump to Mill cost, it is obvious that while the ground based component is economically viable at this time, the helicopter component is not. The reasons for this include the effect high fuel prices has on helicopter yarding costs, and depressed values for forest products due to the current housing market. The helicopter component is included in this analysis because the project objectives still apply to that unit, and the possibility that during the life of the project a combination of lower fuel prices and an improved forest products market or the combination of this unit with another project in a neighboring area may cause it to become economically viable.

Table 40: Alternative 2 timber sale viability

Logging System	Base Rates ($ per CCF)	Indicated Advertised Rates ($ per CCF)	Total Estimated Sale Value
Ground Based Only	$15.95	$19.94	$316,767
Ground Based and Helicopter	$8.5	-$0.90	-$20,682

Table 40 details the economic viability for this alternative. The base rates are the minimum value that the government will accept for the timber, and it includes essential reforestation of the shelterwood and green tree retention units. The advertised rates are the predicted selling value of the timber if it was appraised in today's market. An advertised rate of less then the base rate indicates a deficit sale. It is unlikely that a purchaser would buy a deficit sale.

The biomass component is not economically viable at current market prices. It has been left in the analysis because utilizing this material is preferable to disposing of it, and the possibility that a combination of lower fuel prices and higher electricity prices during the life of the project may cause it to become economically viable.

Under current market conditions, only the ground based component of this project is economically viable. The financial efficiency will be calculated based on all treatments. The indirect effects (jobs, income, and payments to counties) will be calculated using only the ground based component. If the helicopter or biomass components do become viable during the life of the project,

the effect will be to increase the financial efficiency by amortizing the fixed project costs over more volume, and will increase the number of jobs, and amount paid to the county.

Financial Efficiency

The financial efficiency of this project is measured by the present net value of the project (PNV). The PNV is calculated by subtracting the present value of future costs from the present value of future benefits. The present value is the 2008 value of costs and benefits earned or spent in future years, discounted back to 2008 dollars.

Table 41: Alternative 2 benefit and cost detail

Benefit	Quantity and Unit of Measure	Value per Unit	Inflation Rate (%)	Base Year	Estimated Accomplishment Year
Stumpage from Timber Sale	15,886 CCF	19.94	4	2008	2009
COST	**Quantity and Unit of Measure**	**Cost per Unit**	**Inflation Rate (%)**	**Base Year**	**Estimated Accomplishment Year**
Hand Pile (Fuels Treatment)	14 Acres	$800	4	2008	2009
TOS – Commercial Acres (Fuel Treatment)	1,306 Acres	$57.50	4	2009	2013
Preparation (Timber Sale)	15,886 CCF	$17.33	4	2008	2009
Administration (Timber Sale)	15,886 CCF	$8.67	4	2008	2010
Pre-commercial Thinning (PCT)	481 Acres	$200	4	2008	2010
Tractor Pile and Burn (Slash Treatment)	58Acres	$300	4	2008	2010
Tractor Pile Fuel Break (Slash Treatment)	103 Acre	$250	4	2008	2010
Burn Hand Piles (Slash Treatment)	117 Acres	$50	4	2008	2011
Burn Landing Piles (Slash Treatment)	57 Each	$100	4	2008	2011
Tree Planting (Tree Planting)	58 Acres	$1,250	4	2008	2012
First Release (Tree Release)	58 acres	$375	4	2008	2016
Second Release (Tree Release)	58 Acres	$375	4	2008	2023
Road Decommissioning	13.8 Miles	$ 5,000	4	2008	2011

Table 42: Alternative 2 present net value summary*

Present Net Value – Stumpage	Present Net Value – Costs	Present Net Value
$329,437	-$903,385	-$573,948**

*Source: Quicksilver Economic Analysis Program; 2008. **This value is discounted, so it is different then the value in other Table.

The present net value of this alternative is -$573,948. The Forest Service will need to budget this amount of funding (in 2008 dollars) to accomplish all the objectives of this project.

Indirect Effects

This alternative has indirect effects on the local economy. These effects include the number of jobs supported, income derived from the jobs, and payments of 25% of the stumpage value to Trinity County.

Harvesting and manufacturing timber will support jobs within the local economy. For this analysis, only direct jobs (logging and milling) were considered. Jobs are described as a person/year employment, and are based on the ratio of logging and milling employment to total volume harvested in 2007 within the state of California.

Counties receive payments in lieu of taxes (PILT) to replace tax revenue lost due to the public nature of lands administered by federal agencies as authorized under the 1976 Payments in Lieu of Taxes Act. The amount is based on the amount of acreage administered by certain federal agencies, population, a schedule of payments, the Consumer Price Index, other federal payments made in the prior year, and the level of funding allocated by Congress. These payments would not be affected by changes in revenue as a result of implementation of the proposed action or alternatives.

In addition to PILT payments, counties receive a portion of the revenue generated on National Forest System lands. Historically, counties have received 25 Percent Fund payments. These payments returned 25% of all revenues generated from forest activities, with the exception of certain mineral programs, and were paid based on the number of National Forest System lands within each county. These funds are used for the upkeep and maintenance of public schools and roads. However, in 2000 Congress enacted the Secure Rural Schools and Community Self-Determination Act (SRSCS). This act was designed to stabilize annual payments to states and counties for the next six years beginning in 2001. The new formula for computing annual payments is based on averaging a state's three highest payments between 1986 and 1999 to arrive at a compensation allotment or "full payment amount". SRSCS authorization ended on September 30, 2006. The last payment under this authorization was made in December of 2006. Public Law (PL) 110-28, the Iraq Accountability Appropriations Act of 2007 contained a provision that provided for payments under the SRSCS Act of 2000 for 2007 and payments continued through September 30, 2007. In 2008 the emergency economic package extended payments through 2011.

Table 43: Alternative 2 – jobs, income, and payment to county

MBF Harvested	Jobs Supported*	Income Supported	Estimated Stumpage Value	Estimated 25% Payment to County
9,365	28.7	$1,067,397	$316,767	$79,191

*Direct Logging and Milling Jobs: Source: 2007 Bureau of Labor Statistics, 2007 California Board of Equalization

Cumulative Effects

Timber volume harvested from this project contributes to the Forest's allowable Sale Quantity. The Forest Plan forecasted an ASQ of 82 MMBF for the Forest Plan preferred alternative. The average volume sold between 1995 and 2006 was 47 MMBF per year, or 57% of the ASQ. This alternative will contribute 9.4 MMBF to the annual target, or 11% of the ASQ.

Alternative 3

Alternative 3 proposes to treat 1,415 acres within the project area. Treatments include commercial and non-commercial thinning of overstocked stands, regeneration of declining stands via shelterwood and green tree retention prescriptions, thinning an existing shaded fuel break, pre-commercial thinning of high risk plantations, and hand treatment of fuels in a visually sensitive area.

The major difference between this alternative and the proposed action is increasing the remaining canopy closure to 60%, which significantly reduces the harvest volumes. Some of the proposed units will generate no commercial volumes, and will be understory thinned using service or integrated resource contracts.

Table 44: Alternative 3 proposed activities, timber sale related and non-commercial acres

Harvest Activity	Timber Sale Related Acres	Non-Commercial Acres
Intermediate Thinning	867	0
Shelterwood – Green Tree Retention	30	0
Fuel Break Maintenance*	100	100
Totals	997	100
Slash Treatment Activity	**Timber Sale Related Acres**	**Non-Commercial Acres**
Hand Pile and Burn	113	14
Treat Slash On Site	867	0
Tractor Site Prep, Burn Piles	30	0
Tractor Jackpot Pile, Burn Piles	0	100
Total	652	114
Other Activities	**Timber Sale Related**	**Non-Commercial**
Pre-commercial Thinning	0	421 Acres
Decommission Roads	0	13.8 Miles

*The shaded fuel break maintenance has some commercial timber to remove. The timber sale is only responsible to treat the slash created by removing the commercial timber. Sub-merchantable timber will need to be treated outside of the timber sale contract.

Direct and Indirect Effects

Commodity Production

This alternative will result in the production of timber commodities. In addition to sawlogs, this project could also produce fuel for the biomass industry. However, the closest facility capable of utilizing the fuel is in Anderson, California, and the cost of removing, processing, and transporting the fuel exceeds the current delivered fuel price.

The proposed harvest removal methods for the commercial thinning units include ground based and helicopter yarding. The ground based system used for this analysis is mechanized falling (feller buncher) and tractor skidding. The analysis assumed that the tops would be left attached, skidded to the landing for processing and disposal. If no biomass market exists at the time of harvest, the tops and slash would be piled and burned at the landing. The helicopter yarding analysis showed that it is less expensive to hand pile and burn the slash in the unit then to fly the tops out with the sawlogs.

Table 45: Alternative 3 - acres, volumes, and harvest costs by logging system

Harvest System	Acres	Sawlog Volume MBF*	Sawlog Volume CCF**	Biomass Volume BDT***	Stump to Mill Costs per CCF****
Commercial Ground Based	867	2,741	5,100	4,680	$153.35
Commercial Helicopter	113	565	1,051	0	$376.44
Totals	**980**	**3,306**	**6,151**	**4,680**	---

*MBF = Thousand Board Feet; **CCF = Hundred Cubic Feet; ***BDT = Bone Dry Ton; ****Stump to Mill Cost: Source Salt Alt3 R5_sale_eval_V1_02_02_09.xls. Costs include all cost centers including harvest, load, trucking, road construction, reconstruction, slash disposal, and erosion control.

The timber harvested under this alternative consists of small and medium sawtimber. The fuel being harvested consists of the limbs and tops of the merchantable trees. To meet fuel loading objectives, the cost of yarding the tops is included in the cost of removing the sawtimber. The additional biomass costs include chipping, and transportation to the biomass plant.

Table 46: Timber characteristics and delivered product values

Product	Species	Volume CCF	Pond Log Value*
Sawlog	Ponderosa Pine	1,926	$139.33
Sawlog	Sugar Pine	601	$153.31
Sawlog	Douglas-Fir	1,792	$165.81
Sawlog	White Fir	1,468	$138.91
Sawlog	Incense-Cedar	364	$312.50
Total/Weighted Average		6,151	$158.56
Product	**Volume CCF**	**Landing to Plant Cost**	**Pond Log Value****
Biomass	1,702	$61.95	$43.15

*Source: Oregon Department of Forestry, Klamath Region, 4th Quarter 2008 prices. Pond Log Value is the price paid at the mill for delivered logs. **Source: Region 5 TEA Spreadsheet. Pond Log Value is the price paid at the mill for delivered fuel.

Comparing the average Pond Log Value to the average Stump to Mill cost for both harvest systems, it is obvious that the helicopter portion is not economically viable. The ground based component appears to have a positive economic value, but the difference is still below base rates, which indicates a deficit sale. It is unlikely that a purchaser would purchase a sale with these values. The reasons for this include the effect high fuel prices has on helicopter yarding costs, depressed

values for forest products due to the current housing market, and the dramatic effect low harvest volumes per acre have on both ground based and helicopter harvest costs. The biomass component is not economically viable at current market prices. It has been left in the analysis because utilizing this material is preferable to disposing of it, and the possibility that a combination of lower fuel prices and higher electricity prices during the life of the project may cause it to become economically viable.

Table 47: Alternative 3 timber sale viability

Logging System	Base Rates ($ per CCF)	Indicated Advertised Rates ($ per CCF)	Total Estimated Sale Value
Ground Based Only	$10.56	$-6.54	$-33,355
Ground Based and Helicopter	$8.80	$-45.84	$-281,981

Table 47 details the economic viability for this alternative. The base rates are the minimum value that the government will accept for the timber. The advertised rates are the predicted selling value of the timber if it was appraised in today's market. An advertised rate of less then the base rate indicates a deficit sale. It is unlikely that a purchaser would buy a deficit sale.

Under current market conditions, this alternative does not have an economically viable timber sale. It is highly unlikely that there will be a combination of lower fuel costs and higher market conditions during the life of the project which will make the commercial sawtimber in the alternative economically viable. To achieve the objectives of this alternative, the only solution is to offer the project as an integrated resource contract. Under this type of contract, the value of the sawtimber is subtracted away from the cost of treatment, and appropriated funds are used to finance to balance.

The financial efficiency will be calculated for all treatments. The indirect effects (jobs, income, and payments to counties) will be calculated using only the commercial treatment component of this alternative.

Financial Efficiency

The financial efficiency of this project is measured by the present net value of the project (PNV). The PNV is calculated by subtracting the present value of future costs from the present value of future benefits. The present value is the 2008 value of costs and benefits earned or spent in future years, discounted back to 2008 dollars.

Table 48: Alternative 3 benefit and cost detail

Benefit	Quantity and Unit of Measure	Value per Unit	Rate (%)	Base Year	Estimated Accomplishment Year
Stumpage (Timber Sale)	6,151 CCF	$8.80	4	2008	2009
Cost	**Quantity**	**Value**	**Rate (%)**	**Base**	
Hand Pile (Fuels Treatment)	127 Acres	$800.00	4	2008	2009
TOS – Commercial Acres (Fuel Treatment)	867 Acres	$57.50	4	2009	2013
TOS - Non-Commercial Acres (Fuel Treatment	228 Acres	$103.67	4	2009	2013
Preparation (Timber Sale)	6,151 CCF	$17.33	4	2008	2009
Timber Sale (Net Harvest Costs)	6,151 CCF	$45.84	4	2008	2009
Administration (Timber Sale)	6,151 CCF	$8.67	4	2008	2010
Mechanized Fell, Pile, and Burn	228 Acres	$250.00	4	2008	2010
Pre-commercial Thinning (PCT)	481 Acres	$200.00	4	2008	2010
Tractor Pile Fuel Break (Slash Treatment)	100 Acre	$300.00	4	2008	2010
Tractor Pile Regen Units	30 Acres	$300.00	4	2008	2010
Burn Hand Piles (Slash Treatment)	127 Acres	$50.00	4	2008	2011
Burn Landing Piles (Slash Treatment)	20 Each	$100.00	4	2008	2011
Road Decommissioning (Service Work)	13.8 Miles	$5,000.00	4	2008	2011
Tree Planting (Tree Planting)	30 Acres	$1,250.00	4	2008	2012
first release (Tree Release)	30 acres	$375.00	4	2008	2016
Second Release (Tree Release)	30 Acres	$375.00	4	2008	2023

Table 49: Alternative 3 present net value summary*

Present Net Value – Stumpage	Present Net Value – Costs	Present Net Value
52,293	-804,809	-$748,515

*Source: Quicksilver Economic Analysis Program; 2008

The present net value of this alternative is -$748,515. The Forest Service will need to budget this amount of funding (in 2008 dollars) to accomplish all the objectives of this project.

Indirect Effects

This alternative has indirect effects on the local economy. These effects include the number of jobs supported, income derived from the jobs, and payments of 25% of the stumpage value to Trinity County.

Harvesting and manufacturing timber will support jobs within the local economy. For this analysis, only direct jobs (logging and milling) were considered. Jobs are described as a person/year employment, and are based on the ratio of logging and milling employment to total volume harvested in 2007 within the state of California.

Counties receive payments in lieu of taxes (PILT) to replace tax revenue lost due to the public nature of lands administered by federal agencies as authorized under the 1976 Payments in Lieu of Taxes Act. The amount is based on the amount of acreage administered by certain federal agencies, population, a schedule of payments, the Consumer Price Index, other federal payments made in the prior year, and the level of funding allocated by Congress. These payments would not be affected by changes in revenue as a result of implementation of the proposed action or alternatives.

In addition to PILT payments, counties receive a portion of the revenue generated on National Forest System lands.

Table 50: Alternative 3 – jobs, income, and payment to county

MBF Harvested	Jobs Supported*	Income Supported	Estimated Stumpage Value	Estimated 25% Payment to County
3,305	10.1	$376,809	$54,128	$13,532

*Direct Logging and Milling Jobs: Source: 2007 Bureau of Labor Statistics, 2007 California Board of Equalization

Cumulative Effects

Timber volume harvested from this project contributes to the Forest's allowable Sale Quantity. The Forest Plan[155] forecasted an ASQ of 82 MMBF for the Forest Plan preferred alternative. The average volume sold between 1995 and 2006 was 47 MMBF per year, or 57% of the ASQ. This alternative will contribute 3.3 MMBF to the annual target, or 4% of the ASQ.

3.4.4 Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

A financial efficiency analysis is required during Gate 2 of timber sale planning (project analysis, design and decision notice) (FSH 2409.18). The financial efficiency analysis of the proposed timber harvest, vegetation management, and transportation management activities meets this requirement.

[155] USDA 1995

3.4.5 Summary of Measures of Success

Table 51: Measure of success – providing forest products, timber sale viability

Measure of Success	Alternative 1	Alternative 2	Alternative 3	Difference Between Alternative 2 and 3
Provide Timber Products				
Timber sale viability ground based only. Total Sale Value	0	Viable Timber Sale. Total Sale Value $316,767	Not a Viable Timber Sale. Total Sale Value -$33,355	Alternative 2 is Viable Alternative 3 is Not Viable
Total stumpage value for helicopter unit (Pond log value minus stump to Mill costs per ccf. Positive number = viable sale).	0	Not a Viable Timber Sale Total Sale Value -$20,682	Not a Viable Timber Sale. Total Sale Value -$281,981	Neither Alternative is Viable

3.5 Threatened and Endangered Wildlife[156]

3.5.1 Methodology for Analysis

Issues Addressed

One of the key issues identified during scoping is: ***Changes to stand structure by treatments in the proposed action would remove or downgrade foraging and moderate quality nesting and roosting habitat***.

Issue Indicator: To analyze potential effects of the alternatives on spotted owl habitat the acres of northern spotted owl foraging or nesting and roosting habitat that would be removed or downgraded were considered for each alternative.

Methods

The Forest accessed the most recent list of endangered, threatened, or proposed species that may occur in the project area vicinity (i.e., Trinity County). The following two threatened species[157] will not be discussed further for the following reasons: The project area does not lie proximate to eagle foraging areas (e.g., lakes, rivers, larger creeks) and eagles are not expected to occur in the vicinity. The project area lies well outside the known or expected ranges of the marbled murrelet[158] and the California red-legged frog. [159]

[156] Information in this Section is adapted from the Salt Biological Assessment Quinn 2007; and Supplement to the Biological Assessment, Oechsner 2009b
[157] The bald eagle was de-listed in 2007 and is now included on the Regional Forester's Sensitive Species list.
[158] Ralph et al. 1995
[159] USDI 2002

The project is in the range and contains potential habitat for the northern spotted owl. The Forest Plan database (LMP-90 database) was used to assess National Forest within the watershed for the northern spotted owl analysis. Database assumptions and definitions are found in the Biological Assessment.[160]

Effects to northern spotted owl habitat were analyzed at different scales which are explained in detail, along with the rationale for selection in the Biological Assessment.[161] Effects are summarized in this EIS for:

- The 36,881-acre Salt Creek 5th Field Watershed, which is the appropriate scale to assess the 15% standard and guideline to "Provide for Retention of Old-Growth Fragments Where Little Remains." [162]
- The 16,920-acre spotted owl Action Area which is the primary area analyzed for this project. It was established by a 1.3 mile buffer around all proposed harvest units.
- Two individual owl home ranges are analyzed for two historic owl activity centers included in our records (State ID#s TR287 and TR295; Maps 2 and 3).
- The 4,278 project area encompasses the area in which the Salt project activities would occur.

3.5.2 Affected Environment

Total late-successional conditions in the Salt Creek 5th level HUC Watershed are currently well above the 15% standard and guideline threshold of concern. Total existing late-successional forest (dominated by mature forest) comprises about 78% of federal forest land in the watershed. Old-growth[163] that provides high quality habitat for species associated with old-growth forests such as the northern spotted owl comprises only 408 acres or less than 2% of the 26,491 acres of federal forest land in the 5th level HUC.

2008 Telephone Fire

The 2008 Telephone wildfire did not burn within the Salt project area, but it did affect spotted owl habitat. It affected approximately 6% of the 16,920 acre owl analysis area, 16% of northern spotted owl territory TR-295, and 20% of the Salt Creek-Hayfork Creek 6th Field Watershed. Within the fire effects literature, the term "fire severity" is used to describe ecological impacts of fires.[164] At all three of these scales a majority of the northern spotted owl habitat was unburned (Table 52, Table 53, and Table 54). Most of the landscape that did burn, burned at low severity levels. Mild to moderate fires generally burn in the forest understory, removing small trees and herbaceous groundcover. Only high-intensity fires burn into the crowns of the tallest trees.

Effects to northern spotted owl habitat in the areas that burned were variable. A small amount of mature forest and old growth habitat was reduced as a result of the wildfire. Some important habitat

[160] Quinn 2007, page 22 and 23
[161] Quinn 2007, page 6 and 7
[162] USDA Forest Service and USDI Bureau of Land Management; ROD 1994, page C-44
[163] Vegetation strata 4G and 4N. 4=greater than 24 foot crown diameter, large sawtimber; G=greater than 70% canopy closure; N=40-69% canopy closure.
[164] Parsons 2003

components for owls were lost. Some existing snags were burned up in the fire. Down woody debris and ground cover for prey was reduced. Grasses, herbaceous vegetation and shrubs would be expected to begin recovering within a year following the fire. Within the northern spotted owl habitat that burned, some trees likely were killed or scorched badly enough that they will eventually die and fall. Thus some snags and down woody material may have been created.

Habitat diversity (patchiness of the vegetation) across the landscape would have increased as a result of low severity burned areas. This will be beneficial to owls and their prey base over the long-term. Conditions for another wildfire event occurring within those portions of the area that burned have been reduced, thus maintaining a majority of the remaining habitat values for owls over the long-term.

Table 52: Acres of habitat in owl action area affected by wildfire*

Habitat	Level of Fire Severity				Total Acres
	Unburned	Low	Moderate	High	
Capable	1,566	10	20	1	1,597
Connectivity	9,971	564	123	1	10,660
Foraging	2,412	135	9	0	2,556
High Nesting/Roosting	36	47	11	0	94
Moderate Nesting/Roosting	813	0	0	0	813
Not Capable	440	65	29	6	540
Private	636	20	4	0	660
Total Acres	**15,874**	**841**	**196**	**8**	**16,920**

* Note: total acres differ slightly than Quinn 2007 Biological Assessment, page 15, due to GIS layer variability.

Table 53: Acres of habitat in northern spotted owl territory TR-295 affected by wildfire*

Habitat	Level of Fire Severity				Total Acres
	Unburned	Low	Moderate	High	
Capable	359	0	0	0	359
Connectivity	1,564	139	38	0	1,741
Foraging	199	13	1	0	213
High Nesting/Roosting	12	14	2	0	28
Moderate Nesting/Roosting	52	0	0	0	52
Not Capable	49	3	5	0	57
Territory Outside Analysis Area	646	220	79	2	947
Total	**2,881**	**389**	**125**	**2**	**3,397**

* Note: total acres differ slightly than Quinn 2007 Biological Assessment, page 15, due to GIS layer variability.

Table 54: Acres of habitat burned in the Salt Creek-Hayfork Creek watershed

Habitat	Level of Fire Severity			Total Acres
	Low	Moderate	High	
Non-habitat	535	619	70	1,224
Mature Forest	2,469	769	48	3,286
Old Growth	158	41	6	205
Total	**3,162**	**1,429**	**124**	**4,715**

Table 55: Acres of habitat in northern spotted owl territory TR-287*

Habitat	Total Acres
High Nesting/Roosting	17
Moderate Nesting/Roosting	105
Foraging	746
Total	**868**

*Source Quinn 2007 Biological Assessment, page 15

Connectivity (Dispersal) Habitat

Connectivity habitat comprises 63% (10,660 acres) of the 16,920-acre spotted owl action area and is relatively contiguous except for areas leading to the southeast where harsh growing conditions limit conifer growth. Thomas[165] et al. established the level of adequate connectivity habitat at 50% of a given landscape (e.g., quarter-township). Connectivity habitat is defined as conifer stands meeting at least "11-40" conditions (i.e., an average conifer of at least 11 inches diameter at breast height and at least 40% canopy closure). [166]

Spotted Owl Nesting & Roosting Habitat

Old-growth provides “high quality” owl nesting/roosting habitat. Younger densely to moderately canopied mature stands provides “moderate” quality owl nesting/roosting habitat and foraging habitat respectively. There is a clear distinction between old-growth and late-successional habitat. Late-successional (late seral) is defined simply as conifer stands at least 80 years old regardless of other stand attributes such as level of decadence or canopy closure. Old-growth is a subset of late-successional and is defined as a forest stand usually at least 180-220 years old with moderate to high canopy closure; a multi-layered, multi-species canopy dominated by large overstory trees; a high incidence of large trees, some with broken tops and other indications of old and decaying wood (decadence); numerous large snags; and heavy accumulations of wood, including large logs on the ground.[167]

No high quality nesting or roosting habitat exists in the project area therefore it is not part of the affected environment. Moderate quality nesting roosting habitat exists in the owl action area and in TR295 and TR287 (813, 52 and 105 acres respectively) (Table 52, Table 53, and Table 55).

[165] Thomas et al. 1990
[166] Thomas et al. 1990
[167] USDA Forest Service and USDI Bureau of Land Management; ROD 1994, page F-4

Foraging (NRF) Habitat

Foraging habitat exists in the owl action area and in TR295 and TR287 (2,556, 213 and 746 acres respectively) (Table 52, Table 53, and Table 55).

Snags and Downed Woody Debris

Stand exam data from 2008 shows that currently there is an average of 13 dead trees per acre across the project area (Chapter 3.2.2). Three of the 13 dead trees per acre are over 14 inches dbh (Chapter 3.2.2). This is greater than the Forest Plan standard of 1.5 snags per acre over 15 inches dbh. Large woody debris ranges from 5 to 10 trees per acre for mixed conifer stands, to 3 to 8 trees per acres for tree/brush stands and 1 to 5 logs per acre for brush areas.[168] Downed woody material ranges from less than 7 tons per acre to over 68 tons per acre, with an overall average of approximately 37 tons per acre on most of the project area (Chapter 3.3.2).

3.5.3 Environmental Consequences

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

There would be no change to northern spotted owl habitat with Alternative 1, because no activities would occur.

Alternative 2 – Proposed Action[169]

Direct and Indirect Effects

No disturbance or displacement to northern spotted owls is expected because no birds are known to occupy the area and resource protection measures require a limited operating period to avoid potential disturbance if a bird was in the area during nesting (Chapter 2.4, #1, #2). No designated critical owl habitat would be affected because there is no critical habitat within the project area. The existing condition of nesting and roosting habitat in the core areas of owl territories TR 287 and TR295 will be maintained.

Habitat Removed

Alternative 2 would remove four acres of foraging habitat in the northern spotted owl analysis area. The four acres are in the regeneration harvest - green tree retention Unit 37. Four acres represents less than 0.2% of northern spotted owl foraging habitat in the owl analysis area and 0.6% of northern spotted owl foraging habitat in the project area. None of the four acres of foraging habitat that would be removed occurs within either northern spotted owl territory TR 287 or TR295. Habitat removed

[168] Foss 2009
[169] Since the 2007 Biological Assessment was completed (Quinn 2007) modifications have been made to Alternative 2, the proposed action. A supplement to the 2007 Biological Assessment was completed (Oechsner 2009b) that outlines and evaluates these differences and assessed the consistency with management direction in the Recovery Plan for the Northern Spotted Owl.

indicates the habitat would no longer function as owl habitat. Foraging habitat should develop in roughly 80 years.

Downgraded Habitat

Alternative 2 would downgrade 28 acres of moderate quality nesting and roosting habitat by intermediate thinning in Units 32 and 33A. Downgraded habitat indicates a temporary reduction of owl nesting/roosting habitat down to foraging habitat resulting from thinning prescriptions within existing moderate quality nesting/roosting habitat.

Intermediate thinning from below would reduce overall canopy closure from existing levels down to approximately 50%. Snags less than 19 inches dbh and down woody material in the 3-inch to 20-inch class would be reduced. Existing snags and down logs greater than 19 inches in diameter will be retained, unless they are in a skid trail, landing site, or other exceptions (Chapter 2.4, #4). An average of 1.5 snags per acre greater than 15 inches in diameter and 20 feet in height will also be retained (Chapter 2.4, #4). Snags felled for safety reasons would be left on site. An average of 5 logs per acre will be retained. Additionally an average of 5 or 10 tons of downed material, depending on the unit's Forest Plan land allocation, will be retained on slopes less than 40% with a preference to have 4 to 6 logs per acre at the largest available diameter. (Chapter 2.4, #5, #5a).

Modeling shows that 50 years following treatment the canopy closure would range between 55 to 75% (Chapter 3.2.3). Thus, returning to the existing canopy closure condition in some stands will take 50 years or more. Depending upon the existing vegetative stage of the stands, 50 years after treatment the modeled quadratic mean diameter of trees is projected to be in the range of 22 - 29 inches (Chapter 3.2.3). The projected number of years to achieve a 30-inch quadratic mean diameter for all trees ranges from 60 to over 100 years (Chapter 3.2.3). Thus, the predicted timeframe for the development of moderate and high quality nesting and roosting habitat for owls will exceed 60 years.

Degraded Habitat

Two hundred-thirty six acres of foraging habitat would be degraded in the northern spotted owl analysis area in Alternative 2. Eleven acres of foraging habitat would be degraded in owl territory TR287 and two acres of foraging habitat in owl territory TR295 would be degraded (Table 56). Regeneration harvest and shelterwood with green tree reserves would reduce connectivity habitat within the project area by 54 acres; however, connectivity habitat would be maintained at well above the 50% threshold in the northern spotted owl analysis area.

Degraded indicates some habitat components (e.g., smaller snags, canopy closure, and vertical structural complexity) may be somewhat reduced but the habitat would continue to function at the current level resulting from thinning and fuel break treatments within foraging habitat. The retention of large predominant (legacy) conifers, larger snags (greater than 19") and viable hardwoods would maintain snags and decadent conifers large enough to provide potential future owl nest sites and contribute to vertical structure.

A reduction in the density of smaller trees, standing dead and down woody debris would reduce the wildfire hazard and the severity of effects of a wildfire should it occur. Reducing the wildfire

hazard would maintain and promote owl habitat within the project area for an anticipated 20 years (Chapter 3.3.3).

Cumulative Effects

Current forest conditions within the Salt Creek Watershed [170] are a culmination of past actions that led to those conditions. Mid-mature conifer forest dominates Federal land within the roughly 16,920-acre action area as a result of historic timber harvest activities and fire. Over time, older conifer forest habitat within the action area will likely be restricted to 15,784 acres of federal forest land. Existing non-conifer areas such as hardwood and shrub dominated habitats and riparian vegetation would remain largely intact on both federal and private lands. The action area includes approximately 660 acres of private property that is either residential, including the community of Trinity Pines or areas that were harvested in the 1960s. As a result, this land is dominated by very dense pine forest. While these areas meet the 11-40 condition of owl connectivity habitat, they are currently so dense as to prohibit the free movement of owls. The California Department of Forestry and Fire Protection (CDF) web site[171] lists no private timber harvest plans in this area. Forest Service projects planned in the action area in the foreseeable future include: a 14 acre pre-commercial thin; a watershed restoration project to decommission roads that currently pose risks to water quality and watershed resources and that are not necessary for public or administrative access; and, a hazard tree removal project along access roads in the area burned by the 2008 Telephone fire (Appendix B). Neither action would have a significant cumulative effect with the actions planned in the Salt project.

Determination

Alternative 2 may affect and would likely adversely affect the northern spotted owl based upon the following rationale: Direct harm or disturbance to breeding activities would be avoided with the use of the limited operating period. Existing nesting, roosting and foraging would be removed, downgraded or degraded. The quantity and relative quality of northern spotted owl nesting, roosting and foraging habitat would gradually increase after 50 years or more. The probability of loss of owl habitat due to fire would be reduced for 20 years.

See Appendix G for the USFWS Biological Opinion stating the Salt project is not likely to jeopardize the continued existence of the northern spotted owl.

[170] Quinn 2007, Attachment 1
[171] http://www.fire.ca.gov/ResourceManagement/THPStatusUpload/THPStatusTable.html

Table 56: Effects to spotted owl habitat in action area and TR287 and TR295.

Analysis Area	Effects to Habitat	High Quality Nest/Roost		Moderate Quality Nest/Roost			Foraging		
		Existing Available Habitat	Alt. 2 & 3	Existing Available Habitat	Alt. 2	Alt. 3	Existing Available Habitat	Alt. 2	Alt. 3
Owl Action Area	Removed	94	0	813	0	0	2,556	4	0
	Downgraded		0		28	0		0	0
	Degraded		0		0	0		236	212
	TOTAL		**0**		**28**	0		**240**	**212**
TR287 Owl Home Range	Removed	17	0	105	0	0	746	4	0
	Downgraded		0		0	0		0	0
	Degraded		0		0	0		11	9
	TOTAL		**0**		**0**	**0**		**15**	**9**
TR295 Owl Home Range	Removed	26	0	64	0	0	483	0	0
	Downgraded		0		0	0		0	0
	Degraded		0		0	0		2	2
	TOTAL		**0**		**0**	**0**		**2**	**2**

Alternative 3

Direct and Indirect Effects

No disturbance or displacement to northern spotted owls is expected with the implementation of the limited operating period (Chapter 2.4, #1, #2). No designated critical owl habitat would be treated because there is no critical habitat within the project area. Less northern spotted owl habitat would be affected in Alternative 3.

Habitat Removed

In the northern spotted owl analysis area and project area, no owl habitat would be removed in Alternative 3.

Downgraded Habitat

No moderate quality nesting/roosting habitat would be downgraded in Alternative 3. The existing 28 acres of moderate quality nesting/roosting habitat within Units 32 and 33A in the project area would be excluded from treatment and would remain moderate quality nesting/roosting habitat.

Degraded Habitat

Two hundred-twelve acres of foraging habitat in the project area and northern spotted owl analysis area would be degraded in Alternative 3. Alternative 3 would degrade nine acres of foraging habitat in owl territory TR287 and degrade 2 acres of foraging habitat in owl territory TR295 (Table 56). Long-term displacement of the owls from either owl territory is unlikely due to the few acres (11 acres total for both territories) of foraging habitat being degraded by treatments proposed.

Shelterwood with green tree reserves is prescribed in Alternative 3 which would reduce connectivity habitat by 30 acres within the project area; however, connectivity habitat would be maintained at well above the 50% threshold in the owl analysis area.

The immediate effect of the proposed treatments would result in a reduction of vertical and horizontal structure by removing smaller diameter trees. Canopy closure would be reduced to 60% closure in all thinned units as well as in the shaded fuel break in Alternative 3. No thinning treatments would occur in any riparian reserves, including intermittent or ephemeral streams, preserving the existing canopy closure in those areas. Because canopy closure would be reduced less during treatment, higher levels of canopy closure would be achieved sooner. Canopy closure would be projected to be higher in 50 years by implementing Alternative 3. The modeled projection of crown canopy 50 years following treatment would range from 59-77% (Chapter 3.2.3) or slightly (approximately 2-4%) more canopy closure for northern spotted owls in 50 years than in Alternative 2

Removal of dying trees and those infected with mistletoe would reduce future snags and down woody debris. Some loss of snags less than 19 inches dbh and down woody material in the 3” to 20” class would also reduce existing prey habitat and foraging opportunities for goshawks. However, resource protection measures will assure that existing snags and down logs greater than 19” in diameter will be retained, unless they are in a skid trail, landing site, or other exceptions (Chapter 2.4, #4). An average of 1.5 snags per acre greater than 15 inches in diameter and 20 feet in height will also be retained. Snags felled for safety reasons would be left on site (Chapter 2.4, #4). An average of 5 logs per acre will be retained. Additionally an average of 5 or 10 tons of downed material, depending on the unit’s Forest Plan land allocation, will be retained on slopes less than 40% with a preference to have 4 to 6 logs per acre at the largest available diameter. (Chapter 2.4, #5, #5a).

Depending upon the existing vegetative stage of the stands, the modeled quadratic mean diameter of trees 50 years after treatment by implementing Alternative 3 is projected to be in the range of 19 - 27 inches (Chapter 3.2.3). The projected number of years to achieve a 30 inch quadratic mean diameter for all trees ranges from 85 to more than 100 years (Chapter 3.2.3). The DBH of the trees 50 years following treatments proposed in Alternative 3 would be slightly less (approximately 2-3 inches) than with Alternative 2 Modified.

A reduction in the density of smaller trees, standing dead and down woody debris would reduce the wildfire hazard and the severity of effects of a wildfire should it occur. Reducing the wildfire hazard would maintain and promote owl habitat within the project area for 20 years (Chapter 3.3.3).

Cumulative Effects

The past and present actions that resulted in today’s current forest condition are the same for Alternative 3 as was presented for Alternative 2. The future planned activities are also the same and when considered with the actions planned in Alternative 3 would not be cumulatively significant.

Determination

Alternative 3 of the Salt Timber Harvest and Fuels Hazard Reduction Project may affect, but is not likely adversely affect the northern spotted owl based upon the following rationale: Direct harm or

disturbance to breeding activities would be avoided with the use of the limited operating period. No existing nesting/roosting habitat would be degraded or removed. No foraging habitat would be removed. Nine acres (approximately 1%) of foraging habitat in owl territory TR287 would be degraded. Two acres (less than 0.5%) of foraging habitat in owl territory TR295 would be degraded. Across the analysis area, 211 acres (approximately 8%) of foraging habitat would be degraded. Canopy closure in riparian reserves would remain intact. The quantity and quality of foraging habitat would gradually increase after 50 years or more. The probability of loss of owl habitat due to fire would be reduced for 20 years (Chapter 3.3.3).

Alternative 3 would have no affect on designated spotted owl critical habitat because no designated critical habitat lies within areas proposed for treatment.

3.5.4 Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Alternative 2 and Alternative 3 comply with the *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl.*[172] The Regional Forester approved the Shasta-Trinity Forest Plan on April 28, 1995 and it became effective as of June 5, 1995. The Northwest Forest Plan ROD was incorporated into the Forest Plan.

3.5.5 Summary of Key Issue Effects

Table 57: Key issue - removal or downgrading of northern spotted owl habitat by alternative

Issue Indicator	Alternative 1	Alternative 2	Alternative 3
Key Issue **Treatments may remove or downgrade suitable northern spotted owl habitat or, when considered cumulatively with past projects, negatively affect spotted owls.**			
Acres of northern spotted owl habitat removed	0	No critical owl habitat or high quality nesting and roosting habitat affected. 4 acres foraging habitat removed (Portion of Unit 37) This is 0.2% of the foraging habitat available in the owl action area.	No critical owl habitat or high quality nesting and roosting habitat affected. 0 acres removed or downgraded.
Acres of northern spotted owl downgraded	0	28 acres moderate quality nesting and roosting habitat downgraded (Portions of Units 33C and 32) which is 3.4% of the moderate quality nesting and roosting habitat available in the area.	0

[172] USDA Forest Service and USDI Bureau of Land Management; ROD 1994

3.6 Sensitive Wildlife Species

3.6.1 Overall Methodology for Analysis

Issues Addressed

During the public scoping process the following key issues, related to sensitive wildlife species, were identified:

- Retaining less than 60% canopy closure after thinning could affect wildlife habitat.
- Thinning in riparian reserves may have unintended effects on the watershed, fisheries and wildlife.
- Construction of 0.3 miles of new temporary road may negatively impact hydrology, soils and wildlife.

To analyze potential effects of each alternative on these issues the following Issue Indicators were used:

- Acres of suitable habitat that would become unsuitable due to retaining 50% rather than 60% canopy closure
- Suitable wildlife habitat that would become unsuitable due to thinning in intermittent and ephemeral riparian reserves
- Acres of wildlife habitat affected by temporary roads were considered.

In addition, several analysis issues, which are considered in the effects analysis, were identified:

- Treatments may destroy, alter or fragment forest habitat suitable for fishers.
- Treatments, when considered cumulatively with past projects in the watershed may fragment habitat
- Vegetation treatments may impact management indicator species (MIS) and threatened, endangered, and sensitive (TES) species habitat and ability to survive.
- Removing old legacy trees may impact wildlife habitat including future snag habitat.

Overall Methods

The Regional Forester's Sensitive Species list (last appended October 15, 2007 was reviewed and twenty-four sensitive terrestrial animal species were identified that may occur on the Shasta-Trinity National Forest. In order to determine the scope of analysis, a preliminary evaluation was conducted for each potentially affected sensitive species.

A number of sensitive wildlife species are not analyzed further in this analysis because the project would have no impact on them because there is either no potential habitat in the project area for them or the likelihood of occurrence in the project area is remote. These species include the California wolverine, bald eagle, willow flycatcher, northwestern pond turtle, Cascades frog, foothill yellow-legged frog, southern torrent salamander, Shasta salamander, Shasta sideband snail, wintu sideband snail, Shasta chaparral snail, tehama chaparral snail, big bar (Pressley) hesperian snail, Shasta Hesperian snail, California floater, montane peaclam, topaz (scalloped juga, nugget pebble snail.

Field reviews and habitat assessments were conducted in 2007 and 2008. Within the project area, vegetation components were sampled in May, 2008 using standard R-5 Stand Exam protocol. A total

of 160 field plots (representing 98% of the vegetation found in the project area) were completed in the major vegetation types in the project area (Chapter 3.2.2).

To assess existing habitat conditions, the 2008 stand exam data was extrapolated to similar vegetation types across the analysis areas for each sensitive wildlife species. The existing Forest GIS database Veg1980 layer was used for those vegetation types that did not have 2008 stand exam data. In addition to the stand exams, habitat was assessed through field observations in 2008.

The Forest GIS database and the California Natural Diversity Database were consulted and used to determine habitat occupancy and sighting information.

Assumptions and limitations of the data used in this analysis were considered. Extrapolations of site-specific stand exam data to like vegetation types is an accepted method of characterizing vegetation, however it is not a 100% accurate representation of each acre on the ground. For wildlife habitat characterization this methodology is appropriate. All habitat determinations were reviewed and validated by a wildlife biologist who is familiar with the habitat within the project area.

During preparation of this document in the summer of 2008, a wildfire occurred directly adjacent to the Salt project area. The Telephone wildfire was part of the Lime Complex of fires that occurred on the front country of Trinity County in the Lower Hayfork Creek 6th field watershed. Changes to the amount of available habitat as a result of the Telephone wildfire were incorporated into the existing condition of each species evaluated.

3.6.2 Existing Conditions Relevant to Late Successional Forest, Snags and Downed Woody Debris

The existing habitat condition in the project area, as it relates specifically to the habitat needs of each sensitive species, is described in this section. The existing condition of late successional forests, snags and downed woody debris are also described here because they are important components for a number of species.

Late-Successional Forest – Related to 15% Forest Plan Standard and Guideline

The 36,881-acre Salt Creek Watershed includes about 5,748 acres of private property and 31,133 acres of National Forest System Lands of which about 26,491 acres are vegetation types that are considered ‘federal forest land’ (Figure 14). Federal forest land is the denominator in calculating the Standard and Guideline of total existing late-successional forest. Table 58 and Table 59 display the tree size classes and canopy closures used to characterize and describe vegetation.

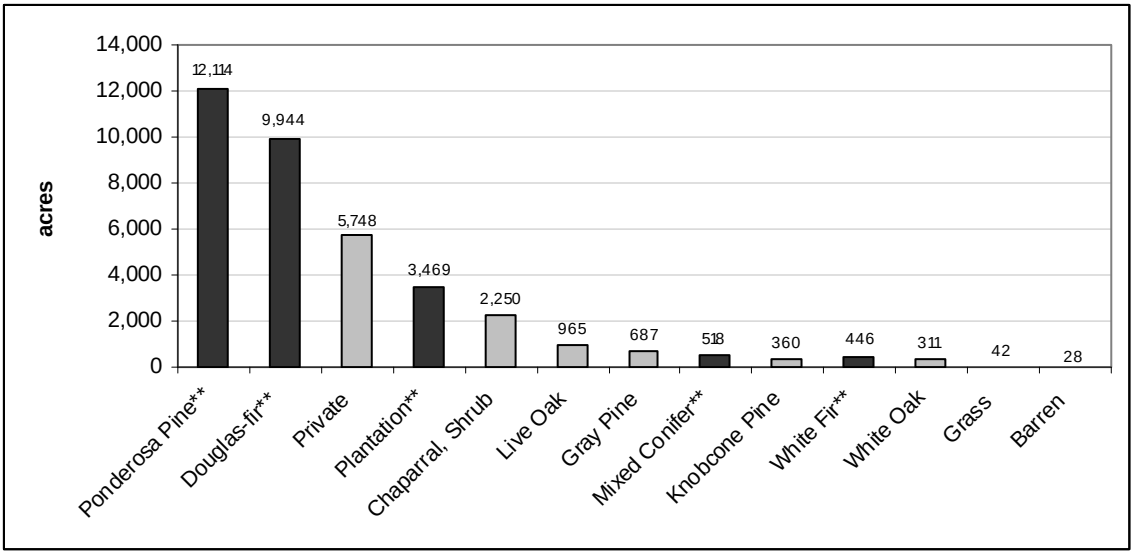

Figure 14: Major vegetation types in the Salt Creek Watershed.

**Vegetation types that qualify as Federal Forest Land and supply the denominator in calculating the 15% S&G

Late-successional forests, as defined in the Northwest Forest Plan and Shasta-Trinity Forest Plan, include small, mature and medium to large old growth trees (size class 3 and 4), regardless of the crown density of those stands (canopy closure codes S, P, N & G). Approximately 78% of the Salt Creek Watershed is in late-successional forest. Only two percent of this habitat is high quality old-growth habitat (4N/G), the rest is small, mature forest. The Salt project does not propose any activities in the high quality old-growth habitat therefore, high quality old-growth habitat is not part of the affected environment for this project.

Table 58: Description of the tree size class codes used in vegetation descriptions

Size Class Code	Forest Plan Size Class – Crown Diameter
1	Sapling (less than 6 feet)
2	Pole-size timber (6-12 feet)
3	Small sawtimber (13-24 feet)
4	Medium/large sawtimber ((25+ feet)

Table 59: Description of the canopy closure codes used in vegetation descriptions

Canopy Closure Code	Density Group	Percent Canopy Closure
S	Sparse	10-19%
P	Light	20-39%
N	Medium	40-69%
G	Heavy	70-100%

Snags and Downed Woody Debris

Stand exam data from 2008 shows that currently there is an average of 13 dead trees per acres across the project area. Three of the 13 dead trees per acre are larger than 16 inches dbh and on average there is one additional snag per acre between 14.1 and 16 inches dbh (Chapter 3.2.2). This is greater than the Forest Plan standard of 1.5 snags per acre over 15 inches dbh.

Large woody debris ranges from 5 to 10 logs per acre for mixed conifer stands, from 3 to 8 trees per acre for tree/brush stands and 1 to 5 logs per acre for brush areas (Chapter 3.9.2). Downed woody material ranges from less than 7 tons per acre to over 68 tons per acre, with an overall average of approximately 37 tons per acre on most of the project area.

3.6.3 Pacific Fisher

Spatial and Temporal Scales Analyzed

Truex[173] and Lamberson[174] determined that female fisher survival was the single most important demographic parameter of fisher population stability. The actual size and configuration of a female fisher home range varies and is seldom known. The analysis area used to evaluate potential impacts to fisher related to this project was based on average female fisher home range (5,800 acres) from studies conducted by Yeager[175] on the Shasta-Trinity National Forest.

Fisher habitat was analyzed at three scales:

- A 21,006 acre fisher analysis area was developed by creating a 1.7 mile radius circle (5,800 acres) buffer around all units proposed for treatment within the project area.
- Fisher habitat was also evaluated at the project area and,
- Fisher territory level. Territory 604 and 819

No fisher sightings have been documented within the Salt project area, but there have been four fisher sightings in the vicinity. For purposes of this analysis, the four fisher sightings were each buffered by 5,800 acres in order to establish a potential home range for each individual. The four potential home ranges (territories) intersect portions of the 21,006 acre fisher analysis area established for the Salt project. Two of the fisher territories, numbers 604 and 819, overlap with the Salt project area, therefore they are considered in this analysis.

Timelines used in this analysis begin immediately following treatment and includes projections of stand changes and projected recovery in excess of 100 years.

Affected Environment

The 4,278 acre Salt project area provides approximately 3,740 acres of fisher habitat. None of these acres were affected by the 2008 Telephone fire. No moderate or high quality resting and denning habitat exists within the project area. A majority of the fisher habitat in the project area is low quality resting and denning habitat, and foraging habitat.

[173] Truex et al (1998)
[174] Lamberson et al (2000)
[175] Yeager 2005

The 21,006 acre fisher analysis area had approximately 18,371 acres of fisher habitat before the Telephone fire and is projected to have 18, 076 acres of suitable habitat currently.[176] A portion of fisher territory 604 (outside the project area) also was affected by the Telephone wildfire and that consideration is included in the existing condition for fisher territory 604 (Table 60).

Table 60: Acres of fisher habitat in the Salt project area, fisher analysis area, and territories 604 and 819

Habitat Quality	Acres of Existing Habitat (*Acres burned in 2008 at high or moderate severity assumed no longer habitat)			
	Salt Project Area	Fisher Analysis Area*	Territory 604*	Territory 819
High Resting Denning	0	112	69	0
Moderate Resting Denning	0	0	0	0
Low Resting Denning	3,532	16,523	4,534	1,772
Foraging Habitat	158	949	369	0
Marginal Foraging	50	492	161	50
Total Acres (%) Fisher Habitat	**3,740**	**18,076**	**5,133**	**1,822**

*Acres burned in 2008 at high or moderate severity assumed no longer habitat; 15 and 280 acres respectively in the fisher analysis area.

Twenty-eight acres of land within the project area are considered “non-capable”. The project area has 481 acres of conifer plantations in the 1-24 foot tree size. Plantations range in age from approximately 10 to 33 years old. Plantations and “non-capable” acres are not included in the fisher habitat acreages displayed in Table 60**.** The acres of conifer plantations within the project area and analysis area would be considered “capable” and may be providing some amount of fisher foraging habitat (depending upon individual stand canopy closure and development) as well as connectivity between existing available fisher habitat. Buck[177] and Mullis[178] documented fishers hunting in plantations with greater than 80% canopy closure and average tree heights of 5 to 10 feet.

It is likely that an individual fisher or two utilize some of the habitat available within the project area.

[176] The effects of fire on mammal species are related to the uniformity and pattern of fire on the landscape (Smith, 2000). Effects to fisher habitat in the areas that burned were variable. Areas that burned at the high severity level no longer provide habitat for fisher. Areas that burned at low levels of severity will continue to provide fisher with habitat. Moderate severity burn areas may or may not continue to provide habitat for fishers. Most of the fire burned at low severity. In areas of low to moderate severity, small trees, small down woody debris and herbaceous groundcover were removed. Denning, resting and foraging habitat was reduced with the burning of down woody debris snags and canopy closure. Grasses, herbaceous vegetation and shrubs should begin recovering within a year. Within the moderately severity some snags and down woody material were/will be created. Some habitat fragmentation occurred. A small amount of high quality old growth denning and resting habitat was eliminated. Habitat heterogeneity (patchiness of the vegetation) across the analysis area will be beneficial to fisher and their prey base over the long-term. Conditions for another wildfire event have been reduced.
[177] Buck 1982
[178] Mullis 1985

Environmental Consequences

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

Under the No action alternative, current management plans would continue to guide existing and previously authorized activities within the project area. Habitat conditions would not be expected to change appreciably within the next 10 years, barring a wildfire event. Existing structural characteristics, canopy closure and snag numbers and down woody material would not change appreciably within the next 10 years.

The existing amounts of low quality resting and denning habitat and foraging habitat for fishers would remain. In the long-term (greater than 10 years) further development of large old trees within stands would likely progress slowly due to existing tree densities and competition for sunlight, nutrients and water. In the long-term (greater than 10 years) snag numbers and down woody material would be expected to increase as trees die due to crowded conditions, insects and disease.

There are no cumulative effects because there are no direct or indirect effects of the no action alternative.

Determination of Effects and Rationale

There would be no change to the existing environment within the Salt project area, therefore, Alternative 1, would result in **no impact** to fishers or their habitat.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Because there is no high or moderate quality resting and denning habitat within the Salt project area, it is unlikely that a female fisher and her young would be displaced or disturbed during the denning season as a result of implementing Alternative 2. Disturbance and/or displacement of fishers from low quality resting and denning habitat or foraging habitat could occur as a result of implementing Alternative 2. It is unlikely, but possible that a resting or denning fisher could be killed during tree felling operations.

Changes to the quality and quantity of available fisher habitat in the project area and fisher territory 604 would occur as a result of implementing Alternative 2. No habitat modification in fisher territory 819 would occur as a result of Alternative 2. There would be no change in the amount of marginal fisher habitat or habitat not “capable” in the project area. There would be no changes to high and moderate quality resting and denning habitat that occurs in fisher territory 604 and the analysis area. Table 61 displays the acreage changes to low quality resting and denning habitat and foraging habitat within the project area, fisher territory 604 and the analysis area with the implementation of Alternative 2.

Table 61: Changes to fisher habitat at three scales with Alternative 2.

Habitat	Change in Acres Available Fisher habitat in Project Area and Analysis Area	Change in Acres Available Fisher Habitat in Fisher Territory 604 within the project area
Low Quality Resting and Denning	Decrease of 44 acres	Decrease of 33 acres
Foraging	Increase of 44 acres	Increase of 33 acres

The proposed regeneration harvest and shelterwood treatments with green tree retention would cause a 1.2% decrease in the amount of available low quality resting and denning habitat for fishers in the project area with the implementation of Alternative 2. Forty-four acres of low quality resting and denning habitat would be converted to foraging habitat which would increase by 28% in the project area. There would be a 1.6% decrease in low quality resting and denning habitat in that portion of fisher territory 604 that occurs within the project area and less than 0.3% decrease in low quality resting and denning habitat over the analysis area. Foraging habitat would increase 28% in that portion of fisher territory 604 that occurs within the project area. Foraging habitat within the analysis area would increase 4.6%.

The immediate effect of the proposed treatments would result in a reduction of vertical and horizontal structure by removing smaller diameter trees. Tree removal would occur in the 103 acre shaded fuel break reducing canopy closure to approximately 40%. Canopy closure would be reduced to 50% closure in all other thinned units except for 41 acres within intermittent or ephemeral stream riparian reserves, which will be reduced to no more than 40% (i.e. 60% canopy closure will be retained). Reduction of structure and canopy closure would reduce cover, decrease resting, denning and foraging substrate. Fisher would likely continue to use the habitat; however, the quality of fisher habitat and prey habitat would be reduced. Reduction of canopy closure and woody debris substrate increases fisher vulnerability to predation because those elements provide protective cover (Green et al, 2008). The modeled projections of crown canopy 50 years following treatment range from 54 to 75% (Chapter 3.2.3).

Pre-commercially thinning plantations would have a negligible effect on fisher habitat in the near term. Long-term (greater than 30 years) trees should grow more rapidly developing into desirable fisher habitat.

Fisher habitat fragmentation across 103 acres would continue with the maintenance thinning of the shaded fuel break. Fragmentation of fisher habitat would also occur as a result of the proposed regeneration harvest and shelterwood treatments with green tree retention on 58 acres. Fisher would generally avoid these fragmented habitats. An individual that moves across or within fragmented habitat would be at increased risk of predation because forest cover provides protection.

Currently there is an average of 13 dead trees per acre across the project area. Three of the 13 dead trees per acre average over 16 inches dbh (Chapter 3.2.2). Some dead, dying and mistletoe infected trees would be removed. Some loss of snags less than 19 inches dbh and down woody

material in the 3 - 20 inch class would also reduce existing and future resting, denning and foraging substrate and increase fisher vulnerability to predation. However, resource protection measures will assure that existing snags and down logs greater than 19 inches in diameter will be retained, unless they are in a skid trail, landing site, or other exceptions (Chapter 2.4, #4). An average of 1.5 snags per acre greater than 15 inches in diameter and 20 feet in height will be retained. Snags felled for safety reasons would be left on site (Chapter 2.4, #4). An average of 5 logs per acre will be retained. Additionally an average of 5 or 10 tons of downed material, depending on the unit's Forest Plan land allocation, will be retained on slopes less than 40% with a preference to have 4 to 6 logs per acre at the largest available diameter (Chapter 2.4, #5, #5a). All hardwoods that have a reasonable chance of surviving and thriving after stand treatments will also be retained (Chapter 2.4, #5).

Reconstruction of roads, construction of temporary roads (0.4 acres), landing development and borrow pit expansion would remove about 1 acre of low quality resting and denning habitat for more than 30 years. Decommissioning 13.8 miles of road would in time, add to low quality resting and denning habitat availability.

Some shrubs, herbs, grasses and forbs would be expected to develop as a result of increased sunlight on the forest floor until the canopy gradually closes again. An increase in shrubs, herbs, grasses and forbs would provide fishers with cover, foraging opportunities and may increase prey diversity.

Depending upon the existing vegetative stage of the stands, the modeled quadratic mean diameter of trees 50 years after treatment is projected to be in the range of 22 - 29 inches (Chapter 3.2.3). The projected number of years to achieve a 30 inch quadratic mean diameter for all trees ranges from 60 to greater than 100 years (Chapter 3.2.3). A reduction in the number of smaller trees would reduce competition for nutrients, light and water and increase the growth and size of the remaining largest trees (the average diameter of retained trees would be about 16.5 inches dbh[179] and hasten the development of desirable late-successional stand conditions which would be favorable to fishers in the long-term (greater than 50 years).

A reduction in the density of smaller trees, standing dead and down woody debris would reduce the wildfire hazard in the project area. Reducing the wildfire hazard would maintain and promote fisher habitat within the project area.

Cumulative Effects

The following projects and activities are anticipated to occur within the fisher analysis area between now and December 2012.

A watershed restoration project to decommission roads that currently pose risks to water quality and watershed resources and that are not necessary for public or administrative access is planned within the project area. This action would not be expected to have a significant cumulative effect with the actions planned in the Salt project.

[179] Petersen personal communication 2008

The Forest is in the process of proposing to re-issue term livestock permits in the Upper South Fork and Post Creek Cattle and Horse Allotments. Fifteen-thousand eight-hundred ninety-two acres of the Post Creek Pastures 1 and 2, Wildwood Pasture 1 and the Upper South Fork Pasture occur within the fisher analysis area. Activities proposed include continuation of grazing between June 1 and October 31, vegetation monitoring, maintenance of fencing and corrals, construction and reconstruction of fences. Alternative 2 would have no discernible impacts to the resources and values of riparian reserves or riparian/wet meadow habitat. There would be no direct effects to fishers from grazing activities proposed. Indirect effects through alteration of vegetation and thus small mammal abundance and diversity are possible, but are expected to be highly dispersed, immeasurable and discountable. Due to the low level and dispersed nature of the effects of the proposed grazing no impacts to the highly mobile and opportunistic fisher are anticipated.

The Seven Bone, Tower Fire Salvage Owl and West Smoky pre-commercial thinning of conifer plantations would affect 326 acres of “capable” fisher habitat. The short and long-term direct and indirect effects of pre-commercial thinning activities to fisher and their habitat for these three proposed projects would be expected to be similar as described above in Alternative 2.

The Trinity roadside hazard abatement project proposes to remove dead trees within up to 150 feet on both sides of maintenance level 2-5 roads within areas recently burned. Removal of hazard trees could potentially reduce existing and future denning, resting and foraging substrate for fishers and increase the area of habitat fragmented by roads.

The proposed Westside Plantation Thinning project would be expected to have similar cumulative effects to fisher habitat as plantation thinning described above in Alternative 2; negligible effect in the near term with long-term benefit of more rapid tree growth.

Forest-wide travel management planning is proposed. It is anticipated that this planning document will direct changes to the amount of on and off-road travel, eliminating cross country travel, and will designate specific roads and trails authorized for use. The effects of roads and trails and accessibility with regard to fishers and their habitat, in general, include: disturbance, displacement, increased fisher vulnerability to mortality via vehicles and humans with guns and traps, habitat fragmentation and the reduction in denning, resting and foraging habitat due to the loss of snags and down woody material from firewood cutters. The Salt project would result in a reduction in road use with the decommissioning of roads and their will likely be a cumulative reduction of road use with the travel management designation process.

Determination of Effects and Rationale

Alternative 2 would not affect any high or moderated quality fisher habitat. It would cause a reduction in key fisher habitat components such as canopy closure, standing dead snags and down woody debris across 1,619 acres. Alternative 2 would reduce 44 acres of low quality denning and resting habitat to foraging habitat, which is less than 0.3% reduction over the analysis area.

Therefore: Alternative 2 **may impact individual fishers but would not likely cause a change in the U.S. Fish and Wildlife Service prioritization towards federal listing**[180].

Alternative 3

Direct and Indirect Effects

Direct and indirect effects to fishers and their habitat with the implementation of Alternative 3 would be similar to Alternative 2 with the following exceptions.

Two hundred three fewer acres of vegetation would be treated in Alternative 3. Fewer acres treated would lessen the effects of disturbance and displacement of fishers that may occur within the project area.

Table 62 displays the changes to low quality resting and denning habitat and foraging habitat within the project area, fisher territory 604 and the analysis area with the implementation of Alternative 3.

Table 62: Changes to fisher habitat at three scales with Alternative 3.

Habitat	Change in Acres Available Fisher habitat in Project Area and Analysis Area	Change in Acres Available Fisher Habitat in Fisher Territory 604 within the project area
Low Quality Resting and Denning	Decrease of 30 acres	Decrease of 30 acres
Foraging	Increase of 30 acres	Increase of 30 acres

There would be approximately a 0.9% decrease in the amount of available low quality resting and denning habitat for fishers in the project area with the implementation of Alternative 3. Thirty acres of low quality resting and denning habitat would be converted to foraging habitat which would increase by 19% in the project area. There would be a 1.5% decrease in low quality resting and denning habitat in that portion of fisher territory 604 that occurs within the project area and less than 0.2% decrease in low quality resting and denning habitat over the analysis area. Foraging habitat would increase 49% in that portion of fisher territory 604 that occurs within the project area. Foraging habitat within the analysis area would increase 3.1%.

Alternative 3 would treat four percent less of the project area and better quality fisher habitat would remain in the habitat treated. Existing fisher habitat conditions and key fisher habitat components would be maintained on 203 acres of existing fisher habitat. Not treating 203 acres would lessen the effects of the project on key fisher habitat components such as canopy, closure, snags, and

[180] Generally, the analysis for Forest Service sensitive species focuses on whether or not the action "is likely to lead to a trend in Federal listing." However, the U.S. Fish and Wildlife Service has already determined that the listing of the Pacific Fisher is 'warranted, but precluded' by higher priorities (USDI, 2004). Therefore we have evaluated here whether or not the proposed action is likely to cause a significant enough shift in the population factors that it would cause the FWS to reprioritize the Pacific fisher and accelerate the development of a listing package and its official listing as a threatened and endangered species.

down woody debris. More standing dead trees and down woody debris would remain in the project area.

Less reduction in canopy closure would occur in Alternative 3. Canopy closure would be reduced to 60% closure in all thinned units as well as in the shaded fuel break in Alternative 3. No thinning treatments would occur in any riparian reserves, preserving the existing canopy closure in those areas. The difference to fisher between 50% canopy closure in Alternative 2 and 60% in Alternative 3 is not measurable; however, the risk of predation of individuals would be expected to be less in Alternative 3. Because canopy closure would be reduced less during treatment, higher levels of canopy closure would be achieved sooner. Canopy closure would be projected to be higher in 50 years by implementing Alternative 3. The modeled projection of crown canopy 50 years following treatment would range from 59 to 77% (Chapter 3.2.3) or slightly (approximately 2-4%) more canopy closure available to fishers in 50 years (assuming no other future activities or natural disturbances).

In Alternative 3, the effects of fragmentation of fisher habitat would occur on 28 fewer acres. Depending upon the existing vegetative stage of the stands, the modeled quadratic mean diameter of trees 50 years after treatment by implementing Alternative 3 is projected to be in the range of 19 - 27 inches (Chapter 3.2.3). The projected number of years to achieve a 30 inch quadratic mean diameter for all trees ranges from 85 to more than 100 years (Chapter 3.2.3). The DBH of the trees 50 years following treatments proposed in Alternative 3 would be slightly less (approximately 2-3 inches) than with Alternative 2.

Cumulative Effects

Cumulative effects for Alternative 3 would be the same as those for Alternative 2.

Determination of Effects and Rationale

Alternative 3 would not affect any high or moderated quality fisher habitat. It would cause a reduction in key fisher habitat components such as canopy closure, standing dead snags and down woody debris across 1,415 acres. Alternative 3 would reduce 30 acres of low quality denning and resting habitat to foraging habitat, which is less than 0.2% decrease over the analysis area. Therefore: Alternative 3 **may impact individual fishers but would not exacerbate the significant threats to viability identified by the USFWS.**

3.6.4 American Marten

Spatial and Temporal Scales Analyzed

The 21,006 acre fisher analysis was checked for marten sightings. Since no marten are known to occur in this larger scale surrounding the Salt project area, marten habitat was evaluated only at the project level. Project level analysis includes those areas (units/stands) proposed for treatment. Timelines used in this analysis begins immediately following treatment and includes projections of stand changes and recovery in excess of 89 years.

Affected Environment

No sightings of marten have occurred in the southern half of Trinity County.[181] No marten occurrences have been documented in the project area or the surrounding fisher analysis area. High and/or moderate quality marten habitat does not exist in the project area.[182] The project area has 4,278 acres of marginal mixed conifer marten habitat below 4,000 ft. elevation.

Environmental Consequences

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

Under the No action alternative, current management plans would continue to guide existing and previously authorized activities within the project area. Habitat conditions would not be expected to change appreciably within the next 10 years, barring a wildfire event. The existing amounts of marginal mixed conifer habitat would remain.

There are no cumulative effects because there are no direct or indirect effects of the no action alternative.

Determination of Effects and Rationale

There would be no change to the existing marginal habitat for marten within the Salt project area, therefore, Alternative 1; no action would result **in no impact** to marten or their habitat.

Alternative 2 & 3

Direct and Indirect Effects

No direct effects to marten are anticipated with the implementation of either Alternative 2 or Alternative 3 because the marginal habitat in the project area is unoccupied.

Alternative 2 would treat a total of 1,138 acres of marginal marten habitat. All but 44 acres of the marginal marten habitat treated would remain marginal habitat. Forty-four acres of regeneration harvest and shelterwood with green tree retention treatment would change from marginal habitat to "capable". These 44 acres of capable habitat would not return to marginal habitat for at least 89 years.

Alternative 3 would treat a total of 994 acres of marginal marten habitat. Following treatment all but 31 acres would remain marginal marten habitat. Thirty acres of shelterwood with green tree retention treatment would change marginal marten habitat to "capable". These 30 acres of 'capable" habitat would not return to marginal habitat for at least 89 years.

Changes to the amount of down woody debris and canopy and number of existing snags as discussed in Alternative 2 and Alternative 3 in the fisher section of this document would have similar negative

[181] Quinn personal communication 2008
[182] Shasta-Trinity Forest Plan, Appendix G, page G-11 has a description of marten habitat used in this evaluation

effects for marten and as with fisher, the resource protection measures will also reduce potential impacts to marten including: retaining snags and down logs greater than 19" in diameter; retaining an average of 1.5 snags per acre greater than 15 inches in diameter and 20 feet in height; retaining 5 logs per acres with 20 inches in diameter desired; and, retaining an average of 5 or 10 tons of downed material per acre, depending on Forest land allocation, with a preference to have 4 to 6 logs per acre at the largest available diameter (Chapter 2.4, #4, #5, #5a). Retaining hardwoods will also reduce potential impacts to marten (Chapter 2.4, #6).

Cumulative Effects

The proposed projects and the effects of those projects to marten and their habitat would be expected to be similar that discussed for fishers.

Determination of Effects and Rationale

Alternative 2 and 3 would treat 1,138 and 1,025 acres (respectively) of unoccupied marginal marten habitat within the project area. Forty-four and 30 acres (respectively) of marginal marten habitat would be reduced to "capable" habitat for the long-term (greater than 89 years). Therefore, Alternative 2 and 3 **may impact individual marten but would not likely result in a trend toward listing or loss of viability**.

3.6.5 Northern Goshawk

Spatial and Temporal Scales Analyzed

To evaluate the effects of the action alternatives on northern spotted owls, a 16,920 acre analysis area was established by developing a 1.3 mile buffer around all proposed harvest units. [183] The 16,920 acre analysis area established for the spotted owl was also used to evaluate project effects to goshawk habitat. This analysis area is also appropriate for goshawks because spotted owls are late-successional (late seral) habitat management indicator species and goshawks are also associated with late successional forest habitat. Goshawk habitat is also evaluated at the project area level and includes only those areas directly impacted by the proposed actions.

Timelines used in this analysis begins immediately following treatment and includes projections of stand changes and recovery in excess of 100 years.

Affected Environment

The 4,278 acre Salt project area and the 16,920 acre analysis area has goshawk habitat. Moderate and low quality habitat for goshawks exists in the project area. A majority (96%) of the goshawk habitat in the project area is considered moderate quality nesting, post-fledging and foraging habitat. Table 63 displays the goshawk habitat capability (quality) in the Salt project area and goshawk analysis area.

[183] Quinn personal communication 2008

Table 63: Acres of goshawk habitat ranked by quality in the Salt project area and goshawk analysis area

Habitat Quality	Acres (Percent) of Existing Habitat Available	
	Salt Project Area	Goshawk Analysis Area*
High	0	83 (less than 1%)
Moderate	3,532 (96%)	13,515 (94%)
Low	158 (4%)	807 (6%)
Total Goshawk Habitat	**3,690**	**14,405**

*Acres burned in 2008 at high (1 acre) or moderate severity (142 acres) were assumed no longer suitable habitat and removed from totals.

Low, moderate and a small amount (less than 1%) of high quality nesting, post-fledging and foraging habitat exists within the larger analysis area. A majority (94%) of the goshawk habitat in the analysis area is moderate quality nesting, post-fledging and foraging habitat.

Land not listed nor considered in Table 63 includes approximately 660 acres of non-National Forest System Lands and 2,373 acres of conifer plantations in the 1-24 foot tree size. Ninety-five acres of plantations burned at low severity, 53 acres burned at moderate severity and 7 acres were severely burned in the Telephone wildfire. The acres of conifer plantations within the project area and analysis area would be considered “capable” and may be providing goshawks with some amount of foraging habitat (depending upon individual stand canopy closure and development) as well as connectivity between existing available goshawk habitat.

It is possible that the project area and/or larger analysis area is utilized by goshawks even though no goshawk sightings have occurred in either area.

Environmental Consequences

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

Under the No action alternative, current management plans would continue to guide existing and previously authorized activities within the project area. Habitat conditions would not be expected to change appreciably within the next 10 years, barring a wildfire event. Existing structural characteristics, canopy closure and snag numbers and down woody material would not change appreciably within the next 10 years.

The existing amounts of moderate and low quality nesting and foraging habitat for goshawks would remain. In the long-term (greater than 10 years) further development of large old trees within stands would likely progress slowly due to existing tree densities and competition for sunlight, nutrients and water. In the long-term (greater than 10 years) snag numbers and down woody material would be expected to increase as trees die due to crowded conditions, insects and disease.

Determination of Effects and Rationale

There would be no change to the existing amount and quality of habitat for goshawks within the Salt project area, therefore, Alternative 1, no action would result in **no impact** to goshawks or their habitat.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Because the project area is not currently known to be occupied by goshawks, there should be no direct effects to goshawks with the implementation of Alternative 2. Resource protection measures state that should a new goshawk territory be discovered prior to or during implementation, conferencing with a biologist will occur and a buffer zone and limited operating period will be established (Chapter 2.4, #3).

There would be more changes to the quality rather than the quantity of available goshawk habitat in the project area with the implementation of Alternative 2. Table 64 displays the acreage changes to low and moderate quality nesting and foraging habitat within the project area and the analysis area with the implementation of Alternative 2.

Table 64: Changes to goshawk habitat at two scales with Alternative 2 and Alternative 3.

	Change in Acres Available Goshawk Habitat in the Project Area and Analysis Area	
Habitat	**Alternative 2**	**Alternative 3**
High	0	0
Moderate	-44	-30
Low	+44	+30

The proposed regeneration harvest and shelterwood with green tree retention treatment would cause 1.3% decrease in the amount of available moderate quality nesting and foraging habitat for goshawks in the project area with the implementation of Alternative 2. Forty-four acres of moderate quality nesting and foraging habitat would be reduced to low quality goshawk habitat. By this action, low quality habitat in the project area would increase by 28%.

Likewise, the proposed regeneration harvest and shelterwood with green tree retention treatment would cause 0.3% decrease in the amount of available moderate quality nesting and foraging habitat for goshawks in the larger analysis area with the implementation of Alternative 2. By this action, low quality habitat in the analysis area would increase by 5.4%.

Thinning treatments of the shaded fuel break would likely maintain the habitat as foraging for goshawks. Pre-commercially thinning plantations would have a negligible effect on goshawk habitat in the near term. Long-term (greater than 30 years) trees should grow more rapidly developing into desirable goshawk habitat.

The immediate effect of the proposed treatments across 1,085 acres would result in a reduction of vertical and horizontal structure by removing smaller diameter trees. Tree removal would also reduce crown closure. Canopy closure would be reduced to 50% closure in all thinned units except for 41 acres within intermittent or ephemeral stream riparian reserves, which will be reduced to 60%. The canopy closure in shaded fuel breaks would be 40%. Reduction of structure and canopy closure would reduce cover and, decrease perching and foraging substrate while at the same time increasing goshawks' flight maneuverability and increasing goshawk prey vulnerability. Goshawks would

likely continue to use the habitat; however the quality of goshawk habitat and prey habitat would be reduced because canopy closure and downed wood would be reduced.

The modeled projection of crown canopy 50 years following treatment would range from 54 to 75% (Chapter 3.2.3).

Some dead, dying and mistletoe infected trees would be removed. Removal of trees with dwarf mistletoe brooms will likely be detrimental to wildlife species that nest in mistletoe brooms including northern goshawks. [184] Removal of dying trees and those infected with mistletoe would reduce future snags and down woody debris. Some loss of snags less than 19 inches dbh and down woody material in the 3" to 20" class would also reduce existing prey habitat and foraging opportunities for goshawks. However, resource protection measures will assure that existing snags and down logs greater than 19" in diameter will be retained, unless they are in a skid trail, landing site, or other exceptions (Chapter 2.4, #4). An average of 1.5 snags per acre greater than 15 inches in diameter and 20 feet in height will also be retained. Snags felled for safety reasons would be left on site. An average of 5 logs per acre will be retained. Additionally an average of 5 or 10 tons of downed material, depending on the unit's Forest Plan land allocation, will be retained on slopes less than 40% with a preference to have 4 to 6 logs per acre at the largest available diameter. (Chapter 2.4, #5, #5a).

Reconstruction of roads, construction of temporary roads (0.4 acres), landing development and borrow pit expansion would alter about 1 acre of goshawk habitat.

The regeneration harvest unit, shelterwood with green tree retention unit, reconstructed roads, construction of temporary roads, landing development and expansion of the borrow pit would create edge habitats that are sometimes used by foraging goshawks. The thinning of the existing shaded fuel break would also likely to continue to provide some foraging opportunities for goshawks.

Some shrubs, herbs, grasses and forbs would be expected to develop as a result of increased sunlight on the forest floor until the canopy gradually closes again. An increase in shrubs, herbs, grasses and forbs would provide goshawks foraging opportunities and may increase prey diversity.

Depending upon the existing vegetative stage of the stands, the modeled quadratic mean diameter of trees 50 years after treatment is projected to be in the range of 22 - 29 inches (Chapter 3.2.3). The projected number of years to achieve a 30 inch quadratic mean diameter for all trees ranges from 60 to more than 100 years (Chapter 3.2.3). A reduction in the number of smaller trees would reduce competition for nutrients, light and water and increase the growth and size of the remaining largest trees (the average diameter of retained trees would be about 16.5 inches DBH[185] and hasten the development of desirable late-successional stand conditions which would be favorable to goshawks in the long-term (greater than 50 years).

A reduction in the density of smaller trees, standing dead and down woody debris would reduce the wildfire hazard in the project area. Reducing the wildfire hazard would maintain and promote goshawk habitat within the project area for 20 years (Chapter 3.3.3).

[184] Pilliod et al, 2006
[185] Petersen personal communication 2008

Cumulative Effects

The following projects and activities are anticipated to occur within the goshawk analysis area between now and December 2012.

A watershed restoration project to decommission roads that currently pose risks to water quality and watershed resources and that are not necessary for public or administrative access is planned within the project area. This action would not be expected to have a significant cumulative effect with the actions planned in the Salt project.

The Forest is in the process of proposing to re-issue term livestock permits in the Upper South Fork and Post Creek Cattle and Horse Allotment. Some of the 9230 acres of Post Creek Pastures 1 and 2 and 3,655 acres of Wildwood Pasture 1 occur within the goshawk analysis area. Activities proposed include continuation of grazing between June 1 and October 31, vegetation monitoring, maintenance of fencing and corrals, construction and reconstruction of fences. Alternative 2 would have no discernible impacts to the resources and values of riparian reserves or riparian/wet meadow habitat. There would be no direct effects to goshawks from grazing activities proposed. Indirect effects of grazing on goshawks include possible alteration of prey availability and diversity through reduction or change in prey species habitat. Monitoring of location of animals and forage utilization throughout the grazing season, and adherence to limits on utilization of available forage, should minimize these impacts. Any change in prey abundance and diversity is likely to be masked by other factors such as climate or predation from other sources, and thus cannot be quantified. Effects from grazing are therefore believed to be immeasurable and so minor as to be insignificant and discountable.

The Seven Bone, Tower Fire Salvage Owl and West Smoky pre-commercial thinning of conifer plantations would affect 184 acres of “capable” goshawk habitat. The short and long-term direct and indirect effects of pre-commercial thinning activities to goshawks and their habitat for these three proposed projects would be expected to be similar as described above in Alternative 2.

Trinity roadside hazard abatement project proposes to remove dead trees within up to 150 feet on both sides of maintenance level 2-5 roads. Removal of dead trees would reduce existing and future perching and foraging substrate for goshawks.

The proposed Westside Plantation Thinning project would be expected to have similar effects to goshawk habitat as plantation thinning described above in Alternative 2; negligible effect in the near term with long-term benefit of more rapid tree growth.

Forest-wide travel management planning is proposed. It is anticipated that this planning document will direct changes to the amount of on and off-road travel, eliminating cross country travel, and will designate specific roads and trails authorized for use. The effects of roads and trails and accessibility with regard to goshawks and their habitat, in general, include: disturbance, displacement, and increased risk of mortality via humans with guns, increased “edge” habitat used by foraging goshawks and the reduction in perching and prey habitat due to the loss of snags and down woody material by firewood cutters. The Salt project would result in a reduction in road use with the

decommissioning of roads and their will likely be a cumulative reduction of road use with the travel management designation process.

Determination of Effects and Rationale

Alternative 2 would treat 1,085 acres of unoccupied goshawk habitat within the project area. More changes to the quality rather than the quantity of available goshawk habitat in the project area would result from thinning treatments proposed across 1,085 acres in Alternative 2. Important goshawk habitat components within areas treated would be reduced. Forty-four acres of moderate quality goshawk habitat would be reduced to low quality habitat for the long-term (greater than 89 years). This represents a negligible 0.3% decrease in the amount of available moderate quality nesting and foraging habitat for goshawks in the larger analysis area. Therefore, Alternative 2 **may impact individual goshawks but would not likely result in a trend toward listing or loss of viability**.

Alternative 3

Direct and Indirect Effects

Because the project area is not currently known to be occupied by goshawks, there should be no direct effects to goshawks with the implementation of Alternative 3. Resource protection measures state that should a new goshawk territory be discovered prior to or during implementation, conferencing with a biologist will occur and a buffer zone and limited operating period will be established (Chapter 2.4, #3). Indirect effects to goshawk habitat with the implementation of Alternative 3 would be similar to Alternative 2 with the following exceptions.

Two hundred and three fewer acres of vegetation would be treated in Alternative 3 and better quality goshawk habitat would remain in the habitat treated. Fewer acres treated would lessen the amount of goshawk habitat affected by the project. Table 64 displays the changes to moderate and low quality goshawk nesting and foraging habitat within the project area and analysis area and compared it to Alternative 2.

The proposed shelterwood with green tree retention treatment would cause a 0.9% decrease in the amount of available moderate quality nesting and foraging habitat for goshawks in the project area with the implementation of Alternative 3. Thirty acres of moderate quality nesting and foraging habitat would be reduced to low quality goshawk habitat. By this action alternative, low quality goshawk habitat in the project area would increase by 19%.

Likewise, the proposed shelterwood with green tree retention treatment would cause a negligible (0.02%) decrease in the amount of available moderate quality nesting and foraging habitat for goshawks in the larger analysis area with the implementation of Alternative 3. By this action alternative, low quality goshawk habitat in the analysis area would increase by 3.7%.

Alternative 3 would treat four percent less of the project area. Existing goshawk habitat conditions and key goshawk habitat components would be maintained on 204 acres of existing goshawk habitat. Not treating 204 acres would lessen the effects of the project on key goshawk

habitat components such as canopy closure, snags, and down woody debris. More standing dead trees and down woody debris would remain in the project area.

Less reduction in canopy closure would occur in Alternative 3. Canopy closure would be reduced to 60% closure in all thinned units as well as in the shaded fuel break in Alternative 3. No thinning treatments would occur in any riparian reserves, preserving the existing canopy closure in those areas. The difference to goshawks between 50% canopy closure in Alternative 2 and 60% in Alternative 3 is not measurable; however the overall quality of the habitat would be higher in Alternative 3 and the risk of predation of individuals would be expected to be less. Because canopy closure would be reduced less during treatment, higher levels of canopy closure would be achieved sooner. Canopy closure would be projected to be higher in 50 years by implementing Alternative 3. The modeled projection of crown canopy 50 years following treatment would range from 59 to 77%[186] or slightly (approximately 2-4%) more canopy closure for goshawks in 50 years.

Depending upon the existing vegetative stage of the stands, the modeled quadratic mean diameter of trees 50 years after treatment by implementing Alternative 3 is projected to be in the range of 19 - 27 inches (Chapter 3.2.3). The projected number of years to achieve a 30 inch quadratic mean diameter for all trees ranges from 85 to greater than 100 years (Chapter 3.2.3). The DBH of the trees 50 years following treatments proposed in Alternative 3 would be slightly less (approximately 2-3 inches) than with Alternative 2.

Cumulative Effects

Cumulative effects for Alternative 3 would be the same as those for Alternative 2.

Determination of Effects and Rationale

Alternative 3 would cause a reduction in key goshawk habitat components such as canopy closure, standing dead snags and down woody debris across 945 acres. Alternative 3 would reduce 30 acres of moderate quality goshawk habitat to low quality habitat. This represents a negligible 0.02% of the analysis area. Therefore: Alternative 3 **may impact individual goshawks but would not likely result in a trend toward listing or loss of viability**.

3.6.6 Townsend's Big-eared Bat

Spatial and Temporal Scales Analyzed

The maximum foraging distance for Townsend's big-eared bats from roost sites in California is eight miles. An analysis area for Townsend's big-eared bats was developed by using an eight mile radius from the center of the project area. The project area was also evaluated for roosting and foraging habitat for this species.

Timelines used in this analysis begin immediately following treatment and includes projections of stand changes and recovery in excess of 89 years.

[186] Petersen and Amell 2009

Affected Environment

Marcot[187] reported *Plecotus townsendii* in four limestone caves on the Shasta-Trinity National Forest between March 6 and April 8 in 1984. Two out of the four locations were determined to be outside the Shasta-Trinity National Forest boundary and one appears to be a legal description error. One of Marcot's occurrences is 18 miles northwest of the project area. Another documented Townsend's big-eared bat occurrence is 62 miles northeast of the project area. It has not been verified whether or not Townsend's big-eared bats occupy or utilize the Salt project area.

There are four locations of caves within the eight mile bat analysis area. [188] Two caves are approximately five miles east of the center of the Salt project area. It is not known if these two caves are occupied by bats and/or what species of bats inhabit them. Two other caves are approximately ten miles west of the project area center.

There are four known addits (tunnels) within the eight mile bat analysis area, near Hall City Caves, which are located about five miles east of the project area center. There are other addits within the bat analysis area, some of which have bat gates installed on them. Presumably, bats occupy these addits, but the species of bats is unknown. There are potentially other addits in the bat analysis area, but the location and number are unknown.

Foraging and roosting habitat is likely present within the project area and the eight mile bat analysis area. Table 65 displays some of the management indicator habitat assemblages occurring in the project area that may be occupied or utilized by Townsend's big-eared bats.

Table 65: Potential bat habitat (by assemblages) in the Salt project area

Habitat Type	Acres
Chaparral	48
Cliff	28
Late (snags)	673
Open	3,529
Total	**4,278**

Environmental Consequences

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

Under the no action alternative, current management plans would continue to guide existing and previously authorized activities within the project area. Habitat conditions for bats would not be expected to change appreciably within the next 10 years, barring a wildfire event. There are no cumulative effects because there are no direct or indirect effects of the no action alternative.

[187] Marcot 1984
[188] Less than 0.01% of the 128,689 acre, 8 mile analysis area was affected by the 2008 Telephone fire.

Determination of Effects and Rationale

There would be no change to the existing habitat for bats within the Salt project area; therefore, Alternative 1 would result in **no impact** to Townsend's big-eared bats or their habitat.

Alternative 2 and Alternative 3

Direct and Indirect Effects

While occupancy and/or use of the project area by Townsend's big-eared bats is uncertain, felling a roost structure (snag less than 19inches) could result in the mortality of the bat(s) inside the roost.[189] Resource protection measures will assure that with few exceptions existing potential roosting and nesting sites (snags greater than 19" in diameter) will be retained in all units (Chapter 2.4, #4). Exceptions may occur if the snag is in a skid trail, landing site, or temporary road location.

Bats roosting in caves and mine addits within the eight mile analysis area would not be affected by the Salt project.

The immediate effect of the proposed treatments would result in changes to the density and vertical and horizontal structure of the vegetation by removing smaller diameter trees. A decrease in the density of trees and opening the canopy would increase bat foraging areas, increase their foraging maneuverability and alter the thermal properties in and adjacent to live trees with cavities and snags used for roosting.[190]

Reconstruction of roads, construction of temporary roads (0.3 miles, which equals approximately 0.4 acres), landing development and borrow pit expansion would create openings (approximately 1 acre) that may be utilized by bats for foraging. Some shrubs, herbs, grasses and forbs would be expected to develop as a result of increased sunlight on the forest floor until the canopy gradually closes again. An increase in shrubs, herbs, grasses and forbs and would provide additional foraging opportunities for bats and may increase prey diversity.

Cumulative Effects

The following projects and activities are anticipated to occur within the eight mile bat analysis area between now and December 2012.

No new mining or recreational caving activities are proposed. The Forest is in the process of proposing to re-issue term livestock permits in the Upper South Fork and Post Creek Cattle and Horse Allotment. Activities proposed include continuation of grazing between June 1 and October 31, vegetation monitoring, maintenance of fencing and corrals, construction and reconstruction of fences. Alternative 2 would have no discernible impacts to the resources and values of riparian reserves or riparian/wet meadow habitat. There would be no direct effects to Townsend's big-eared bats from grazing activities proposed. Indirect effects to these species may be through alteration of their prey base as a result of vegetative manipulation by stock or through changing aquatic environments along

[189] Hayes and Loeb 2007
[190] Hayes and Loeb 2007

with their dependant insect populations. These impacts are expected to be localized and of small scale, and no impact to these highly mobile and wide-ranging bats.

Pre-commercial thinning projects proposed, including the Westside Plantation Thinning project, would decrease the density of trees, increase the amount of bat foraging areas and increase their foraging maneuverability. Trinity roadside hazard abatement project proposes to remove dead trees within up to 150 feet on both sides of maintenance level 2-5 roads. Removal of dead trees would reduce existing roosting habitat for bats.

Forest-wide travel management planning is proposed. It is anticipated that this planning document will direct changes to the amount of on and off-road travel (eliminating cross country travel) and will designate roads and trails authorized for use. The effects of roads and trails management with regard to bat habitat would be a gradual change to the amount of "edge" habitat used by foraging bats and a reduction in the loss of roosting habitat, snags, due to firewood cutters – since access will be reduced. The Salt project would result in a reduction in road use with the decommissioning of roads and there will likely be a cumulative reduction of road use with the travel management designation process.

Determination of Effects and Rationale

Actions proposed in Alternatives 2 and 3 would alter the amount and quality of the roosting and foraging habitat of Townsend's big-eared bats within the Salt project area. Foraging habitat and opportunities would likely increase in either Alternative 2 or 3. Snag roosting habitat would decrease in quality (thermal properties). Therefore: Alternative 2 and Alternative 3 **may impact individual Townsend's big-eared bats but would not likely result in a trend toward listing or loss of viability**.

3.6.7 Pallid Bat

Spatial and Temporal Scales Analyzed

The maximum foraging distance for pallid bats from roost sites in California is 1.55 miles. An analysis area for pallid bats was developed by using a 1.55 mile radius around the perimeter of the project area. The project area was also evaluated for roosting and foraging habitat for this species.

Affected Environment

It is not known whether the Salt project area is used by pallid bats. Table 65 (in Townsend's Big Eared Bat Section) displays some of the management indicator habitat assemblages occurring in the project area that may be occupied or utilized by pallid bats. There are twenty-eight acres of cliff habitat and 48 acres of chaparral that exist within the project area. In addition, some of the more open conifer habitat could provide suitable foraging habitat and roost sites.

Environmental Consequences

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

Under the no action alternative, current management plans would continue to guide existing and previously authorized activities within the project area. Habitat conditions for bats would not be expected to change appreciably within the next 10 years, barring a wildfire event. There are no cumulative effects because there are no direct or indirect effects of the no action alternative.

Determination of Effects and Rationale

There would be no change to the existing habitat for bats within the Salt project area; therefore, Alternative 1 would result in **no impact** to pallid bats or their habitat.

Alternative 2 and Alternative 3

Direct and Indirect Effects

While occupancy and/or use of the project area by pallid bats is uncertain, trapping or crushing of a roosting pallid bat(s) could occur in the borrow pit expanded to support the construction and maintenance of forest roads.[191] No changes to or adjacent to chaparral or cliff habitats would occur in Alternative 2 or Alternative 3. Borrow pit expansion, reconstruction of roads, construction of temporary roads (0.4 acres), landing development and borrow pit expansion would create openings that may be utilized by pallid for foraging.

Not much is known about foraging habitat of pallid bats. However, it is likely that the increases in some shrubs, herbs, grasses and forbs that would develop as a result of increased sunlight on the forest floor by opening the canopy would provide additional gleaning opportunities for pallid bats and may increase prey diversity.

Cumulative Effects

Foreseeable actions and their effects to the pallid bat and/or its habitat would be similar to that described for Townsend's big-eared bats

Determination of Effects and Rationale

An individual pallid bat using the expanded borrow pit developed for road work may inadvertently be crushed or trapped. Actions proposed in Alternatives 2 and 3 would alter the amount of foraging habitat for pallid bats within the Salt project area. Foraging habitat and opportunities would likely increase in either Alternative 2 or 3; therefore, Alternative 2 and Alternative 3 **may impact individual pallid bats but would not likely result in a trend toward listing or loss of viability**.

[191] Hayes and Loeb 2007

3.6.8 Western Red Bat

Spatial and Temporal Scales Analyzed

The project area was evaluated for roosting and foraging habitat for this species.

Affected Environment

Mixed conifer forests adjacent to riparian areas occur within the project area. Roosting and foraging habitat for Western red bats occur within and adjacent to the Salt project area.

Environmental Consequences

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

Under the no action alternative, current management plans would continue to guide existing and previously authorized activities within the project area. Habitat conditions for bats would not be expected to change appreciably within the next 10 years, barring a wildfire event. There are no cumulative effects because there are no direct or indirect effects of the no action alternative.

Determination of Effects and Rationale

There would be no change to the existing habitat for bats within the Salt project area; therefore, Alternative 1 would result in **no impact** to western red bats or their habitat

Alternative 2 and Alternative 3

Direct and Indirect Effects

While occupancy and/or use of the project area by western red bats is uncertain, felling trees during thinning operations could result in the mortality of a roosting bat.[192] Not much is known about foraging habitat of western red bats. Vegetative actions proposed in Alternatives 2 and Alternative 3 are likely to have a positive effect on foraging habitat and foraging opportunities for western red bats. It is likely that the increases in edge and openings and the development of shrubs, herbs, grasses and forbs as a result of increased sunlight on the forest floor would provide additional foraging opportunities for western red bats. The riparian reserve resource protection measures will retain potential riparian habitat for this species (Chapter 2.4, #17 through #20).

Cumulative Effects

Foreseeable actions and their effects to the Western red bat and/or its habitat would be expected to be similar to that described for Townsend's big-eared bats.

[192] Hayes and Loeb 2007

Determination of Effects and Rationale

An individual western red bat may be killed during tree felling operations. Actions proposed in Alternatives 2 and 3 would increase western red bat foraging habitat and foraging opportunities by creating more edge and small openings. Therefore, Alternative 2 and Alternative 3 **may impact individual western red bats but would not likely result in a trend toward listing or loss of viability.**

3.6.9 Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Sensitive species are managed under the authority of the National Forest Management Act (PL 94-588) and the USDA Forest Service Manual Direction (FSM 2600). Sensitive species are administratively designated by the Regional Forester (FSM 2670.5). This document is prepared in accordance with current policy and follows the standards established in Forest Service Manual direction (FSM 2670.32). The Salt project is consistent with the Standards and Guidelines in the Forest Plan, USDA Forest Service Manual Direction, and the National Forest Management Act related to sensitive species.

3.6.10 Summary Key Issue Effects

Table 66: Key issue - effects of canopy closure, thinning riparian, temporary roads on wildlife by alternative

Issue Indicator	Alternative 1	Alternative 2	Alternative 3
Key Issue Retaining less than 60 percent canopy closure after thinning could affect wildlife habitat			
Acres of suitable habitat eliminated due to retainin 50% rather than 60% canopy closure	0	0	0
Key Issue Thinning in riparian reserves may have unintended effects on the watershed, fisheries and wildlife.			
Acres of suitable habitat eliminated due to thinning in ephemeral and intermitant riparian reserves	0	0	0
Key Issue Construction of new temporary roads may negatively impact hydrology and soil health and could impact wildlife			
Acres of wildlife habitat affected	0	0.4 acres in 4 different short linear areas	0.6 acres of disturbance in four units from additional skid trails

3.7 Management Indicator Species Assemblages[193]

3.7.1 Methodology for Analysis

Issues Addressed

During the public scoping process the following key issues, related to management indicator species, were identified:

- ***Retaining less than 60% canopy closure after thinning could affect wildlife habitat***
- ***Thinning riparian reserves may have unintended effects on …wildlife***
- ***Construction of new temporary road may negatively impact hydrology, soils and wildlife.***

To analyze the potential effects of each alternative on these issues the following issue indicators were used:

- Acres of suitable wildlife habitat that would become unsuitable due to retaining 50% rather than 60% canopy closure
- Suitable wildlife habitat that would become unsuitable due to thinning in intermittent and ephemeral riparian reserves
- Acres of wildlife habitat affected by temporary roads were considered.

Another key issue identified is that changes to stand structure by treatments in the proposed action would remove or downgrade foraging (portion of Unit 37) and moderate quality nesting and roosting habitat (portions of Units 33C and 32). This issue is addressed in Chapter 3.5. Several analysis issues, which are considered in the effects analysis, were identified:

- Vegetation treatments may impact MIS … habitat and ability to survive.
- Removing old legacy trees may impact wildlife habitat including future snag habitat.

Methods

This analysis documents the effects of project alternatives on the habitat components of selected wildlife management indicator assemblages as identified in the Forest Plan.[194] The assemblage habitats selected for project-level management indicator analysis for the Salt project are: late-seral, openings and early seral stage forest, snag & downed logs, hardwood, and riparian assemblages. These five assemblages were selected because they are likely to be either directly or indirectly affected by Alternative 2 or Alternative 3 of the Salt project.

3.7.2 Affected Environment

Table 67 displays the five management indicator assemblages that could be affected by proposed activities and the acres each assemblage occupies in the Salt project area.

[193] Information in this Section is adapted from the Salt Project-Level Management Indicator Assemblages Report, Oechsner 2008b
[194] USDA 1995, page 3-24

Table 67: Acres of management indicator assemblages and their habitat components in the Salt project area

Management Indicator Assemblage	Habitat Components for Analysis	Acres in Project Area
Late Seral	Tree stands with average crown diameter equal to or greater than 13' and having a crown density equal to or greater than 40% as represented in Forest Plan database (size class small-medium 13" to 24" dbh with canopy closure of 40-69%- 3N- and above).	3,533
Open and Early Seral	Meadows, openings, and tree stands with average crown diameter less than 13' or tree stands with average crown diameters between 13' and 24' with crown cover less than 40% as represented in Foerst Plan database (size class small – medium, 13" to 24" dbh with canopy closure of20% - 39% -3P- and below)..	670
Riparian	The presence of riparian classified vegetation components as mapped in the Forest Plan data base.	1,054
Hardwood	Vegetation types containing significant proportions of hardwood trees as represented in the LRMP database.	Component of area – not separate acres
Snag and Down Log	Forest types greater than or equal to 13" crown diamater, and greater than or equal to a 40% crown cover, containing snags and down logs (size class small-medium 13" to 24" dbh with canopy closure of 40-69%-3N and above) as represented on the Forest Plan database, including all hardwood stands.	Component of area – not separate acres

The hardwood assemblage is not represented separately within the project area. Hardwoods are present in the project area as a component of the mixed conifer stands. The snag and down log habitat assemblage also occurs within the project area. Stand exam data from 2008 shows that currently there is an average of 13 dead trees per acres across the project area. Three of the 13 dead trees per acre are larger than 16 inches dbh and on average there is one additional snag per acre between 14.1 and 16 inches dbh (Chapter 3.2.2). This is greater than the Forest Plan standard of 1.5 snags per acre over 15 inches dbh.

Large woody debris ranges from 5 to 10 trees per acre for mixed conifer stands, from 3 to 8 trees per acre for tree/brush stands and 1 to 5 logs per acre for brush areas (Chapter 3.9.2). Downed woody material ranges from less than 7 tons per acre to over 68 tons per acre, with an overall average of approximately 37 tons per acre across most of the project area (Chapter 3.3.2).

The multi-habitat wildlife assemblage represents a variety of vegetated habitats, seral stages and special habitat components.[195] Effects of the Salt project to the multi-habitat wildlife assemblage will be analyzed as part of the other assemblages rather than separately

[195] USDA 1995, page 3-25

3.7.3 Environmental Consequences

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

Wildlife habitat assemblages present in the project area would not change with implementation of Alternative 1. There would be no direct, indirect or cumulative effects.

Alternative 2 and Alternative 3

Direct and Indirect Effects

Table 68 displays the acres of habitat by assemblage that would be disturbed by actions proposed in the Salt project. Acres of disturbance does not equate to a shift to a different assemblage, it merely represents the acres of each assemblage treated.

Table 68: Acres of habitat by assemblage that would be disturbed by Alternative 2 and Alternative 3

Assemblage Type	Acres Treated (Disturbed)	
	Alt. 2	Alt. 3
Late Seral	951	877
Open and Early	148	138
Riparian: *Commercial thinning* *Pre-commercial thinning* Riparian Total	 *80* *62* 142	0

There would be no change in the number of acres of late seral, riparian and open/early seral habitat assemblages as a result of intermediate thinning proposed in either Alternative 2 or 3.

Thinning in the shaded fuel break proposed in Alternative 2 or Alternative 3 would result in no change in acres of existing of late seral and open/early seral habitat assemblages.

No thinning would occur within riparian reserves of perennial streams. There would be no change in the number of acres of riparian habitat assemblages as a result of the commercial and pre-commercial thinning treatments proposed in Alternative 2 or Alternative 3.

There would be no change in the number of acres of open/early seral habitat assemblages as a result of the commercial and pre-commercial thinning treatments proposed in Alternative 2 or Alternative 3.

Regeneration harvest with green tree retention proposed in Alternative 2 would result in a loss of 14 acres of late seral habitat and an increase of 14 acres of open/early seral habitat (portions of Units 37 and 40). No regeneration harvest with green tree retention is proposed in Alternative 3 so there would be no shift in late seral habitat to open/early seral habitat.

Shelterwood harvest with green tree retention proposed in Alternative 2 would result in a 31 acre loss in late seral habitat (Units 17 and 18). Open/early seral habitat would increase by 31 acres in

Alternative 2. Shelterwood harvest with green tree retention proposed in Alternative 3 would result in a 30 acre loss in late seral habitat and an increase of 30 acres of open/early seral habitat.

The hardwood component that occurs within the mixed conifer stands would be indirectly affected by treatments proposed in Alternative 2 or Alternative 3. Hardwoods would not be treated, but some individual trees may be inadvertently damaged and subsequently lost as a result of thinning and logging operations. Damaged hardwoods would be left on site. Loss of hardwoods would not be expected to be significant across the project area. Resprouting of some hardwood species would also be expected.

There would be some loss of snags and down wood habitat assemblage in both Alternative 2 and Alternative 3. Some dead, dying and mistletoe infected trees would be removed. Removal of dying trees and those infected with mistletoe would reduce future snags and down woody debris. Some loss of snags <19 inches dbh and down woody material in the 3” to 20” class would also occur. However, resource protection measures will assure that existing snags and down logs greater than 19” in diameter will be retained, unless they are in a skid trail, landing site, or other exceptions (Chapter 2.4.1, #4). An average of 1.5 snags per acre greater than 15 inches in diameter and 20 feet in height will also be retained. Snags felled for safety reasons would be left on site. An average of 5 logs per acre will be retained. Additionally an average of 5 or 10 tons of downed material, depending on the unit’s Forest Plan land allocation, will be retained on slopes less than 40% with a preference to have 4 to 6 logs per acre at the largest available diameter (Chapter 2.4, #5, #5a).

A few acres of existing assemblage habitat would be removed for the reconstruction and construction of temporary roads, landings and gravel pit expansion.

Cumulative Effects

Habitat Assemblage Status and Trend

The habitat status and trend data for the Forest is drawn from the detailed information on habitat and population trends in the Shasta-Trinity National Forest Management Indicator Assemblage Report.[196] Since 1995, when the Forest Plan was finalized, the Forest has seen a net shift of management indicator assemblage habitat from openings and early seral assemblage type to late seral assemblage type. This results from the natural processes of forest ingrowth where pole size forests (6-12 feet - size class 2) accrue growth and transition into small sawtimber (13-24 feet - size class 3) forests or when ingrowth in lower density forests results in canopy closure above 40%.

Timber harvest and fires have moved late seral assemblages into the openings and early seral assemblage category, however, the net accrual of habitat into the late-seral assemblage partially reflects the reduction in timber harvesting since the early 1990’s and the Forest wide efforts to control wildfire. One should keep in mind that there is a distinction between “old-growth” as a seral category of interest and “late-seral assemblage” as a management indicator assemblage category. Accrual of

[196] USDA 2007

growth from open and early seral assemblage stands to late-seral assemblage stands represents ingrowth at the smaller size classes of late-seral assemblage habitat.

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

Alternative 2 would result in a net shift of approximately 45 acres of late-seral and snag and down log assemblage habitat to open and early seral assemblage habitat. This shift would occur as a result of the regeneration and shelterwood harvest with green tree retention treatments.

Alternative 3 would result in a net shift of approximately 30 acres of late-seral and snag and down log assemblage habitat to open and early seral assemblage habitat. This shift would occur as a result of the shelterwood harvest with green tree retention treatment.

None of the other treatment types are intense enough to result in a significant shift of habitat assemblage type. Although all larger snags will be retained in this project treatment type, we exclude younger forest types from the snag and down log assemblage habitat in order to favor the consideration of larger snags because they are more valuable for most wildlife species than the smaller ones.

The small shift in acres of late-seral to open/early seral habitat in each Alternative is counter to the general accrual of late-seral assemblage habitat. The slight increase in the acres of open and early seral assemblage would maintain diversity in the project area and benefit those wildlife species dependent on this habitat type as well as the multi-habitat assemblage species.

The actions proposed in either Alternative 2 or Alternative 3 of the Salt Timber Harvest and Fuels Hazard Reduction Project would not have any affect on the current habitat trend on the Shasta-Trinity.

3.7.4 Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The Forest Plan requires either appropriate indicator species or habitat components to represent the assemblages in forest monitoring; hence, the assemblage effects analysis for the Salt project complies with the Forest Plan.

3.7.5 Summary of Key Issue Effect

Table 69: Key issue - effects of canopy closure, thinning riparian, temporary roads on wildlife habitat (management indicator species assemblages) by alternative

Issue Indicator	Alternative 1	Alternative 2	Alternative 3
Key Issue **Retaining less than 60 percent canopy closure after thinning could affect wildlife habitat**			
Acres of suitable habitat eliminated due to retainin 50% rather than 60% canopy closure	0	0	0
Key Issue **Thinning in riparian reserves may have unintended effects on the watershed, fisheries and wildlife.**			
Acres of suitable habitat eliminated due to thinning in	0	0	0

Issue Indicator	Alternative 1	Alternative 2	Alternative 3
ephemeral and intermitant riparian reserves			
Key Issue **Construction of new temporary roads may negatively impact hydrology and soil health and could impact wildlife**			
Acres of wildlife habitat affected	0	0.4 acres in 4 different short linear areas	0.6 acres disturbed due to larger skid trails.

3.8 Neotropical Migrant Birds[197]

3.8.1 Methodology for Analysis

Issues Addressed

The following analysis issues were identified through public scoping, and were considered in the effects analysis:

- Treatments, when considered cumulatively with past projects in the watershed may fragment habitat.
- Removing old legacy trees may impact wildlife habitat including future snag habitat.
- Thinning within the project area, when considered cumulatively with other effects to neotropical bird habitat, may contribute to declining populations.

Methods

This report presents the best available data and provides the responsible official on the Forest with an analysis of migratory and residential bird (MRB) population trends on the Forest and within the bio-ecological area relative to the Salt Timber Harvest and Fuels Hazard Reduction project. Much of the data utilized in this report is derived from the Shasta-Trinity National Forest Migratory and Resident Bird Population Trend Monitoring Report.[198]

3.8.2 Affected Environment

The nearest known breeding bird survey routes located in the Sierra Nevada Physiographic Area 66 strata is approximately 20 miles from the Salt project area. No breeding bird surveys have been conducted within the Salt project area. There are fourteen Breeding Bird Routes that are on or partially on the Shasta-Trinity National Forest. The Salt Migratory and Residential Bird Population Trend Monitoring Report[199] lists Sierra Nevada strata birds that may occur in the Salt project area based on breeding bird surveys.

[197] Information in this Section is adapted from the Salt Migratory and Residential Bird Population Trend Monitoring Report, Oechsner 2009a
[198] Oechsner 2009a, Appendix A
[199] Oechsner 2009a

3.8.3 Environmental Consequences

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

Migratory bird habitat within the Salt project area would not change. There would be no impacts to migratory birds.

Alternative 2 and Alternative 3

Direct and Indirect Effects

With either Alternative 2 or 3 of the Salt project, impacts to the habitat and approximately 143 migratory and residential bird species are likely to occur in the Salt project area.[200] Some changes in bird species composition, density and abundance in the project area would be expected. The proposed Salt project would have adverse impacts on some migratory and residential birds and their habitat while other species would benefit. Short-term responses may differ from long-term responses and breeding bird response may differ from wintering bird response.[201]

Direct effects to birds could include disturbance and/or displacement to adjacent suitable habitat and/or unintentional mortality of adults and young, particularly in those areas that would receive treatment during the breeding bird season, which varies by species.

The immediate effect of the proposed treatments would alter the physical habitat and habitat components of the stands. Table 68 (Chapter 3.7.3) displays the acres of habitat by assemblage that will be treated (disturbed) by actions proposed in Alternative 2 and Alternative 3. Alternative 3 would affect fewer acres of bird habitat. The acres disturbed does not equate to a shift to a different assemblage as a result of treatment. Removal of smaller diameter trees (the average diameter of retained trees would be about 16.5 inches DBH)[202] would alter the canopy closure, vertical, horizontal, and understory structures and ground cover along with the density of mixed conifer stands within the project area. Treatments would impact existing nesting, roosting, perching and foraging habitat and forage of migratory and residential birds.

The dense mixed conifer stands present in the project area currently provides a high degree of structural diversity and cover. Those species dependent upon dense, close canopied, structurally diverse stands would be negatively impacted. Likewise, bird species that prefer less dense forested habitat would be positively affected by the proposed treatments.

Alternative 2 will thin approximately 481 acres of plantations to 150 trees per acre and Alternative 3 will thin approximately 421 acres of plantations. Total species abundance in the plantation thinning units may change. Total abundance of bird species was greater in thinned young stands compared to young un-thinned stands in one Oregon study [203] while another study found some

[200] Oechsner 2009a, Appendix A
[201] IN Pilliod et al. 2006
[202] Petersen personal communication 2008
[203] Muir et al. 2002, p. 37, 49

species decreased in numbers (9 out of 22), others increased (8 out of 22) and some were not influenced (5 out of 22).[204]

A reduction in the number of smaller trees would reduce competition for nutrients, light and water and increase the growth and size of the remaining largest trees. Long term, this would positively affect birds that prefer larger trees for nesting and foraging.

In Alternative 2 tree removal would reduce crown closure in the 103 acre shaded fuel break retaining 40% canopy closure. Canopy closure would be retained to 50% closure in all other thinned units except for 41 acres within intermittent or ephemeral stream riparian reserves where 60% canopy closure will be retained. The modeled projection of canopy closure 50 years following treatment would range from 54 to 75% (Chapter 3.2.3).

In Alternative 3, canopy closure would be reduced to 60% closure in all thinned units as well as in the shaded fuelbreak. No thinning treatments would occur in any riparian reserves, preserving the existing canopy closure in those areas. Because canopy closure would be reduced less during treatment, higher levels of canopy closure would be achieved sooner. Canopy closure would be projected to be higher in 50 years by implementing Alternative 3. The modeled projection of crown canopy 50 years following treatment would range from 59 to 77% (Chapter 3.2.3) or slightly (approximately 2-4%) more canopy closure would be available to birds that prefer it.

The varying degrees of canopy closure reduction in either Alternative 2 or Alternative 3 would more or less affect those bird species that perch, nest and forage in the canopy and/or depend on a high degree of crown closure in the overstory.

Currently there is an average of 13 dead trees per acre across the project area. Three of the 13 dead trees per acre are larger than 16 inches dbh and on average there is one additional snag per acre between 14.1 and 16 inches dbh (Chapter 3.2.2). This is greater than the Forest Plan standard of 1.5 snags per acre over 15 inches dbh. Some habitat for snag and down woody dependent bird species would be affected by the proposed treatments. Some dead, dying and mistletoe infected trees would be removed. Thinning treatments that select against mistletoe infected trees would likely be detrimental to those bird species that forage and nest in mistletoe brooms. Removal of dying trees and those infected with mistletoe would reduce future snags and down woody debris.

Resource protection measures will assure that existing snags and down logs greater than 19 inches in diameter will be retained, unless they are in a skid trail, landing site, or are a safety hazard during logging operations (Chapter 2.4.1, #4). Some loss of snags less than 19 inches dbh and down woody material in the 3 inch to 20 inch class would occur. Less snag and down woody habitat would be affected in Alternative 3 because fewer acres would be treated. An average of 1.5 snags per acre greater than 15 inches in diameter and 20 feet in height will also be retained. Snags felled for safety reasons would be left on site. An average of 5 logs per acre will be retained. Additionally an average of 5 or 10 tons of downed material, depending on the unit's Forest Plan land allocation, will be retained on slopes less than 40% with a preference to have 4 to 6 logs per acre at the largest available diameter (Chapter 2.4, #5, #5a). These resource protection measures will ensure that adequate snag,

[204] Hayes et al. 2003, p. 1222

cavity and down woody dependent birds habitat will remain within the areas treated as well as the project area.

Berry, cone and mast production would be altered in areas receiving treatment. Ground cover and some bird foods would be expected to increase due to the reduction in canopy closure and subsequent increase in sunlight that would stimulate grasses, forbs and shrub layer development.

Bird species that depend upon the hardwood component that occurs within the mixed conifer stands would be minimally affected by treatments proposed in Alternative 2 or Alternative 3. Hardwoods would not be treated, but some individual trees may be inadvertently damaged and subsequently lost as a result of thinning and logging operations. Damaged hardwoods would be left on site, slightly increasing the number of hardwood snags and future down woody debris which would provide for cavity and down woody dependent bird species. Loss of hardwoods would be expected to be minimal across the project area. Re-sprouting of some hardwood species would also be expected and would benefit birds that utilize hardwood shrubs.

Alternative 2 would result in a net shift of approximately 45 acres of late-seral and snag and down log assemblage habitat to open and early seral assemblage habitat. This shift would occur as a result of the regeneration and shelterwood harvest with green tree retention treatments. Alternative 3 would result in a net shift of approximately 30 acres of late-seral and snag and down log assemblage habitat to open and early seral assemblage habitat. This shift would occur as a result of the shelterwood harvest with green tree retention treatment. Birds that prefer late-seral and snag and down log habitat would be negatively affected; bird species that prefer open and early seral habitats would be beneficially affected.

A few acres of existing bird habitat in the project area would be altered for the reconstruction and construction of temporary roads, landings and gravel pit expansion. Roads and landings contribute to habitat fragmentation which negatively affects some interior forest dependent birds. Birds with a preference for edge habitats would likely be positively affected. The decommissioning of 13.8 miles of road would improve these edge habitats for bird species with a preference for edge, open and early seral habitats.

Cumulative Effects

Thirty-eight percent of the 4,278 acre project area would be treated in Alternative 2. Thirty-four percent of the project area would be treated in Alternative 3. Bird species currently present within the project area would likely remain present within the project area following treatment, albeit with changes in distribution based upon habitat needs.

While habitat components available to birds would change as a result of the treatments, acres of each of the types of habitat assemblages would only shift by about 1%. It is unlikely that a net shift in 45 acres and 30 acres of late seral habitat assemblage to open and early seral habitat assemblage in Alternative 2 and Alternative 3, respectively, would result in any change in bird species numbers, composition or density. Competition among snag dependent birds may increase slightly as a result of the loss of some smaller snags. This would not be expected to affect overall numbers or abundance of snag dependent birds present in the project area.

Changes in forested vegetation patterns in the Salt project area and across the Forest in general indicate a shift of open and early seral stage assemblage habitat to late-seral assemblage forests over the last 30 years. Neither Alternative 2 nor Alternative 3 would significantly alter this gradual habitat assemblage shift. The impacts to bird habitat resulting from implementation of Alternative 2 or Alternative 3 are not likely to influence bird species trends in the habitat assemblages within the project area or on the Shasta-Trinity National Forest.

3.8.4 Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Implementation of either Alternative 2 or 3 would be in compliance with the appropriate laws and regulations related to neotropical migrants as explained below.

The Migratory Bird Treaty Act (MBTA) of 1918 and amendments.

Implementation of this project would not "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in the terms of this Convention . . . for the protection of migratory birds . . . or any part, nest, or egg of any such bird." as is prohibited by this law (16 U.S.C. 703).

Executive Order 13186

This analysis meets the requirement of this Order to “evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern; (b) identify where unintentional take reasonably attributable to agency actions is having, or is likely to have, a measurable negative effect on migratory bird populations, focusing first on species of concern, priority habitats, and key risk factors.”

National Forest Management Act (“NFMA”)

The Salt project is compliant with the NFMA requirement for the Forest Service to “provide for diversity of plant and animal communities based on the suitability and capability of the specific land area.” The project, as reflected in this EIS analysis would maintain viable populations of existing native and desired non-native vertebrate species in the planning area.[205]

The Shasta-Trinity Forest Plan

The Salt project is consistent with the goal of the Neotropical Migrant Bird Program in that it would maintain habitat for migratory birds.

[205] USDA 1995, page 4-4, 4-29

The project also is consistent with the Matrix Land Management Direction for Birds and specific standards and guidelines for bird species identified in the plan. [206]

Maintain adequate numbers of large snags and green-tree replacements for future snags within the four species' ranges in appropriate forest types. Resource protection measure will retain snags over 19"dbh (Chapter 2.4, #4) and the intermediate thinning is thin from below. Large trees would generally be removed on only on 27 acres of regeneration harvest-with green tree retention in Alternative 2, and dead and dying trees removed from 30 and 31 acres in shelterwood-green tree retention units in Alternative 3 and 2 respectively.

Stand exams indicate that current snag levels, with the snag retention requirements of this project (Chapter 2.4, #4) will assure the appropriate tree and snag species mixes and densities can be achieved.

3.9 Soils[207]

3.9.1 Methodology for Analysis

Issues Addressed

A key issue, related to soils, raised during public scoping and a second key issue identified through internal scoping follow.

- ***Construction of new temporary roads may negatively impact ... soil health…***

The Issue Indicators used to analyze these issues are:

- Miles of temporary road and resulting acres of detrimental soil disturbance.

Public comments also raised the general issue that yarding with tractors could negatively impact soil health and productivity which is also considered in the analysis.

Methods

Information

Soil information for the Salt project area is available in the Soil Survey of Shasta-Trinity Forests Area report.[208] This survey provides general information about the soils, their capabilities and their limitations. The soil information contained in the Soil Survey of the Shasta-Trinity Forests Area, while not intended for project level work, does provide a sound background for project level work with further field investigations. The information in the Soil Survey directs field work to the most sensitive areas to management.

Geographic information system (GIS) data includes: Ecomap, Serpentine soil covers, Soil survey, DEM, and contours.

[206] USDA 1995, pages 4-63 and 4-64
[207] Information in this Section is adapted from the Salt Soils Report, Foss 2009
[208] Lanspa, 1994

Field Work

Two survey methods were used during the 2007 field surveys. **Method 1:** Utilized the Soil Compaction Monitoring Protocol for the Shasta-Trinity National Forest.[209] Five, 200 foot transects were evenly distributed throughout the project area on a Holland loam soil (map unit 182, Marpa-Holland complex, 20 to 40% slopes). Holland soils have the highest compaction hazard rating within the project area and the majority of the project activity units are located on map unit 107 and 182. By sampling Holland soils throughout the project area, past activities that caused the most compaction is accurately portrayed. Each transect end point was recorded in a GPS and located to capture all disturbance classes of undisturbed, disturbed, and skid trails. Twenty points were sampled per transect for a total of 100 samples used to measure bulk density. (Bulk density is expressed as g/cc3 and is used to calculate porosity, which is expressed as total porosity (or void space) of the soil).

Bulk density was sampled in the 4 to 8 inch zone at each 10-foot increment along each 200 foot transect. Bulk density values for each disturbance level were averaged for the entire area sampled. Porosity change was calculated by using the difference between undisturbed and disturbed classes.

Soil map units were evaluated for accuracy with soil pit descriptions and total cover was evaluated to determine percent cover, depth of duff, large woody debris (LWD) per acre, along with total fuel per acre on selected project units. Soil erosion was evaluated on visual indicators of surface erosion using rills, gullies, pedestalling, soil deposition, erosion pavement or loss of the surface "A" horizon. These indicators were evaluated by visiting selected project units.

Method 2: A protocol developed for Idaho and Montana by Rocky Mountain Research Station[210] was used to describe current soil conditions in the Salt project. This method used paced transects with spade-point sampling. It relies heavily on qualitative indicators of disturbance. Initial field time was spent attenuating visual soil indicators to determine detrimental disturbance.

Four categories were used for classifying soil disturbance as outlined in the Region 1 protocol: Classes 0 though 3. Class 3 was considered detrimental based on initial field reconnaissance and professional judgment. Class 2 was moderate disturbance, Class 1 was low disturbance, and Class 0 was no disturbance. Much of the disturbance observed fell between Class 1 and Class 2; low-moderate disturbance. Such areas are not quite detrimentally disturbed or compacted but have strong visual indicators of soil disturbance. These areas could be called recovering detrimentally disturbed areas. Disturbance class 2 could be best described as a 50-year old skid trail with duff over a very thin A horizon.

A target of 60 points was classified for all units greater than 25 acres but less than 100 acres. For units less than 25 acres, the soil scientist took about 40 points but added more if higher-than-average rates of disturbance were found (i.e. more than 1 or 2 points) to increase the sampling density. For the units greater than 100 acres, the soil scientist increased the number of points and tried to arrange transects to sample as many portions of the units as possible. In units where we found higher than expected levels of disturbance, more points were taken.

[209] Young and Rust 2007
[210] USDA 2008

Field work also included Coarse Woody Debris (LWD) survey. These were taken every 5-7 points during the disturbance survey. Points were 10 paces apart which measures about 50 feet. All LWD larger than 3 inches was recorded according to diameter size.

The soil scientist recorded GPS data, notes and photos for all units.

Analysis – Spatial and Temporal Boundaries and Effects Analysis Units of Measure

The analysis area for direct, indirect, and cumulative soil effects are the proposed harvest units[211]. This is the area that is expected to be directly impacted. The Salt project area (Figure 1) is used to qualitatively discuss the past activities outside of proposed treatment units. Please see the hydrology resource section for cumulative watershed effects (Chapter 3.10).

Effects to soils from roads are long-term, generally defined as more than 50 years. Most activities from thinning have different recovery rates. Compaction of the Salt project area soils lasts approximately 50 years during which inputs from plant roots, other organic inputs or, physical weathering relieves the compaction. Erosion recovery is three to five years and fertility is one to two years.

The following units of measure will be used to describe the differences between alternatives.

- Erosion Hazard Rating (EHR) a measure of the risk of accelerated erosion
- Percent detrimental soil conditions from thinning and fuel operations, including skid trails, temporary roads, treatment units, etc post activity.
- Miles of temporary road constructed
- Degree of Influence on Soil Productivity, are based on monitoring information, literature and professional experience. These are defined as follows:
    - Negligible: Soil resources would not be affected or the change would be so small that it would not be of any measurable of any perceptible consequence. Negligible, as defined here, includes no effect. Erosion rates would remain normal (1-2 tons per acre per year). No detrimental compaction is expected.
    - Minor: Effects to soil resources would be measurable, although the changes would be small, likely short-term, the effects localized. No mitigation measures are needed. Erosion rates would be at natural levels to slightly accelerated in a few, discreet areas. Moderate compaction/displacement would exist but it would not be detrimental or continuous. Soil cover would remain high—preventing erosion and maintaining fertility. Soils would meet R-5 soils quality standards (SQS) in all units. Most of the skid trails/tractor operation would occur on slopes less than 35%.
    - Moderate: Effects to soil resources would be measurable and long-term but the effects would be local. Mitigation would be necessary and would be successful. There would be accelerated erosion, some detrimental compaction, and/or noticeable loss of vital soil fertility. The effect may be long-term but soil productivity would still meet standards through most of the units through mitigation. There would be tractor operation on small areas greater than 35% slope.
    - Major: Effects to soil resources would be measurable with substantial consequences. Mitigation measures would be necessary and their success would not be guaranteed. Erosion will be accelerated beyond natural conditions. Detrimental compaction would exceed R-5 standards on over 15% of the area. Soil fertility would be severely

[211] USDA 1995, page O-2

limited (little soil cover, loss of organics, no LWD). The plant community is different in large areas from what is expected. There would be several areas where tractors are expected to operate on sustained slopes greater than 35%

Assumptions

Analysis assumes the resource protection measures in Chapter 2.4 (#7 through #16 and #21 through #29) are implemented.

There will be some, up to 5% overlap, between existing disturbance and new disturbance. Detrimental soil conditions are calculated for the individual harvest units. Detrimental soil conditions incurred by proposed harvest activities are calculated by harvest method: 7% for tractor harvest (based on Shasta-Trinity Soil Monitoring)[212] on slopes less than 35%, 20% or tractor harvest on sustained slopes greater than 40%[213], and 3% for helicopter.

3.9.2 Affected Environment

The Salt project area is located in the Rattlesnake Creek (M261Au) Ecological Subsection of the Klamath Mountains Ecological Section (M261A) of northern California.[214] Elevation ranges from about 3,500 to 5,800 feet. The area is primarily vegetated with a mix of conifers with hardwood species occurring on steep, rocky slopes. This project area is dominated by intensely faulted Paleozoic metavolcanic and metasedimentary rocks and serpentized peridotite. Mass wasting and fluvial erosion are the main geomorphic processes.

The slopes are gentle, ranging from 20 to 40% in the analysis area. This area is mountainous with rounded ridges, steep sides and narrow canyons. Little surface water exists as runoff is rapid and the soils are well drained.

The soils in the project area are generally shallow to moderately deep with high amounts of rock fragments (Table 70). Serpentine soil survey identifies several soil types on the Salt analysis area with serpentine properties or parent material.[215] All unstable geologies, namely serpentines, were avoided in project design.[216] A few of the soils have significant amount of clay (Beaughton and Dubakella). Most of the project area is a loamy textured soil with few rock fragments that formed on dormant landslides. Several soils are shallow to bedrock.

Soil fertility in the Salt project area is moderately high to low depending upon the parent material and available water holding capacity. Generally, deeper, finer-textured soils with high available water-holding capacities (AWC) have the highest soil fertilities. Marpa, and Holland, have the highest soil fertility while Neuns soils have moderate fertility. In most timber soils the parent material has low fertility and most nutrients are recycled from decomposing roots and surface organics that gets

[212] Rust 2008
[213] Resource protection measures require that track line machines generally be restricted to slopes less than 35% and end-lining will be used in those areas where skid trails may exceed 35% (Chapter 2.4.1, #12)
[214] Cleland et al. 2007 and Jasso 2007
[215] USDA 2004
[216] Jasso 2007

incorporated into the soil. It is important to note the critical role surface organics (ex. litter and duff) and organic compounds have in soil fertility.

Table 70: Physical properties of Salt analysis area soils

Soil Name	Texture	Rock fragments (Percent)	Parent Material	Depth*	Acres	Percent of analysis area
Beaughton Family	Clayey-skeletal	25-60	Serpentine	Shallow	561	13
Deadwood Family	Loamy-Skeletal	50-85	metasediments	Shallow	0.2	Less than 1
Dubakella Family	Clayey-skeletal	30-60	Peridotite	Moderate	83	2
Grell Family	Loamy-Skeletal	40-60	Serpentine	Shallow	23	1
Goulding Family	Loamy-Skeletal	45-75	metasediments	Shallow	inclusion	-----
Holland Family	Fine-loamy	10 -35	Metasediments/ dormant landslides	Moderate	1,693	40
Hugo Family	Fine-Loamy	10-30	metasediments	Deep	inclusion	-----
Marpa Family	Loamy-Skeletal	25-55	metasediments	Moderate	381	9
Neuns Family	Loamy-Skeletal	40-65	metasediments	Moderate	657	15
Neuns Family, deep	Loamy-Skeletal	40-65	metasediments	Deep	327	8
Rock Outcrop	Massive Rock	N/A	metasediments	Very Shallow	57	1
Rock Outcrop, ultramafic	Massive Rock	N/A	Serpentine	Very Shallow	42	1
Weitchpec Family	Loamy-Skeletal	40-55	Peridotite	Moderate	453	11
				Total	**4,279**	

Depth classes are: Very Shallow – less than 10 inches, Shallow - 10-20 inches, Moderate - 20-40 inches, Deep - 40-60 inches

Fine-textured soils with few rock fragments have a high compaction hazard. Generally, soils with coarse fragments greater than 40% are better equipped to resist compaction from machine use. The fragments act as a skeleton and protect the more compressible particles in the soil. Holland soils, for example, have a severe compaction rating due to fine texture and lack of rock fragments. Coarse fragments can also act as soil cover, protecting soils from erosion.

Even more important than soil texture in predicting risk of compaction is soil moisture. Dry soils are less likely to compact and have a lower risk of compaction than moist soils.[217] Under moist conditions, even course soils can compact.

Organic component of soil

Organic matter content plays a large role in the storage and release of plant available nutrients. Organic matter ranges is size and distribution from small-particles in soil (SOC) to soil surface litter, to large decaying logs. The logs are called large woody debris (LWD).

Disturbances to the organic matter content in mineral soils can have negative effects on soil nutrient status. Long-term study plots demonstrate a significant reduction in soil carbon and plant-

[217] Welke and Fyles. 2005

available nutrients when the forest floor (organic mat) is removed.[218] When the surface organics are removed fine textured soils can lose up to 13% porosity due to compaction.[219] Gomez et al.'s study demonstrates the importance of duff or litter cover in mitigating compaction.

LWD functions as habitat for vertebrates and invertebrates and not micronutrient banks. In addition to terrestrial habitat, LWD is beneficial for continued soil productivity by ameliorating the site after forest clearing. The wood provides microsites for microbial activity, retains carbon on site, and may moderate soil moisture.[220]

Serpentine Soils in the Project Area

Serpentine geology is found in the project area. The soils from serpentine rock have several limitations for management. Serpentine soils can have high levels of asbestos that pose health risks from dust inhalation. Serpentine soils have low fertility due to a low Ca/Mg ratio. These areas can be barren, with sparse vegetative cover and shallow soils.[221] Serpentine soils even with high rates of rock fragments have a severe risk of compaction due to clayey texture and soft rock structure. Most serpentine soils that have low CA/Mg ratio do not support conifer vegetation. All unstable geologies, including serpentized shear zones, were avoided in project design to maintain soil stability and limit major problems when managing these areas.[222]

Existing Soil Disturbance, Porosity and Cover

Much of the Salt watershed has been managed in the past 50 years. The forests have been selectively harvested, targeting the profitable wood species—mostly Sugar Pine and Ponderosa Pine. Most of the timber was removed by ground-based yarding systems. A dense skid trail and unauthorized route network exists throughout the Salt project area. Approximately 500 acres of the project area, was managed in the 1980s and is now in pine plantations.

The Post Creek grazing allotment encompasses the western half of the Salt project area. Some evidence of grazing was noted, especially in the meadows, in Units 7 and 2A. Detrimental impacts from grazing were not observed.

Little past erosion was detected in the project area due to a continuous duff layer on all soils. Also, there was high soil cover from vegetation or rocks.[223] All of the surveyed units (29) had at least 90% cover with most having close to 100% cover. Where the surface organics are missing, the coarse fragments in the soil are keeping erosion rates very low. Some road segments were actively eroding and there were ruts and gulleys in a few areas. Many of these roads are unauthorized routes. Please refer to the hydrology section (Chapter 3.10) for further discussion of roads and equivalent roaded area (ERA) calculations and erosion modeling.

[218] Powers et al. 2005
[219] Gomez et al. 2002
[220] Brown et al. 2003
[221] USFS 2004
[222] Jasso 2007
[223] Foss 2009, Appendix C & D

The average disturbance and decrease in total porosity was determined in the field. Forty-seven percent of the Salt area is in a disturbed state and the rest of the area is undisturbed (Table 71).[224] Most of the proposed units have less than 5% detrimental soil disturbance. The average is 3%. However, Unit 13 with 10% and Unit 21 with slightly over 5% detrimental disturbance are notable exceptions. Unit 13 disturbance is high due to several benched skid trails and old temporary roads that are not recovered. While the skid trails in the project area units are noticeable, the compaction has been relieved since harvest. Only decreases in porosity of 10% or greater are considered detrimental soil compaction. Therefore, only the old temporary roads, not the skid trails, are considered as detrimentally compacted.

Table 71: Average disturbance and porosity for Salt project area

Disturbance Class	Percent Project Area	Porosity Average Percent	Porosity Percent change from undisturbed	Moisture Percent
Undisturbed	53	52	0	14.6
Disturbed	27	51	2	15.2
Skid trails	17	51	2	15.4
Roads	3	45	14	14.8
Total Disturbed	**47**	**--**	**--**	**--**

Existing soil cover in selected proposed units is very high[225]. Duff thickness ranged from 1 to 3 inches. Results of the fuel cover transects indicate that the dominant cover is the 1 to 3 inch and the 3 to 20 inch class of woody material.[226] Large woody debris (LWD) ranged from 5 to 10 logs per acre for mixed conifer stands, from 3 to 8 logs per acre for tree/brush stands, and 1 to 5 logs per acres for brush areas.[227] This meets the R-5 SQS.[228]

3.9.3 Environmental Consequences

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

There are not any direct effects to soil productivity in Alternative 1.

All roads would remain open to traffic and remain in place. No rehabilitation would occur. Erosion rates would be low on all areas. For a discussion of roads and their impacts please see the hydrology section (Chapter 3.10).

Skid trails and the moderately compacted areas would continue to improve and recover. Soil biological functions would continue. The existing surface organics would continue to decompose and contribute to soil organic matter and duff. Topsoil would build from the organic matter.

[224] Rust 2007
[225] Foss 2009, Appendix D
[226] Rust 2007
[227] Rust 2007
[228] Foss 2009, Appendix D

Some roads in the project area are proposed for decommissioning in a future project (Westside Watershed Restoration Project). See Chapter 3.18 for a table that lists these roads (Table 103).

Alternative 2 – Proposed Action

Direct Effects

The resource protection measures, BMPs, and contract clauses all serve to reduce erosion (Chapter 2.4, #7 through #16 and #21 through #29). Erosion rates may be increased in localized areas during operation but then would return to existing levels post activity. Past BMP monitoring has demonstrated that these practices have been successful. The Forest has a good record of BMP implementation.[229] By leaving at least 50% canopy closure and at least 50% soil cover, the maximum erosion hazard is moderate for all intermediate thin (INT) units (Chapter 2.4, #24 and #25). The two regeneration with green tree retention harvest units and one of the shelterwood with green tree retention harvest (SW) units have a moderate erosion risk rating (Units 37, 40, 17). Resource protection measures assure operation in Units 37, 40, 17 will only have ground-based mechanical equipment operate when the soils are dry down to 8 inches, [230] reducing or eliminating the potential for compaction. This protection measure applies to other units with fine-textured soils as well, (Units 2A, 2B, 2C, 7, 9A, 9B, 10, 11, 13, 14, 17, 18, 25A, 25B, 25C, 25D, 25E, 26, 30A, 30B, 40). Shelterwood green tree retention Unit 18 has a moderate-high risk of accelerated erosion due to high amounts of rock outcrop and steep slopes (Table 72), however, the resource protection measures prohibit mechanical skidding equipment on slopes greater than 35% with the exception of small inclusions of steep areas exceeding 35% and in those cases the skid trails will be covered with woody material larger than 9 inches to divert any potential flow off the trails (Chapter 2.4, #11, 12, 28).

Some areas in the shaded fuel break have soils with a moderate-high risk of accelerated erosion, though little actual erosion was observed in the field. The removal of fuels and retention of less than 50% canopy closure could contribute to accelerated erosion risk, however, because the slope distances are short and BMPs (Chapter 2.4.1, #7) and resource protection measures specifically designed to reduce the potential for erosion (Chapter 2.4.1, #21, #22, #24, #25, #27, #28), will be followed during operations, the risk of erosion due to operations are minimized.

Erosion risk on the plantation thin units depends largely on the slope and thinning method. Specific thinning method will be determined during the implementation phase of this project. Generally, hand falling is less likely to disturb enough soil and existing ground cover to increase erosion on all slopes. Mechanized thinning on slopes less than 20% would have a low erosion risk, slopes 20-35% have a moderate risk and slopes greater than 35% with mechanized thinning have the highest risk of accelerated erosion. However, resource protection measures do not allow mechanical harvesting or treatment on slopes greater than 35% except for small inclusions of steep areas (Chapter

[229] USDA 2004
[230] The resource objective is to operate on dry soils. This may occur from June 1, through September 30 – but could occur outside of these dates as well.

2.4, #11, #12, #28), therefore the effects on erosion of thinning, hand falling or mechanized, in plantations will be negligible.

Table 72: Alternative 2 direct effects to soils summary

Treatment	Erosion Hazard	Compaction
Regeneration with Green Tree Retention	Moderate	7% additional detrimental disturbance from tractor harvesting, generally limited to skid trails. All should meet SQS
Shelterwood	17 is moderate. 18 is moderate-high	7% additional detrimental disturbance from tractor harvesting, generally limited to skid trails. All should meet SQS
Intermediate Thinning	Generally moderate except for 2A, 4, 7, 33B and 36 which are low	7% detrimental disturbance from tractor harvesting, generally limited to skid trails. All units have a low risk of exceeding except for 13 (moderate)
Intermediate Thinning Helicopter (Unit 32)	Minor	3% detrimental disturbance from helicopter yarding. Should meet SQS
Shaded Fuel Break	Unit 45 is moderate high	Should meet SQS
Plantation thin	Varies by slope by slope: less than 20% is low, 20-35% is moderate, 35% plus is high – but protection measures eliminate this risk. Handfalling hazard is low across all slopes	Low risk especially since mechanized equipment is limited to slopes less than 35%. Handfalling has the lowest risk of exceeding SQS

The effects of fuel treatments on soils vary by method. Generally, hand methods have less of an impact on soils than mechanical ones (Table 73). A resource protection measure requires that masticated material will be kept to a depth of 3 inches or less or if the masticated material will be burned it will be burned in the spring (moist soil condition) (Chapter 2.4.1, #11a). This will assure that the potential for detrimental burning of soils is minimized. [231]

Approximately 0.3 miles of temporary road would be constructed which after harvest activities will be ripped, mulched and seeded with native grass seed or non-persistent cereal grains (Chapter 2.4.1, #21, #26). Very short segments of road are needed to access four different units (0.05 miles for Unit 5; 0.07 miles for Unit 9A; 0.03 miles for Unit 11 and 0.15 miles for Unit 33A). Assuming a 12 foot road width, the temporary roads would result in 0.4 acres of detrimental soil disturbance spread out over the four different units. Each of these units would still meet SQS for detrimental soil disturbance.

There would be a moderate degree of influence on soil productivity on the small inclusions of skid trails that are over 35% slope. While most steep areas are excluded by design criteria, the short steep inclusions have higher rates of displacement than slopes that are less than 35% gradient. The resource protection measure requires that end-lining be used in those areas where skid trails exceed 35%, and that those skid trails be covered with woody material larger than 9 inches to divert flow off

[231] Busse et al. 2006

the trail (Chapter 2.4.1, #12). These resource protection measures minimize potential displacement impacts.

Table 73: Fuel treatments and their qualitative effect on soils

Treatment	Effects on Soil
Mastication	Fuel rearrangement, increased soil cover, temp., moisture & microbe activity, possible short-term (less than 5 years) C/N imbalance if too much incorporation.
Lop & Scatter	Scatters 3 to 10 in material, provides soil cover, breaks down rapidly into fine litter and slow (greater than 10 years) incorporation.
Hand Pile	Similar to lop-and-scatter except concentrated, decomposes more slowly (greater than 10 years), concentrations can burn hot but are not continuous.
Jackpot	Concentrated areas of fuel consumed can be hot but are limited on the landscape are mosaic and do not increase overland erosion above natural rates.
Tractor Pile	The highest effects to soil productivity is due to mechanical treatment. Topsoil mixed in with slash, moderate compaction (10 to 20 years) and loss of topsoil if not done properly with brush rakes and good operator.

Indirect Effects

There is a poor link between physical indicators like compaction and biological indicators like soil carbon of soil health.[232] Type and distribution of organic matter is a better metric. The surface organics and soil organic carbon (SOC) have been linked to long-term soil productivity.

Complete removal of organic matter, mostly the loss of the duff/forest floor, has led to declines in soil productivity and reduced nitrogen availability.[233] This pulse removal can be felt at least 10 years after activity. Resource protection measures will assure that a layer of ground cover will occur over at least 50% of the activity area (Chapter 2.4.1, #25)[234]. Partial removal of biomass may reduce the soil organic carbon and nutrient availability for a short time, but canopy retention and growth inputs from fine roots shorten the duration of effects.

Cumulative Effects

It takes about 50 years for compaction to be relieved in these soils as judged from recovered past management. When rotations are closer than this, compaction rates in fine-textured soils will remain high and the risk of exceeding SQS in an entry 10-20 years is elevated. In all units the post treatment detrimental compaction, when considering the existing detrimental compaction and projected additional disturbance, will be at or below 15%. Most of the existing disturbance is in skid trails that would be reused.

Mechanical thinning of plantations adds some detrimental compaction and displacement to an already detrimentally disturbed area. Future management entries into these stands could increase the compaction if adequate time for the soil to recover is not provided. However, most data indicate that

[232] Shestak and Busse 2005
[233] Powers et al. 2005
[234] FSH 2509.18, 2.2.1 Soil Productivity

operating on dry soil on these low-to moderately compacted areas results in moderate compaction that is not root-limiting. [235]

Alternative 3 – Alternative in Response to Public Comments

Direct and Indirect Effects

Direct effects are similar to Alternative 2 (Table 74). Alternative 3 does not treat the regeneration green tree retention units. Thus, Units 37 and 40 will not be treated and will remain as they are now: not actively eroding and with about 3% detrimental soil conditions. No temporary roads are proposed for alternative 3.

Table 74: Alternative 3 direct effects summary

Treatment	Erosion Hazard	Compaction
Shelterwood	17 is moderate. 18 is moderate-high	7% additional detrimental disturbance from tractor harvesting, generally limited to skid trails. All should meet SQS
Intermediate Thinning	Generally moderate except for 2A, 4, 7, 33B and 36 which are low.	7% detrimental disturbance from tractor harvesting, generally limited to skid trails. All units have a low risk of exceeding except for unit 13 (moderate).
Intermediate Thinning Helicopter (Unit 32)	Minor	3% detrimental disturbance from helicopter yarding. Should meet SQS
Shaded Fuel Break	Unit 45 is moderate high	Should meet SQS
Plantation Thinning	Varies by slope by slope: less than 20% is low, 20-35% is moderate, 35% plus is high. Handfalling hazard is low across all slopes	Should meet SQS since mechanized equipment is limited to slopes less than 35%. Handfalling has the lowest risk of adding disturbance.

Indirect effects of carbon interactions would be similar for both Alternative 2 and 3. Since no temporary roads would be constructed, there would be longer skidding distances for a few units.

Temporary roads generally have a 12 foot wide foot print, so the disturbed area from 0.3 miles of temporary road would be 0.4 acres (0.3 miles X 5280 feet/mile X 12 feet wide = 19,008 sq. feet = 0.4 acres). The foot print width for a main skid road needed to remove biomass would be approximately 18 feet wide, which would disturb approximately 0.6 acres (0.3 miles X 5280 feet/mile X 18 feet wide = 28,512 sq. feet = 0.6 acres). Though most of the effects would be mitigated and thresholds would not be exceeded, there would be slightly higher, though insignificant, amount of detrimental soil compaction and displacement in Units 5, 9A, 11, and 33A due to greater skidding disturbance in Alternative 3 compared to Alternative 2.

Cumulative Effects

Cumulative effects for Alternative 3 are similar to those discussed for Alternative 2. Since this alternative does not treat Units 37 and 40 there would be no cumulative effect to soils in these units.

[235] Rust 2008

Table 75: Comparison of alternatives for soil resources

Measure	Alt 1	Alt 2	Alt 3
Generalized erosion risk	Low	Moderate	Moderate
Cumulative aerial extent of Soil compaction/SQS	3%	15% maximum	15% maximum
Temporary roads	0	0.3	0
Degree of influence on soil productivity*	Negligible	Moderate**	Moderate**

* For description of each unit please see Appendices C and E of the Salt Soils Report, Foss 2009.
**Moderate due to tractor yarding on areas greater than 35% slope

3.9.4 Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The National Forest Management Act of 1976

The National Forest Management Act of 1976 (NFMA) recognized the fundamental need to protect, and where appropriate improve, the quality of soil, water, and air resources. With respect to soils, NFMA requires that the Forest Service manage lands so as not to impair their long-term productivity. Further, activities must be monitored to ensure that productivity is protected. The Salt project is in compliance with NFMA.

The National Soil Management Handbook & R5 Soil and Water Handbook

The National Soil Management Handbook defines soil productivity and components of soil productivity, and establishes guidance for measuring soil productivity.[236] Soil properties, measures, and thresholds relative to disturbance types are developed at the Regional and Forest levels, known as Soil Quality Standards. The R5 Soil and Water Handbook (FSH 2509.22) directs that measures be taken to avoid detrimental soil disturbance and to evaluate management effects on soil productivity, soil hydrologic function and soil buffering capacity.

The Region 5 Soil Management Handbook Supplement establishes Regional objectives for the Soil Management Program and Regional Soil Quality Analysis Standards (SQAS). Note that the activity area is the scale at which impacts are ultimately assessed, defined as the area where soil disturbing activities take place, such as a timber harvest unit in a sale area or a burn area within a prescribed burn project; system roads, trails, and other areas not dedicated to growing vegetation (other dedicated uses) are not included as part of an activity area. Aerial extent limits for different disturbance types are not established in the R5 handbook supplement.

SQAS use the following soil properties, conditions, and threshold values to evaluate management effects on key soil functions of soil productivity and hydrologic function. The Salt project is consistent with this direction. The resource protection measures that apply to each are referenced.

[236] USDA 1991

Soil Productivity

- Maintain sufficient soil cover to prevent accelerated soil erosion from exceeding the rate of soil formation. [erosion standard] (Chapter 2.4, #24)
- Maintain at least 90% of the total soil porosity found under natural conditions, as measured at 4 to 8 inches below the soil surface. [compaction standard] (Chapter 2.4, #7 through #16)
- Maintain organic matter in kinds and amounts sufficient to prevent significant nutrient cycle deficits, and to avoid detrimental physical and biological soil conditions. (Chapter 2.4, #4, #5)
- Soil organic matter in the upper 12 inches of soil is at least 85% of the total soil organic matter found under undisturbed or natural conditions. [displacement standard] (Chapter 2.4, #4, #5)
- Fine organic matter occurs on at least 50% of the area; this includes litter, duff, and woody material less than 3 inches diameter. [nutrient cycling standard] (Chapter 2.4, #24)
- Large woody material, when occurring in the forested area, is at least 5 logs per acre in contact with the soil surface; and represents the total range of decomposition. Adjust the number of logs per acre to account for ecological type potential. [soil biology standard] (Chapter 2.4, #4, #5)
- Large woody material and fine organic matter may be reduced to meet fuel management objectives, except when necessary for essential erosion control.
- Maintain soil moisture regime and drainage classes where plant growth or plant community composition may be dependent upon natural conditions.

Soil Hydrologic Function

- To avoid accelerated surface runoff, infiltration and permeability are not reduced to ratings of 6 or 8, as defined in R5 Erosion Hazard Rating (HER) system.

The Shasta-Trinity Forest Plan

The Salt project is consistent with the following Forest Plan goals, objectives and standards including the goal to maintain or improve soil productivity and prevent excessive surface erosion, mass wasting, and cumulative watershed impacts.[237] Forest Plan standards[238] reference the regional standards published in 1995.[239] In addition, the Forest Plan standards clarify the aerial extent for non-productive dedicated uses such as trails and landings; these include 15% for even-aged systems and 20% for uneven aged systems.[240] The Forest Plan references handbook direction for soil management.[241]

[237] USDA 1995, page 4-4
[238] USDA 1995, page O1-O2
[239] USDA 1995a
[240] USDA 1995b, page 4-25
[241] USDA 1995a

3.9.5 Summary of Purpose and Need and Key Issue Effect

Table 76: Key issue – effects to soils of new temporary road construction

Issue Indicator	Alternative 1	Alternative 2	Alternative 3
Key Issue Construction of new temporary roads may negatively impact ... soil health…			
Miles of temporary road and resulting acres of detrimental soil disturbance.	0	0.3 miles = 0.4 acres	0 miles temp rd. 0.6 acres of disturbance in four units from additional skid trails

3.10 Hydrology[242]

3.10.1 Methodology for Analysis

Issues Addressed

Two key issues related to hydrology identified during scoping are:

- ***Thinning within riparian reserves may have unintended effects on the watershed, fisheries and wildlife***
- ***Construction of new temporary roads may negatively impact hydrology and soil health and could impact wildlife***

The Issue Indicators used to compare alternatives, related to these issues, are:

- Estimated tons of potential sedimentation short-term due to thinning in riparian reserves and from all activities.
- Estimated tons of potential sedimentation long-term from all activities
- The number of new stream crossings made by new temporary road construction

The following watershed analysis issue was also identified by input received during the scoping process. This issue was also considered in this analysis.

- Landings and use of roads for this project could contribute sedimentation and cumulative impacts leading to degradation of riparian areas and the watershed

Methods

Field reconnaissance was conducted in the fall of 2007 by a TEAMS hydrologist to evaluate existing hydrologic conditions and potential effects to this resource.[243] Literature reviews, field notes, Forest monitoring reports, Geographical Information System (GIS) data, and professional judgment were used to support report conclusions. Field notes and photographs are in the project file.

[242] Information in this Section is adapted from the Salt Hydrology Report, Fryxell 2009
[243] Hermandorfer 2007

Sediment delivery modeling was conducted using the Forest Service interface for the Water Erosion Prediction Project computer model (WEPP). Modeling was conducted for the two action alternatives and the no-action alternative. Modeling was done for the 7th level Upper Salt Creek-Hayfork Creek and Ditch Gulch-Salt Gulch watersheds, referred to as hydrologic unit codes (HUC7). WEPP modeling was not done on the Upper Rattlesnake Creek watershed as less than 0.7% of the watershed area was involved under both Alternatives 2 and 3. In Alternative 2 Unit 45 would have 52 acres and in Alternative 3 it would have 51 acres. The proposed activity is thinning an existing fuel break. No temporary road construction is proposed. No hauling over roads in the Upper Rattlesnake Creek watershed is proposed and no road decommissioning would be implemented. As a result, there would be no discernible direct, indirect or cumulative effects for Upper Rattlesnake Creek watershed. Results for the other two watersheds were then used to compare potential effects for each alternative.

The model incorporates input of five elements to estimate erosion: climate, soil texture, local topography, residual plant community, and residual surface cover. The accuracy of predicted erosion numbers is highly variable at ±50%,[244] and very dependant on precipitation. The model does, however, allow comparison between alternatives.[245] Copies of the modeling results, including assumptions used in WEPP modeling are found in the project file.[246]

The Equivalent Roaded Area (ERA) model was also utilized to evaluate existing and potential project-related changes in existing cumulative effects, as required in the Region 5 Soil and Water Conservation Handbook, Chapter 50.[247] The threshold of concern (TOC) for a watershed is expressed as the percentage of disturbed or compacted soil area within a total watershed, as measured by ERA. The ERA threshold equals 18% in low sensitivity watersheds, 16% in moderate sensitivity watersheds, and 14% in high sensitivity watersheds and 12% in extremely sensitive watersheds.[248]

3.10.2 Affected Environment

Project Location

The project area is located within the portion of the Klamath River Basin drained by the South Fork of the Trinity River via Lower Hayfork Creek. More specifically it is located in the upper reach of the Salt Creek-Hayfork Creek 6th field (HUC6) watershed. Salt Creek Headwaters, Cold Creek, Bule Ditch and Deer Gulches are the named drainages within the project area.

These streams flow north to northeast to join Hayfork Creek; about 9 miles starting from the head of Salt Creek (Figure 15). Roughly 21 miles downstream of the Salt Creek/Hayfork Creek confluence, Hayfork Creek flows into the South Fork of the Trinity River (Table 77).

[244] Elliot et al. 2000
[245] Elliot et al 2000
[246] Fryxell 2009
[247] USDA Forest Service, 1990; Amendment 2
[248] USDA 1995, page 4-25

Table 77: Watersheds associated with the Salt project

HUC4	HUC5	HUC6	HUC7	HUC8*
South Fork Trinity River	Lower Hayfork Creek	Salt Creek-Hayfork Creek	Ditch Gulch-Salt Creek	1801021204010201(Upper Ditch)
				1801021204010202 (Bule)
				1801021204010203 (Lower Ditch)
			Upper Salt Creek-Hayfork Creek	1801021204010101 (Upper Salt)
				1801021204010102 (Middle Salt)
				1801021204010103(Lower Salt)
				1801021204010104 (Upper Cold)
				1801021204010105 (Lower Cold)

* HUC8 watersheds are depicted on Figure 15 by the last 3 HUC digits (displayed in bold above). The names Upper Ditch, Lower Ditch, Upper, Middle and Lower Salt, and Upper and Lower Cold Creek are not formalized in the Forest's GIS layer for 8th level HUCS. The names come from Christine Mai, Forest Hydrologist.

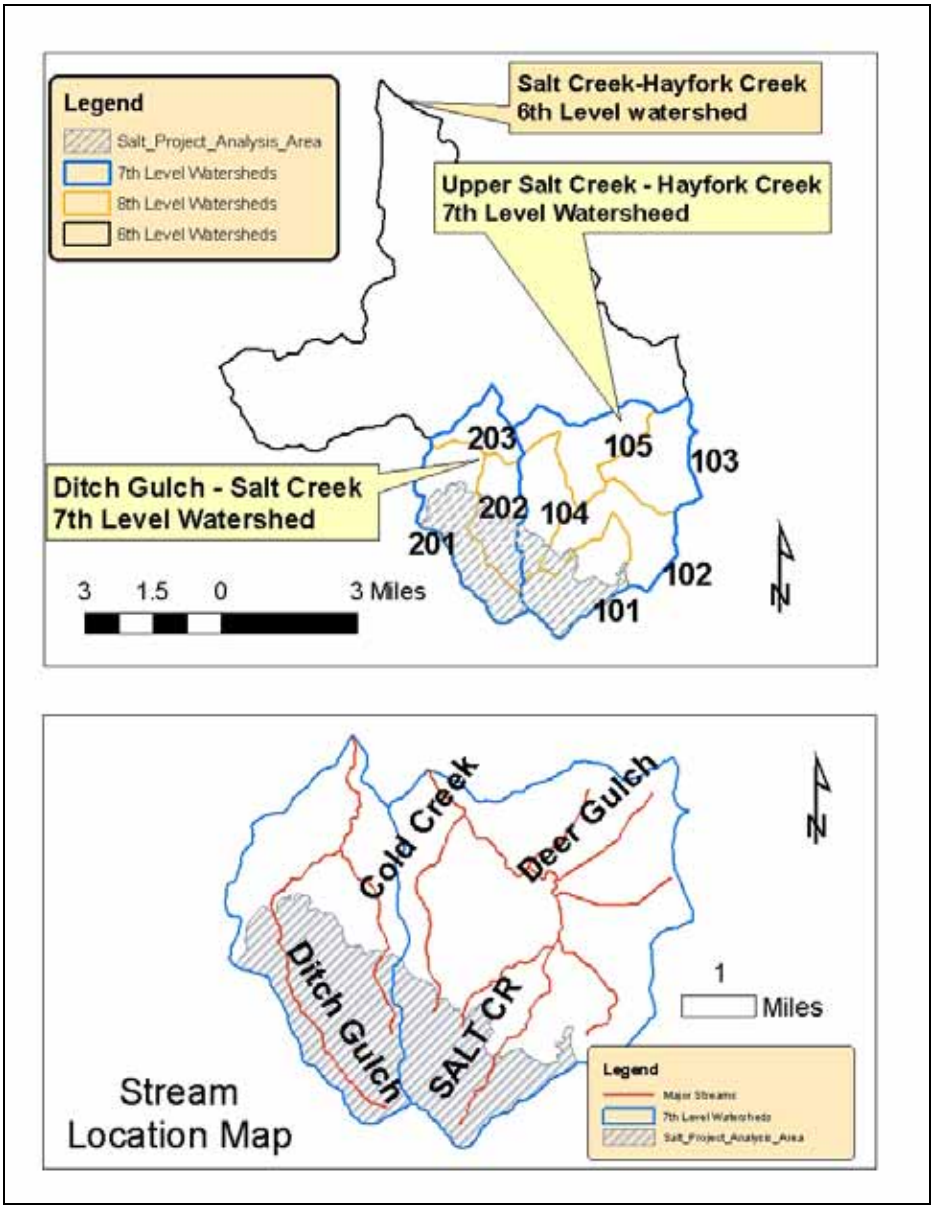

Figure 15: Project area watershed and stream location map

Watershed Description and Condition

Streams in the headwaters of the 6th level Salt Creek-Hayfork Creek Watershed generally function to transport sediment and large woody debris (LWD). Channels are typically low-order streams with high-gradient (10% or greater) having hillside slopes that often range from 70% or greater. Hence, there is limited residence time in the channels and material is easily transported during high flows.[249]

[249] URS et al. 2000; Ratcliff 2007, Table 2

Table 78: Characteristics of watersheds associated with Salt project

HUC6	HUC7	Ephemeral Stream Miles	Intermittent Stream Miles	Perennial Stream Miles
Salt Creek-Hayfork Creek		144.3	99.0	56.1
	Upper Salt Creek-Hayfork Creek	39.7	22.9	15.7
	Dutch Gulch-Salt Creek	12.8	14.5	6.6

Overall road densities for the Salt Creek-Hayfork Creek, Ditch Gulch-Salt Creek and Upper Salt Creek-Hayfork Creek watersheds are shown in Table 79. Road densities were determined using GIS. Unauthorized routes U29N55A, U29N31EA and U29N31E, located within the Upper Salt Creek-Hayfork Creek 7th level watershed, were noted as actively eroding.[250]

Table 79: Existing road density by watershed

6th Level HUC	7th Level HUC	Existing Road Density (miles/square mile)
Salt Creek-Hayfork Creek		3.6
	Ditch-Salt Creek	6.8
	Upper Salt Creek-Hayfork Creek	3.7

An estimated 5,727 acres, or 15.5%, of the Salt Creek-Hayfork Creek watershed were burned by the 2008 Telephone wildfire (Table 80). Approximately 124 acres were rated as high severity burns and 1,423 acres were rated as moderate in severity. Approximately 3,150 acres had a low severity burn rating. One hundred twenty four acres were categorized as having experienced high fire severity within the project area, and 1,432 acres were rated as having moderate burn severity.

The fire burned 30 acres within the project, most of which was categorized as low severity. Approximately 0.3 acres, within the project area, had a moderate burn severity rating. No acres within the project area were rated as having a high burn severity. Areas of low fire severity are actually beneficial at the watershed level, by promoting the sprouting of new vegetation, while retaining protective soil ground cover. Only an estimated 0.7% of the project analysis area itself was impacted by the Telephone fire. Based on the acreages burned within the project area effects are not likely to be evident other than very locally.

[250] Foss 2009

Table 80: 2008 Telephone fire burn severity acres in the 6th level Salt Creek-Upper Hayfork Creek watershed and in the project area

Salt Creek-Upper Hayfork Creek 6th Level Watershed				
Watershed Acres	**Burn Severity (Acres)**	**Acres Burned**	**% of Burn**	**% of Watershed**
36,881	Low	3, 150	69	8.5
	Moderate	1, 423	31	3.9
	High	124.0	3	3.0
	Unburned/Patchy Burn Areas	32,130.3	0	87
Salt Project Area				
Project Area Acres	**Burn Severity (Acres)**	**Acres Burned**	**% of Burn**	**% of Project Area**
4, 278.6	Low	29.5	39.1	0.7
	Moderate	0.3	0.4	0
	High	0.0	0	0
	Unburned/Patchy Burn Areas	4, 248.8	0	0

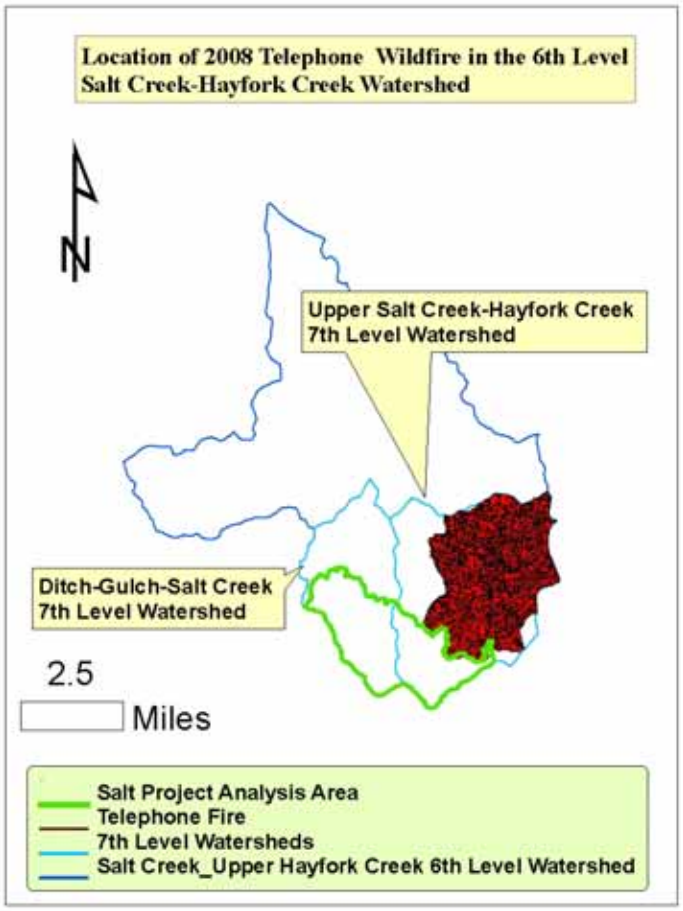

Figure 16: Location of 2008 wildfire in the Salt Creek-Upper Hayfork Creek watershed

Table 81: Watersheds in the Salt project area and summary of existing ERA data and resulting watershed condition class

Salt Project	Acres	Pre-fire ERA			2008 Telephone Fire					Pre and Post-fire Watershed Rating for Watershed Condition Class/Potential for adverse cumulative watershed effects
		ERA	% ERA	% of TOC	# Acres Burned High Severity	# Acres Burned Moderate Severity	Post-fire ERA Acres	Post-fire % ERA	Post-fire % of TOC	
Upper Salt Creek - Hayfork Creek	9,766	236.6	2.4	17	124	1,423	236.6	2.4	17	I/low
Ditch Gulch-Salt Gulch	5,081	191.1	3.8	27	0.0	0.0	191.1	3.8	27	I/low

Historically the area was heavily grazed; used for timber harvest; and placer, dragline, and hard-rock mining. Roads were developed for these uses, and water diversions, still in use today, were developed for domestic and agricultural uses.[251]

Existing disturbance levels within these watersheds are evaluated onsite and by using the ERA process (as required by FSH 2509.18, Soil and Water Conservation Practices, Chapter 50 – Soil Erosion and Hazard Rating). In calculating ERAs, all documented ground-disturbing activities such as roads, vegetation treatments and grazing are entered into the model. The model then calculates a percent disturbance for that watershed, which is the percent existing ERA. This number is compared to a pre-determined TOC; and when the ERA percentage equals 80% or greater of TOC, further analysis is triggered to determine if water yield, erosion, or sedimentation are of concern. Watershed Condition Class (WCC) is defined as an indicator of cumulative watershed risk (Table 81, Table 82 and Figure 17).

The TOC for the 7th field watersheds in this project area are 14%.[252]

ERA analysis of existing conditions for the Upper Salt Creek-Hayfork Creek Watershed has the existing percent ERA calculated at 2.4%. This includes accounting for the 2008 Telephone wildfire. Other disturbance activities included in the ERA analysis were roads, timber harvest, fire and grazing.[253]

The TOC for Upper Salt Creek-Hayfork Creek Watershed is 14%; therefore, the current disturbance level is at 17% of the TOC for this watershed; resulting in a low level of concern and a Watershed Condition Class 1 rating.

[251] URS et al. 2000
[252] Overland 2008a
[253] Overland 2008b

Existing ERA values for the 7th level Ditch Gulch-Salt Gulch Watershed were calculated to be 3.8%; with the same associated activities as mentioned above, except this watershed was not involved with the wildfires of 2008. The calculated ERA value of 3.8% represents 27% of the TOC for this watershed; again resulting in a low level of concern and a Watershed Condition Class 1 rating.

There are no key watersheds,[254] a land allocation with a key role in the conservation of at-risk salmonids, bull trout, and resident fish species,[255] within the project area.

Table 82: Watershed condition classes relative to threshold of concern (TOC)

Watershed Condition Class	Forest Service Manual Definitions 2521.1	WCC & TOC
WCC I	Watersheds exhibit high geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. The drainage network is generally stable. Physical, chemical, and biologic conditions suggest that soil, aquatic, and riparian systems are predominantly functional in terms of supporting beneficial uses	Less than 40% TOC
WCC II	Watersheds exhibit moderate geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. Portions of the drainage network may be unstable. Physical, chemical, and biologic conditions suggest that soil, aquatic, and riparian systems are at risk in being able to support beneficial uses.	Between 40% and 80% TOC
WCC III	Watersheds exhibit low geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. A majority of the drainage network may be unstable physical, chemical, and biologic conditions suggest that soil, aquatic, and riparian systems do not support beneficial uses.	Greater than 80% TOC

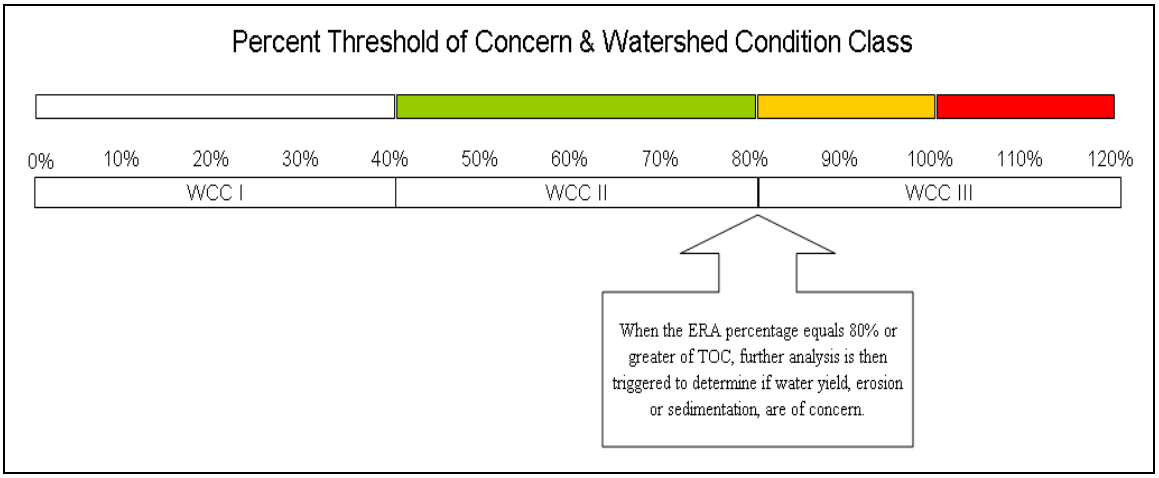

Figure 17: Threshold of concern and watershed condition class

Water Quality

The 2007 Water Quality Control Plan for the North Coast Region defines the following beneficial uses for Hayfork Valley Hydrologic Sub-area which includes the project area (Table 83).

[254] NWFP 1994, page B-12
[255] USDA 1995

Table 83: Designated beneficial uses for the Hayfork Valley hydrologic sub-area

Designated Beneficial Use	Established Use (E) / Potential Use (P)
Municipal or domestic	E
Agricultural supply	E
Industrial service supply	E
Industrial process supply	E
Groundwater recharge	E
Freshwater replenishment	E
Water contact recreation	E
Non-contact recreation	E
Commercial and sport fishing	E
Cold freshwater habitat	E
Wildlife habitat	E
Rare, threatened or endangered species	E
Migration of aquatic organisms	E
Spawning	E
Hydropower generation	P
Aquaculture	P

There are no defined municipal watersheds within the 6th level Salt Creek-Hayfork Creek Watershed, but downstream waters are used for domestic water supplies after treatment. The Clean Water Act directs States to develop a total maximum daily load (TMDL) where water quality is limited. The 2006 listing for California was reviewed for TMDL limited streams in context of the project area boundary and proposed treatment units. The TMDL[256] calls for 30% reductions in sediment load for the SF Trinity and Hayfork Creek, into which the Salt Project Area drains.

There are no listed stream segments located within the project boundary. However, the project area contains some of the headwaters for the South Fork of the Trinity River which is listed.[257] Beneficial uses in this area are considered to be impacted from sedimentation and water temperatures within the entire South Fork Trinity River Watershed. Sedimentation rates within Hayfork Creek are considerably lower than that coming from within the gorge areas of the South Fork Trinity River. Sediment derived in Hayfork Creek is more controllable as it comes from, roads, range, and timber management. Potential sources for temperature increases are water diversions, habitat modification, removal of riparian vegetation, grazing in riparian areas, and stream bank disturbances.

[256] US EPA 1998 (http://www.waterboards.ca.gov/tmdl/303d_lists2006approved.html)
[257] US EPA 1998 (http://www.waterboards.ca.gov/tmdl/303d_lists2006approved.html, http://www.epa.gov/region09/water/tmdl/final.html; Map 2).

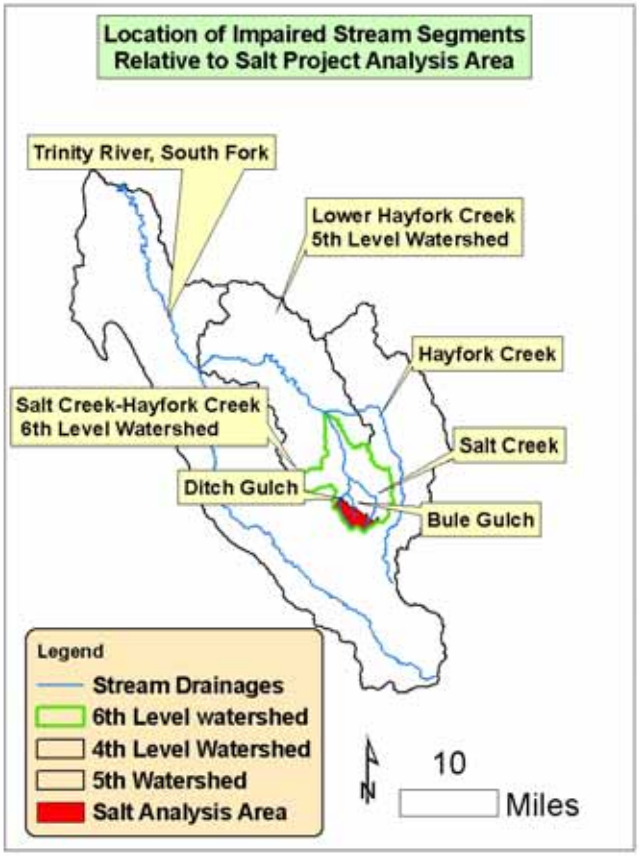

Figure 18: Relationship of the South Fork, Trinity River, to drainages within the Salt project analysis area

Temperature is variable and location dependent, with stream reaches lower in the watershed tending to have higher water temperatures, which may be due to several factors.[258] Low water temperatures ranged from 61-64° F during the summer months and daily high water temperatures exceeding 68° F were common during both years data was collected.[259] Data was collected in 1995 and 1996 between June and October.

Municipal Watersheds

There are no defined municipal watersheds within the 6th level Salt Creek Watershed.

Water Quantity

There are no dams or diversions within the project area. Limited stream flow measurements from within the project analysis area show flows from June through August of 1989 ranging from 3 to 7 (cfs) cubic feet per second.[260]

[258] URS Greiner Woodward Clyde, 2000
[259] URS Greiner Woodward Clyde, 2000
[260] URS Greiner Woodward Clyde, 2000

The watershed analysis indicated that minimum flows are comparatively low for a forested watershed. November through January receives the highest mean precipitation for the year with 2.5 to 3.6 inches a month. [261] Areas found within the project area between 4,000 to 5,000 feet elevation are susceptible to rain on snow events, especially during December and January. These events occur during wet and warm winter storms which saturate existing snow packs, resulting in greater than normal peak runoff.[262]

Elevation is a dominant predictor for precipitation levels. In this relatively low elevation area precipitation tends to fall as rain and runoff is fairly quick, leaving little for groundwater storage and low flows.[263] Precipitation is lowest during June, July, and August, resulting in hot and dry summers.[264] As a result, there is little recharge to supply low flows during the late summer and early fall.

Stream Channel Conditions

Headwater channels in the 6th level Salt Creek Watershed are classified as Rosgen "A" type channels. These are high energy, low order streams with gradients greater than 10% and sideslopes which can exceed 70%. These channels function largely as transport channels, which transport large woody debris (LWD), fine sediment and organic material to downstream portions of the channel system.

Slope instability can occur because of the steep hillside slopes; this is the primary disturbance associated with LWD and sediment delivery into these headwater channels. Where stream channel gradients range from 0.5% to less than 10%, Rosgen "B" channel types dominate. These higher order stream channels are moderately to highly entrenched and sinuosity is typically low to moderate. [265]

During the past 100 years, channel conditions in the project area were affected by road building, timber harvest, grazing, wildfires, and salvage logging, and mining within riparian areas. These activities are believed to have increased overland flow and sediment loads compared to pre-development conditions. Drainage density is considered to have increased due to associated inside road ditches (URS et al. 2000). However, recent data indicates most stream banks and substrate are stable, channel width-to-depth ratios are within expected ranges and streams are considered to be properly functioning (Ratcliff 2007).

[261] Custom Climate 2007
[262] URS Greiner Woodward Clyde, 2000
[263] URS Greiner Woodward Clyde, 2000
[264] Custom Climate 2007
[265] URS et al. 2000

Figure 19: Typical stream channel in the Salt project area

Riparian Reserves

Within the project analysis area, there are about 381.2 acres of riparian reserve. Ditch Gulch-Salt Creek Watershed has an estimated 156.9 acres; the Upper Salt Creek-Hayfork Creek Watershed has an estimated 224.2 acres. As mentioned earlier under "Stream Channel Conditions", these riparian areas have been impacted by historical placer and hydraulic mining. In addition, historical grazing along Salt Creek and its tributaries resulted in bank trampling and a loss of riparian vegetation.[266] Currently these riparian reserves are generally densely vegetated, intact, and considered to be functioning properly.[267]

Water Rights

There are three springs in the project area. A review of the eWRIMS database indicates water rights are held by the Forest.[268] Additional information on the land management uses associated with these springs was not available at the time this report was written.

[266] URS et al. 2000
[267] Ratcliff 2007
[268] http://www.swrcb.ca.gov/ewrims/

Wetlands

A review of the National Wetlands Inventory database is incomplete for this area; however, the data that was available did not show any wetlands.

Floodplains

Due to the nature of the stream channel types within the project area, floodplain development is limited. Those that are present are generally well connected to their streams and are functioning.[269]

3.10.3 Environmental Consequences

Comparisons

Table 84, Table 85, Table 86 and Table 87 provide comparative data referenced throughout the effects analysis for each alternative.

Table 84: Comparison of road densities by alternative by 7th level watershed

Alternative 1-No Action					
	Ditch Gulch-Salt Creek	**Lower Salt Creek-Hayfork**	**Philpot Creek**	**Salt Gulch-Salt Creek**	**Upper Salt Creek-Hayfork Creek**
Existing Road Density (mi/mi^2)	6.6	3.4	5.3	2.6	3.9
Miles of Existing Road to Be Decommissioned (Both System and Unauthorized)	0	0	0	0	0
Miles of New Temporary Roads To be Constructed	0	0	0	0	0
Miles of Temporary Road to be Decommissioned	0	0	0	0	0
Project Road Density after Project Completion	6.6	3.4	5.3	2.6	3.9
Miles of Road Reconstruction	0	0	0	0	0
Alternative 2-Proposed Action					
	Ditch Gulch-Salt Creek	**Lower Salt Creek-Hayfork**	**Philpot Creek**	**Salt Gulch-Salt Creek**	**Upper Salt Creek-Hayfork Creek**
Existing Road Density (mi/mi^2)	6.6	3.4	5.3	2.6	3.9
Miles of Existing Road to Be Decommissioned System/Unauthorized (Total)	3.3/6.5 (9.8)	0	0	0	1.0/3.0 (4.0)
Miles of New Temporary Roads To be Constructed	0.3	0	0	0	0

[269] Ratcliff 2007

Miles of Temporary Road to be Decommissioned	0.3	0	0	0	0
Project Road Density after Project Completion	5.4	3.4	5.3	2.6	3.6
Miles of Road Reconstruction	10.9	6.2	0	0	0
Alternative 3					
	Ditch Gulch-Salt Creek	**Lower Salt Creek-Hayfork**	**Philpot Creek**	**Salt Gulch-Salt Creek**	**Upper Salt Creek-Hayfork Creek**
Existing Road Density (mi/mi^2)	6.6	3.4	5.3	2.6	3.9
Miles of Existing Road to Be Decommissioned System/Unauthorized (Total)	3.3/6.5 (9.8)	0	0	0	1.0/3.0 (4.0)
Miles of New Temporary Roads To be Constructed	0	0	0	0	0
Miles of Temporary Road to be Decommissioned	0	0	0	0	0
Project Road Density after Project Completion	5.4	3.4	5.3	2.6	3.6
Miles of Road Reconstruction	10.9	6.2	0	0	0

Table 85: Road densities within 300 feet of streams

	Ditch Gulch-Salt Creek	**Lower Salt Creek-Hayfork**	**Philpot Creek**	**Salt Gulch-Salt Creek**	**Upper Salt Creek-Hayfork Creek**
Existing Road Density (mi/mi^2)	6.0	3.3	4.1	2.9	2.5
Post-Project Road Density (mi/mi^2)	4.9	3.3	4.1	2.9	2.3

Table 86: Road densities within riparian reserves

	Ditch Gulch-Salt Creek	**Lower Salt Creek-Hayfork**	**Philpot Creek**	**Salt Gulch-Salt Creek**	**Upper Salt Creek-Hayfork Creek**
Existing Road Density (mi/mi^2)	6.2	2.4	3.9	5.7	2.4
Post-Project Road Density (mi/mi^2)	5.0	2.4	3.9	5.7	2.3

Table 87: Estimates of total erosion rates by soil family, by alternative, as determined by WEPP modeling

Alternative 2			
Soil (Name/Soil#)	**Number of Acres of Soil Family within Proposed Treatment Units***	**Alternative 2 (average tons/acre)**	**Total Estimated Erosion Rate by Soil Family (tons/acre)**
Beaughton Family (#13)	125	0.2	25.0
Holland Family (#'s 106 and 107)	202	0.3	61.0
Marpa Family (#182)	175	0.5	87.5
Neuns Family (#206)	172	1.4	241.0
Neuns Family, Deep (#227)	244	0.2	49.0
Alternative Estimated Average (tons/acre) (441 tons/1, 619 acres)			**0.3**
Alternative 3			
Soil (Name/Soil#)	**Number of Acres of Soil Family within Proposed Treatment Units***	**Alternative 3 (average tons/acre)**	**Total Estimated Erosion Rate by Soil Family (tons/acre)**
Beaughton Family (#13)	117	0.2	23.4
Holland Family (#'s 106 and 107)	179	0.3	54
Marpa Family (#182)	141	0.3	42
Neuns Family (#206)	159	1.0	159
Neuns Family, Deep (#227)	196	0.2	39
Alternative Estimated Average (tons/acre) (317 tons/1,415 acres)			**0.2**

*Rounded to nearest whole number

Alternative 1 – No Action

Direct and Indirect Effects

Under the no-action alternative, no timber harvest or fuel reduction activity would occur. There would be no road construction, maintenance, reconstruction or road closures. Existing conditions in the watersheds associated with this project would continue including present conditions for water quality, water quantity, riparian areas, floodplain and flood-prone area function, and stream channels. As a result, there would be no change to existing levels of direct or indirect impacts under this alternative.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Watershed Condition

Potential impacts and consequences to overall watershed health are briefly discussed below. Detailed discussions on potential impacts and associated mitigations follow in subsequent sections.

Road-related activities and timber harvest would have short-term impacts to overall watershed condition. Ground disturbance associated with road reconstruction and decommissioning would result

in increased potential sediment generation where these activities are associated with stream channels. The potential sediment generation is highest where roads are associated with streams, but the impacts would be short term and minimized due to BMP implementation. Upland disturbance would occur with timber harvest, mechanical piling and jackpot burning. However, there would be minimal increases in vegetation-related upland sediment sources due to the implementation of BMPs (Chapter 2.4.1, #7), project-specific resource protection measures including project-specific riparian restrictions (Chapter 2.4.1, #8 - #29).

Vegetation treatments would occur in riparian reserves, associated with intermittent and ephemeral streams, to reduce stocking density, which is suppressing the growth, vigor and resiliency of riparian trees. BMPs would be implemented, as required, for preventing or mitigating impacts to riparian areas and associated stream channels.

Overall and long-term watershed condition would be expected to improve with the implementation of the proposed action. Vegetation treatments would reduce the potential for hazardous fuel conditions and adverse impacts to hydrologic conditions within the watershed, if a wildfire did occur. Depending on wildfire severity, hydrologic resources can be substantially affected when severity is high. This occurs through the loss of vegetation, the development of hydrophobic soils, and increased surface runoff and sedimentation, which can lead to alteration of channel morphology, aquatic habitat, and water quality. Thinning in the riparian reserves would improve overall reserve health.

Closing roads would reduce overall road densities. Road densities would be reduced in the 7th level Ditch Gulch-Salt Gulch and Upper Salt Creek-Hayfork Creek Watersheds, as would the road densities calculated for riparian reserves and road densities within 300 feet of streams (Table 84, Table 85, and Table 86). Such reductions would reduce road-related amounts of surface runoff and erosion entering stream channel systems. Closures of roads would include U29N31EA[270] and U29N31E, which are rutted and gullied.

Sediment and Water Quality

Potential effects to water quality are increased sediment generation associated with vegetation treatments, skid trail and landing construction and use, temporary road construction, road reconstruction, and decommissioning.

To evaluate potential sediment generation “Disturbed WEPP” and “WEPP: Roads” were used to evaluate and conduct a relative comparison between the two proposed action alternatives. Disturbed WEPP modeling was used in both action alternatives to assess the potential for upland sediment generation due to ground disturbance caused by proposed vegetation treatments. WEPP: Road was then used to evaluate potential sediment generation caused by temporary road construction and proposed decommissioning. Major soils in the project area were modeled for potential sediment generation and an average annual value for each soil type was then determined. Subsequently, an

[270] Roads U29N55A and U29N31EA are included in the Westside Watershed Restoration project because they are not needed for the Salt project so can be decommissioned prior to implementation of the Salt project.

overall average for tons per acre of sediment for Alternative 2 was determined, based on all the soils analyzed. Assumptions used in running WEPP are found in the project file.[271] WEPP modeling indicates that on the average, there is the potential for 0.3 tons per acre per year of sediment, caused by timber harvest (Table 88). However, this number is a "maximum potential situation" and would not be expected to occur, or reach streams, for several reasons explained below.

In conducting WEPP modeling runs were done where slopes were steep and adjacent to streams. As discussed above, an average annual value was then determined for each soil type. Obviously, not all of the acres for a given soil type are adjacent to a stream drainage. In addition, WEPP modeling requires a vegetation calibration run to ensure that the final desired vegetative cover is actually used in calculating erosion rates and sediment output. A final calibration value of 75% was not obtainable in this project area even when the value of 100% cover was entered into the data field. Typical calibration results, with a value of 100% entered into the data field, were generally 20 to 30% less. Consequently the results for potential average annual amounts for erosion and sediment generation, that could reach a stream channel, have been over estimated (Table 88).

When WEPP modeling is conducted the estimated results also do not take into account the implementation of BMPs which have been designed and proven effective in protecting watershed resources (Chapter 2.4.1, #7 - #29); Appendix C).[272] Measures include the use of "buffer strips" which act as sediment filters adjacent to streams (Chapter 2.4.2, #18, 19, 20). Field observations showed a very well established and consistent groundcover, with no evidence of sediment transport through the groundcover, to streams.[273] BMPs are certified by the State Water Quality Resources Control Board and approved by the Environmental Protection Agency (EPA) as the most effective way to protect water quality from impacts stemming from nonpoint sources of pollution. BMP effectiveness is evaluated through the use of the R5 BMPEP Program, which has been on-going since 1990. The Forest's random BMP evaluations over the last 18 years indicate that BMP measures have been effective 86% of the time.[274]

Based on these factors, it is expected that the potential average annual amount of sediment available for reaching drainages, within the project area, would be substantially less than predicted by WEPP. Combined with the application of BMPs and buffer strips, which have been proven effective, it is anticipated that no measurable increases, in the amount of sediment entering a stream, would occur. As a result, no exacerbation of existing sediment entering into the TMDL limited stream segment on the South Fork of the Trinity River would be expected.

In addition, project-specific riparian restrictions have been developed. No thinning would occur in Riparian Reserves associated with perennial streams (Chapter 2.4.1, #18); adjacent to intermittent and ephemeral streams there would be equipment exclusion zones of 50 and 25 feet, respectively (Chapter 2.4.1, #19). No treatments would occur in these zones, adding additional sediment filtering capabilities (Chapter 2.4.1, #20). In addition, the WEPP estimated amount of 0.3 tons per acre per

[271] Located in project file {Ih-8}
[272] USDA Forest Service 1990
[273] Hermandorfer 2007
[274] USDA Forest Service 2004a

year would also be expected to steadily decline in the years following harvest. As a result, no measurable increases in sediment load, associated with vegetation treatment under the proposed action, would be expected.

Table 88: Potential effects of Alternatives 2 and 3 on sedimentation and stream crossings

Action	Alternative 2 Tons Annually	Alternative 3 Tons Annually
Harvest Activities (i.e., skidding, landings)	+ 0.3**	+0.2**
Temporary Road Construction	+ 1.6 (Range of 0.8 – 2.4)	0
Road Decommissioning	-45.9 (Range of 22.9 – 68.9)	- 45.9 (Range of 22.9 – 68.9)
Number of Road/Stream Crossings	- 27 crossings	- 27 crossings

** The difference between 0.3 tons and 0.2 tons would not be a detectable or measurable difference in the field

Roads intercept both surface and ground water, and water running down and off road surfaces can enter directly into a creek or through associated road ditches emptying into streams. These factors can result in increased sediment delivery to streams as well as higher peak flows and accelerated timing of peak flows.[275] These alterations to a channel's flow volume can also lead to alterations in channel morphology and aquatic habitat. Increased sediment loads can alter sediment-related water quality analytes[276] such as turbidity, suspended sediment, and bed load, and can modify aquatic habitat. Roads also result in lower infiltration rates after rainfall and can affect groundwater flow when they are located near springs.

To estimate the amount of sediment generation associated with roads in this project WEPP: Roads was used and three units of measure, focusing on road density, were used: overall road density, road density within 300 feet of stream, and road density within riparian reserves.

A distance of 300 feet was selected to ensure that the effect of all potential runoff was evaluated.[277] Road densities within 300 feet of streams, and within that of project area riparian reserves, are especially important, because they are the single largest source and delivery system of sediment to channels.[278] Road density (miles of road/square mile) within 300 feet of streams provides a relative measure of road-stream interaction and the relative risk for increased flows and sediment input into the hydrologic system.[279] It also allows comparison between watersheds within the project area. Areas with higher road densities within 300 feet of streams are at greater risk for modification of flow and sediment loading.

[275] Nelson 2002
[276] An analyte is a substance that is undergoing analysis or is being measured.
[277] Burroughs and King, 1989; Nelson 2002
[278] USDA Forest Service 1996
[279] Boroughs and King 1989

The proposed action would construct four temporary roads totaling 0.3 miles. None of the proposed temporary roads involve streams, wetlands, riparian reserve areas or areas delineated as an "active" feature in GIS, denoting unstable or landslide prone areas. BMPs and project design features would be implemented during the construction and use of these temporary roads

In the Upper Salt Creek-Hayfork Creek Watershed the existing road density is approximately 2.5 miles/square mile. Alternative 2 proposes to decommission 13.8 miles of road and reconstruct an additional 17.1 miles (Chapter 2.2.2, Table 5 and Table 6). A decommissioned road is defined as one that has been removed from the Forest Service transportation system after it has been effectively closed. Decommissioning includes culvert removal, ripping road surfaces and/or barriers, as well as other measures needed to meet site-specific conditions. All measures have the goal to control surface runoff, erosion, and mass failure.[280] Reconstruction is defined as "an improvement required due to an anticipated increase in traffic, service level, or haul capacity. Reconstruction activities may include culvert upgrades, grading, rocking, paving, and draining.[281]

During road decommissioning and reconstruction,[282] short-term impacts to sediment would be expected due to ground disturbance where culvert upgrades, grading, rocking paving and/or draining occur. WEPP road modeling also indicated a potential increase in sediment associated with the construction of temporary roads.

Although there would be short-term increases in sediment associated with reconstruction and decommissioning, WEPP: Road modeling indicated that for either Alternative 2 or 3 there would be an overall reduction in sediment and surface runoff to associated stream drainages (Table 88).

The ground disturbance immediately following road reconstruction and decommissioning would increase the potential for impacting water quality. Increased sediment loads can alter sediment-related water quality analytes such as turbidity, suspended sediment, and bed load; and can modify aquatic habitat. Since there is a potential for increased sediment and impacts to water quality, BMPs, project-specific resource protection measures, and project-specific riparian restrictions would be implemented. These measures have been proven effective in maintaining water quality and protecting beneficial uses, and are in conformance with water quality objectives delineated in the North Coast Regional Water Quality Board basin plan (Chapter 2.4.1 and Appendix B). Although localized increases in sediment-related water quality analytes may occur, exceeding water quality criteria is not expected due to the implementation of BMPs and resource protection measures.

Although there would be short-term increases in sediment generation, in the long-term, reconstruction and decommissioning would lower the amount of road-related sediment entering the hydrologic system. Alternative 2 proposes that 9.5 miles of unauthorized routes and 4.3 miles of classified road would be decommissioned under this alternative (for a total of 13.8 miles) (Chapter 2.2.2, Table 5).

[280] USDA Forest Service 2007
[281] USDA Forest Service 2007
[282] The WEPP Road model was not used to estimate potential sediment volume for road reconstruction, as it is not designed for that purpose.

WEPP road modeling estimated that decommissioning would reduce sediment input into the project area hydrologic system by 22.9 to 68.9 tons annually, with an annual average of 45.9 tons (Table 88). Decommissioning would be expected to improve infiltration rates locally. No direct or indirect effects to springs would be expected. In addition, decommissioning would reduce the number of road-related stream crossings. In the Ditch Gulch-Salt Creek Watershed 20 stream crossings would be eliminated; in the Upper Salt Creek-Hayfork Creek Watershed, 7 stream crossings would be eliminated (Table 88).

Decommissioning would reduce overall road densities in the Ditch Gulch-Salt Creek Watershed from 6.6 to 5.4 miles/square mile. In the Upper Salt Creek-Hayfork Creek Watershed, overall road density would be reduced from 3.9 to 3.6 miles/square mile (Table 84). GIS analysis determined that existing road densities within 300 feet of streams in the project area is 6.0 miles/square mile in the Dutch Gulch-Salt Creek Watershed and 2.5 miles/square mile in the Upper Salt Creek-Hayfork Creek Watershed (Table 85). After project completion and implementation of road decommissioning, road densities within 300 feet of streams would drop to 4.9 and 2.3 miles/square mile, respectively, for each watershed, reducing the amount of sediment available to drainage networks within the project area (Table 86). As a result, it is expected that water quality would be improved.

Short-term increases in sediment load are not expected to measurably increase sediment load in the TMDL limited segment of the South Fork of the Trinity River. Sediment increases are expected to be within the natural range of variability due to the implementation of BMPs and project design features. Such a minimal increase would not be reflected in the limited stream segment, which is over 9 miles downstream of the northern margin of the project area boundary. Overall, sediment input into project area stream channels would be expected to be reduced, thereby improving water quality.

Municipal Watersheds

There are no municipal watersheds within the project area; therefore there would be no direct or indirect effects.

Water Quantity

Although any disturbance that reduces the density of live vegetation cover may increase runoff from forested watersheds, flow increases are generally not measurable until about 25% of the basal area of a forested watershed has been harvested.[283]

Alternative 2 proposes to treat less than 1% of the area in both the Ditch Gulch-Salt Creek and Upper Salt Creek-Hayfork Watersheds. As a result, no measurable increases in water yield would be expected.

Stream Channel Conditions

The channel morphology, including streambed and streambank stability, reflects the existing balance between streamflow, sediment input, and substrate/bank composition. If one of these components varies, then a corresponding change results in the other two. As a result, changes in channel

[283] Grant et al. 2008 and Ziemer 1986

morphology (shape), stability, and changes in the streambed or streambank are often seen, especially over time. Increases in peak flow increases the energy available for sediment transport and bank erosion. No significant changes in flow volume, or alteration to timing of peak flows are expected with Alternative 2 related to timber harvest due to the small percentage of the watershed being treated.

BMPs and project-specific resource protection measures have been incorporated into designing Alternative 2 to protect soil and water resources. Soil resource protection measures prevent or minimize impacts to soil hydrology and nutrient cycling, to acceptable levels (Chapter 2.4.1, #7 - #16, Appendix C). They also protect soil stability and prevent or limit any sediment increases related to uplands. Included in the protection measures are project-specific riparian restrictions, which are essentially buffer strip requirements (Chapter 2.4.1, #18, #19, #20). On perennial streams with fish, the minimum Riparian Reserve width would be 300 feet and there would be no thinning in these areas. For perennial streams without fish, the minimum Riparian Reserve width would be 225 feet, and there would be no thinning in these areas. These areas would effectively function as sediment filter strips, preventing sediment introduction into the streams. Research by Burroughs and King and Burroughs [284] supports this conclusion. As a result, no measurable amounts of additional sediment would be expected to enter these stream channels, and no measurable change to channel morphology would be expected.

Adjacent to intermittent and ephemeral streams there would be a 25 to 50 foot equipment exclusion zone (EEZ) where no treatments would occur (Chapter 2.4.1, #20). The EEZ would also function as a sediment filter or buffer. However, on both intermittent and ephemeral streams between the edges of the equipment exclusion zone at 50 feet out to 150 feet, both thinning and mechanical treatments would be allowed. Measurable increases in sediment contribution to these streams would not be expected due to the combination of the EEZ and BMP and project design effectiveness. As a result, implementation of this alternative would result in no changes to bank integrity or composition of streams.

Road decommissioning would consist of removing culverts, ripping road surfaces, and out-sloping the roads to control surface runoff and to minimize and or prevent erosion and mass failure. Roads would be seeded as needed, further reducing sources of additional water quantity and sediment (Chapter 2.4.1, #23).

WEPP modeling estimated that the four new temporary roads would generate between 0.8 to 2.4 tons of sediment annually (1.6 tons average) over the project life of 3 to 4 years (Table 88). This amount was calculated without considering BMPs and project resource protection measures; hence, it is anticipated that the actual amount of sediment generated annually during the project would be less when BMPs and project-specific resource protection measures are implemented. None of the proposed temporary roads are within a Riparian Reserve or cross a stream channel. After decommissioning, the proposed temporary roads would no longer be a source of potential sediment source.

[284] Burroughs and King 1989; Burroughs 1990

WEPP modeling indicated that by decommissioning both the classified and unauthorized routes, road-related sediment would be decreased by 45.9 tons annually. Under the worse-case scenario, the subtraction of 2.4 tons from 45.9 tons would still result in a net reduction of potential road-related sediment potentially entering drainage systems in the project area.

With the decommissioning of roads under this alternative, potential increases in water flow, due to road-related runoff, would also be reduced. This is especially important on unauthorized routes that have not been designed to control surface runoff and erosion.

One of the unauthorized routes proposed for decommissioning under this proposed action (U29N31E) was observed to be actively eroding (Chapter 2.2.2). Decommissioning of the 13.8 miles of both classified and unauthorized roads under Alternative 2 would be expected to improve stream channel conditions, because road-related sediment and surface runoff would be reduced.

Hand piling and burning are proposed within riparian reserves associated with intermittent and ephemeral streams, but outside of EEZs. No measurable increases in sediment to adjacent streams would be expected in connection with this action. Resource protection measures require that piles be burned so that at least 50% of the localize area remains unburned at any given time. Hand piles would also be placed in a checkerboard pattern where possible, preventing piles from merging as they burn (Chapter 2.4.1, #19). This would also ensure an adequate vegetation cover surrounding a burn area, which would act as a sediment filter. Pile burning would take place when air temperatures are cool and soils moist to limit burn severity and sediment generation.

Riparian Reserves

Alternative 2 proposes to thin 101 acres (41 acres of intermediate thinning and 60 acres of plantation thinning) of dense vegetation in the portion of ephemeral and intermittent riparian reserves furthest away from the stream course. Selective commercial thinning would be accomplished through a combination of mechanical operations and hand thinning. This treatment is proposed to reduce the number of trees competing for limited water, sunlight, and nutrients in riparian reserve areas and improve the condition of desired riparian vegetation and composition. Such thinning would also improve the resistance of these areas to fire hazards (Chapter 3.3.3).

Ground disturbance and sediment generation would occur with mechanical harvest using tractors. Hand thinning would have less ground disturbance than mechanical methods. Although short-term disturbance would be expected, treatment would be expected to improve riparian reserve vegetation health and vigor. Implementation of BMPs and project-specific resource protection measures would be expected to result in non-measurable increases in potential sediment generation. Implementations of EEZs are expected to provide sediment filter strips which would prevent any measurable sediment increases entering a given drainage (Chapter 2.4.1, #20).

Project-specific resource protection measures state that prescribed fire ignitions would not be set within riparian reserves, but would be allowed to back burn into these areas. As stated above under “Stream Channel Conditions” burning would take place under cool and moist conditions, minimizing

burn intensity to soils and the potential for sediment generation. No activities will occur in the area of known springs, and therefore there will be no direct effect to them.

Wetlands

There are no wetlands within the proposed project area; hence, there would be no direct or indirect effects under this alternative.

Floodplains

Floodplain development within the project area is limited. Implementation of project-specific riparian restrictions, BMPs, and project resource protection measures, would be expected to protect any of the very limited floodplain development within the project area (Chapter 2.4.1, #7, #18-#20). Hence, there would be no direct or indirect effects to floodplains under this alternative.

Alternative 3 – Alternative in Response to Public Comments

From a hydrology perspective, Alternative 3 differs from Alternative 2 in two ways: a total of 60 acres in pre-commercial thinning and 41 acres in other thinning units would not be thinned in riparian reserves associated with intermittent and ephemeral streams, and no temporary roads would be constructed. A total of 17.1 miles of road would be reconstructed and 9.5 miles of unauthorized routes and 4.3 miles of classified road would be decommissioned (totaling 13.8 miles, the same as in Alternative 2) (Chapter 2.5.1,Table 10). Alternative 3 was developed to address and analyze the concerns that thinning within riparian reserves may have unintended effects on the watershed, fisheries, and wildlife.

Direct and Indirect Effects

Watershed Condition

Short-term impacts to overall watershed condition would be the same as in Alternative 2, with the following exceptions:

1. Under Alternative 3 no temporary roads would be constructed. Consequently, the 1.6 tons of sediment (estimated by WEPP) due to temporary road construction, would not be generated.
2. Upland disturbances from timber harvesting would also occur; however, potential impacts would be slightly less as 204 fewer acres are proposed for treatment. This difference totals 4.0 % of the project area, and modeling shows only a 0.1 difference in tons of sediment annually produced. As a result, any potential difference in effects between alternatives would be un-measurable.
3. No treatments would occur within riparian reserves associated with intermittent and ephemeral streams. Under this alternative there would be no treatment within the entire width of a riparian reserve area. As a result, the existing potential for increased wildfire severity would remain. Any impacts to the riparian reserves due to wildfire would be expected to be greater than under Alternative 2, because under Alternative 2, BMPs and project specific

resource protection measures would both be implemented, and these measures are expected to be effective in preventing or limiting any impacts, to acceptable levels.

Sediment and Water Quality

Potential impacts to sediment and water quality would be the same as under Alternative 2, although the magnitude would be slightly lower.

As with Alternative 2, Disturbed WEPP modeling was used to estimate the potential amount of sediment Alternative 3 would generate. WEPP modeling, using the same assumptions as Alternative 2, predicted 0.2 tons per acre per year (Table 88). As discussed under Alternative 2, the actual amount generated is expected to be considerably less.

This 0.1 ton per acre per year difference in sediment generation would not be measurable under field conditions, so essentially there is no difference between alternatives in terms of potential upland sediment generation. BMPs and project-specific resource protection measures would be implemented as under Alternative 2, and the same effectiveness, for these measures, is assumed.

With a negligible difference in sediment generation and the application of the resource protection measures, there would likely be no discernable difference in the level of potential impacts between the two action alternatives.

There is only one difference between Alternatives 2 and 3 regarding road-related potential sediment sources. No temporary roads are proposed for construction under Alternative 3 (Chapter 2.2.3). Under Alternative 2 WEPP: Road modeling estimated that 0.8-2.4 tons, with an average of 1.6 tons of sediment would be produced annually in association with the proposed temporary roads (Table 88).

Since no roads are proposed for construction under Alternative 3, there would be no short-term increases in potential sediment sources caused by temporary road construction. However, there would be short-term increases in potential sediment generation associated with the 17.1 miles of road reconstruction and the 13.8 miles of proposed road decommissioning. Potential effects would be associated with ground disturbance when culverts are replaced or put in and grading occurs, etc. As discussed under Alternative 2, WEPP road is not used to estimate potential sediment outputs in a reconstruction scenario; however, these effects would be expected to be short-term as the associated activity is limited in time duration and road-related BMPs would be implemented.

The amount of road decommissioned would be the same as in Alternative 2: 9.5 miles of unauthorized routes and 4.3 miles of classified road (totaling 13.8 miles) (Chapter 2.5.1, Table 10). As with Alternative 2, there would be short-term increases in potential sediment generation as culverts are pulled, road surfaces ripped, and barriers installed, etc. However, these effects are expected to be limited and short in duration as disturbed surfaces recover after roads are decommissioned. The implementation of BMPs and project specific resource protection measures would also limit or prevent any effects. Long-term decreases in sedimentation would also be the same for both alternatives (22.9 to 68.9 tons annually) because the proposed amount of decommissioned road is the same (Table 88).

The number of stream crossings would also be reduced by 27, as in Alternative 2 (Table 88). The same resource protection measures to reduce or eliminate effects would be applied as in Alternative 2 (Chapter 2.4.1, #7-#29).

Reductions in overall road density, road densities within 300 feet of streams, and road densities within Riparian Reserve areas would all be the same for the Ditch Gulch-Salt Creek and Upper Salt Creek-Hayfork Creek Watersheds (Table 84, Table 85, and Table 86).

Alternative 3 is also not expected to exacerbate the TMDL limited stream segment of the South Fork of the Trinity River, for the same reasons as under Alternative 2.

Cumulative Effects for Alternative 2 and Alternative 3

Overview

The cumulative effects boundary for this proposed project includes the 7th level Upper Salt Creek-Hayfork Creek and Ditch Gulch-Salt Gulch Watersheds.

A key assumption for the ERA model was that all harvest would occur in 2009 with effects first realized in 2010. This was done because differing treatment types have differing coefficients, which relate to treatment type and the amount of associated ground disturbance. Since it was not possible to determine what treatments were going to happen when, and in what watershed, the decision was made to assume that all treatments would occur in the first year of project implementation. However, there is very little chance that this would occur. As a result of these assumptions it must be clear that the results documented in Table 89 represent a worse case scenario which has very little chance of occurring.

Past activities in both the 7th level Upper Salt Creek-Hayfork Creek and Ditch Gulch-Salt Gulch Watersheds include timber harvest (hazardous fuels reductions, clear cuts, salvage and thinning), grazing, transmission lines, pipelines, and fire.

Table 89: Equivalent roaded acres (ERA) for existing conditions and by alternative

7th Field Watershed	Total Acres	Existing ERA Acres	Existing ERA Percent (%)	Existing Percentage of TOC (%)	WCC
Upper Salt Creek-Hayfork Creek	9, 760	236.6	2.4	17	I
Ditch Gulch – Salt Gulch	5,077	191.1	3.8	27	I
Alternative 2 Proposed Action					
	Year	**# of Calculated ERA Acres**	**Calculated ERA Percent (%)**	**Calculated Percentage of TOC (%)**	**WCC**
Upper Salt Creek-Hayfork Creek	2010	274.4	2.8	20	I
Ditch Gulch – Salt Gulch	2010	321.7	6.3	45	II
Alternative 3					
	Year	**# of Calculated ERA Acres**	**Calculated ERA Percent**	**Calculated Percentage**	**WCC**

			(%)	of TOC (%)	
Upper Salt Creek-Hayfork Creek	2010	269.6	2.8	20	I
Ditch Gulch – Salt Gulch	2010	306.8	6.0	43	II

In the Upper Salt Creek-Hayfork Creek Watershed, recorded timber harvest has occurred from 1968–2004, and site preparation occurred from 1982–1995. Grazing allotments within the project area include Salt Creek (3,435 acres), Post Creek (304 acres) and the Wildwood Allotment (50 acres). The Salt Creek Allotment has been vacant over 10 years. Watershed condition in the Salt Creek Allotment is thought to be good. The southern half of the Post Creek Allotment, which is in the proposed project area, has also been vacant for at least 10 years. The Wildwood Allotment is active and is being grazed by horses.

Both the Post Creek and Wildwood Allotments were thought to be in good watershed condition.[285] In the Upper Salt Creek-Hayfork Creek Watershed, 101 acres were burned in 1987 in an unnamed fire.

In the Ditch Gulch-Salt Gulch Watershed timber harvest occurred from 1981–2004 and site preparation occurred from 1982–1995. Included in the ongoing fuel treatment activities are 509 acres of the Post Mountain Fuels Hazard Reduction Project. The Post Mountain Project, along with the proposed Salt Project, are part of a large scale overall watershed restoration project involving hazardous fuels reduction.[286] Other projects include Gemmill, Knob Peak, Jones Thin, East Fork I and II, and Dubakella. Out of all these projects, only the Post Mountain Project is within the cumulative effects boundary.

There has been no recorded fire activity in the Ditch Gulch-Salt Gulch 7th level watershed since 1910. The Telephone fire burned in the Upper Salt Cree-Hayfork Creek watershed in 2008. No disturbed acreage was noted in regards to mining or cultural treatments in either watershed. Roads were built in support of past management activities.

Existing overall road density in the Upper Salt Creek-Hayfork Creek Watershed is 3.9 miles/square mile and 6.6 miles/square mile in the Ditch Gulch-Salt Gulch Watershed. Road densities with 300 feet of streams for the Upper Salt Creek-Hayfork Creek Watershed are 2.5 miles/square mile and 6.0 miles/square mile in the Ditch Gulch-Salt Creek Watershed. In riparian reserves the Upper Salt Creek-Hayfork Creek Watershed existing road densities are 2.4 compared to 6.2 for the Ditch Gulch-Salt Gulch Watershed (Table 86).

Foreseeable actions include the West Side Watershed Restoration Project, which overlaps the cumulative effects area of this project and proposes to decommission approximately 5.1 miles of road within the Salt project area (Chapter 3.18.3).

A small amount of proposed activities would occur in the Rattlesnake 7th level watershed (52 acres in Alternative 2 and 51 acres in Alternative 3, both in Unit 45). The proposed activity is thinning an existing fuel break. No temporary road construction is proposed. No hauling over roads in the

[285] Wenham 2008
[286] Harmon 2006

Upper Rattlesnake Creek watershed is proposed and no road decommissioning would be implemented. As a result, there would be no discernible direct, indirect or cumulative effects for Upper Rattlesnake Creek.

Discussion

For municipal watersheds, water quantity, wetlands, and floodplains, no direct and indirect effects would be expected. As a result, no change (either positive or negative), in cumulative effects, would be expected. Existing levels of recreation and grazing would be expected to continue. Activities associated with transmission and pipeline maintenance would continue at existing levels.

To help assess project-related potential cumulative effects on watershed condition, ERA analysis was conducted on the Upper Salt Creek-Hayfork Creek and Ditch Gulch-Salt Gulch Watersheds.[287] Analysis of equivalent roaded acres for the Upper Salt Creek-Hayfork Creek Watershed increased from an existing 2.4% to 2.8% for Alternative 2, and from 2.4% to 2.8 % under Alternative 3 (Table 89). This indicates that there is essentially the same cumulative effect in terms of watershed condition, assuming the project is entirely implemented in one year.

In the Ditch Gulch-Salt Gulch Watershed equivalent roaded acres increased from 3.8% to 6.3% under Alternative 2 (6.7% is 45% of the watersheds TOC). Under Alternative 3 the increase is slightly less, with the estimated ERA at 6.0%, which is 43% of the TOC. In both cases, the values of 45% and 43% would result in a change in watershed condition class from “I” to “II”, according to FSM 2521.1 (Table 82 and Table 89). The manual defines Watershed Condition Class (WCC) of II as “Watersheds exhibit moderate geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. Portions of the drainage network may be unstable. Physical, chemical and biologic conditions suggest that soil, aquatic, and riparian systems are at risk in being able to support beneficial uses”.

However, this change in watershed condition class assumes that the entire project would be implemented within one year, which results in a modeling limitation. All harvesting will not occur in one year. Discussions with the project logging engineer and silviculturist indicated that the project would most likely be implemented over a 3 to 4 year time period, so the relative difference in effects would be less than estimated (due to an overlap of recovering treated acres and just harvested acres). In both cases, watershed TOC values are less than 80% of TOC, which is the level at which concerns become critical[288] (Figure 17).

As the amount of post-project implementation time increases, the percent TOC for both alternatives would be expected to decline, as watershed recovery increases. In the long-term, fuels reduction would reduce the potential for high severity wildfire, which could severely impact watershed conditions.

Under both action alternatives, a short-term increase in potential sediment would be expected, primarily due to road reconstruction and decommissioning (see Watershed Condition section,

[287] Overland 2008b
[288] Mia 2008

Direct/Indirect Effects). However, over the long-term, watershed condition would be expected to improve, and existing levels of cumulative effects reduced, in both action alternatives, due to the decommissioning of roads. Watershed condition would be further improved, and long-term cumulative effects reduced, with the implementation of the West Side Watershed Restoration Project, which is expected to be implemented within the foreseeable future. This project, which overlaps the Salt Project area, would focus on road decommissioning. It is expected that existing road densities for the Upper Salt Creek-Hayfork Creek and Ditch Gulch-Salt Gulch 7th level watersheds would be reduced even further from what is predicted with project implementation (Table 84, Table 85, and Table 86). These activities would also improve stream channel conditions over the long-term.

With the short-term increase in potential sediment, related to vegetation treatment, road reconstruction and decommissioning, there would be an associated potential increase for localized water quality impacts.

The potential for localized water quality impacts to the headwaters of the South Fork of the Trinity River, located within the Salt Creek-Hayfork Creek watershed, would be expected to be within the natural range of variability of sediment, due to the implementation and effectiveness of BMPs and project-specific resource protection measures. Localized long-term improvements in water quality would be also be expected as road densities are decreased due to road decommissioning and road runoff and sedimentation impacts are eliminated (Table 84, Table 85, and Table 86).

3.10.4 Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Implementation of BMPs, project specific resource protection measures, and site-specific riparian measures would result in the proposed activities being in compliance with the Forest Plan, Forest Service handbook and manual direction, and with other guiding laws and regulations including: National Forest Management Act 1976; Clean Water Act of 1972; Executive Order 11990, 1977-Wetlands Management; Executive Order 11998, 1977-Floodplain Management; EPA's Guidance for the Coastal Zone Act Reauthorization Amendment Section 6217; The State Porter-Cologne Water Quality Act; and, the North Coast Regional Water Quality Control Board Basin Plan and Water Quality Objectives.

3.10.5 Summary of Key Issue Effects

Table 90: Key issues - effects of thinning riparian reserve, temp. roads on hydrology by alternative

Issue Indicator	Alternative 1	Alternative 2	Alternative 3
Key Issue Thinning in riparian reserves may have unintended effects on the watershed….			
Estimated tons of potential sedimentation due to riparian thinning.	0	No measurable sedimentation	0
Key Issue Construction of new temporary roads may negatively impact hydrology …			
Additional stream crossings.	0	0	0

Issue Indicator	Alternative 1	Alternative 2	Alternative 3
Estimated tons of potential sedimentation due to temporary roads and all actions, short-term	0	Constructing 0.3 miles of road = potential short-term increase of 1.6 tons over the life of the project. All Harvest activities = potential short-term increase of 1.9 tons over the life of the project	No temporary roads= 0 increase in sedimentation. All Harvest activities = potential short-term increase of 0.2 tons over the life of the project
Estimated tons of potential sedimentation long-term.	0	Road decommissioning = long-term decrease of 45.9 tons.	Road decommissioning = long-term decrease of 45.9 tons.

3.11 Threatened, Endangered, Sensitive, MIS, Survey & Manage Species – Fish/Aquatics[289]

3.11.1 Methodology for Analysis

Issues Addressed

The following key issue, related to fisheries, was identified from input received during scoping: ***Thinning within riparian reserves may have unintended effects on the watershed, fisheries and wildlife.***

Issue Indicator: To analyze potential effects of thinning within riparian reserves the measurable changes in fish habitat (pool depth, channel form, and temperature) were assessed and compared between alternatives.

The following analysis issue related to fisheries was also identified through public scoping and analyzed: Vegetation treatments may impact management indicator species and threatened and endangered species habitat and ability to survive.

Methods

Field reconnaissance was conducted in the late spring of 2008 by a TEAMS hydrologist/soils scientist. Literature reviews, field notes, Forest-level monitoring reports, Geographical Information System (GIS) data, and professional judgment were used to support report conclusions. Field notes and photographs are available in the project file.

Sediment delivery modeling was conducted by the project hydrologist using the Forest Service interface for the Water Erosion Prediction Project computer model, known more commonly as WEPP. Modeling was conducted for both the no action (existing condition) and proposed action alternatives. These results were then used to present a comparison of potential effects, for each alternative. See the hydrology section (Chapter 3.10) for WEPP modeling assumptions and limitations.

Modeling was also conducted to evaluate existing and potential project-related changes in existing cumulative effects, using the Equivalent Roaded Area (ERA) model, as required in the

[289] Information in this Section is adapted from the Salt Fisheries Biological Assessment Vanosdall 2009a; and Fisheries Report, Vanosdall 2009b

Region 5 Soil and Water Conservation Handbook, Chapter 50.[290] Thresholds of Concern, established by the Forest, were used in this analysis.

Middle Hayfork – Salt Creek Watershed Analysis[291] was used as a source document for existing conditions. A current federal endangered and threatened species list for the project area (Dubakella Mountain, Wildwood, and Smoky Ck. quads) was obtained 10 January 2007 from the U.S. Fish and Wildlife Service, Arcata Field Office website (available at http://www.fws.gov/cno/arcata). A sensitive species list was created using the latest revision of the Forest Service Region 5, Regional Forester's sensitive species list.

The Forest Plan identifies fisheries management indicator species and all of these species identified were addressed.

A detailed fishery Biological Assessment (BA) has been prepared to review the project proposals in sufficient detail to determine if the actions are likely to adversely affect the threatened species or its designated critical habitat or essential fish habitat for the Southern Oregon Northern California Coast (SONCC) coho salmon (*O. kisutch*). The SONCC coho salmon Evolutionarily Significant Unit is listed as Threatened under the Endangered Species Act. The BA was prepared in accordance with legal requirements set forth under section 7 of the Endangered Species Act (ESA) (19 U.S.C. 1536 (c)), and follows the standards established in Forest Service Manual direction (FSM 2672.42).

Spatial and Temporal Context for Effects Analysis

The unit of measure to analyze cumulative effects of threatened fish, MIS fish, fish habitat and riparian reserves is the proper functioning condition of subwatersheds based on Watershed Condition Class (WCC). The condition of individual watersheds is highly indicative of the instream (fish and fish habitat) and near stream (riparian reserves) conditions that exist within that watershed. The WCC score (which ranges from I to III, with I representing a properly functioning condition) is a derivative of the cumulative watershed effects modeling and analysis that is completed during the hydrologic analysis of a watershed. Site visit and instream survey results have been used to validate the cumulative watershed effects model.

Cumulative effects to threatened and MIS fish, fish habitat and riparian reserves are addressed by 7th field subwatershed. Two 7th field subwatersheds are included in this analysis: Ditch Gulch - Salt Gulch and Upper Salt Creek- Hayfork Creek subwatersheds (HUC 18010212040102 and 18010212040101). The 7th field subwatershed scale is the most appropriate to analyze effects to threatened and MIS fish, fish habitat and riparian reserves because smaller subwatersheds (i.e. 8th field or smaller) are often too small to support fish at the population level and larger watersheds (i.e. 6th field or larger) are often so large that localized project effects are diluted to the point they can no longer be effectively analyzed.

[290] USDA Forest Service, 1990, Amendment 2
[291] URS Greiner Woodward Clyde, 2000

3.11.2 Affected Environment

The Salt Creek watershed has a drainage area of 124.3 square miles and there are approximately 54.9 miles of perennial streams, 84.4 miles of intermittent streams, and 157.8 miles of ephemeral streams in the watershed.

Headwater streams within the Salt Creek Watershed, as occur in the Salt project area, serve generally as transport channels and are characterized by high stream gradients (greater than 10%) and steep sideslopes (greater than 70%) Large woody debris and sediment have relatively low residence times in these areas, as these materials are readily moved downstream during high flow events. These channels generally lack suitable amounts of fish habitat needed for spawning and rearing and natural fish passage is often limited by gradient and highly fluctuating flows.

Salt Creek, above its confluence with Hayfork Creek, outside the project area, supports a limited run of Klamath Mountain Province steelhead. [292] Upper Hayfork Creek (above the confluence with Salt Creek) currently supports anadromous runs of Klamath Mountain Province (KMP) steelhead *(Oncorhynchus mykiss*), Pacific lamprey (*Lampetra tridentata*), and a remnant run of Upper Klamath/Trinity River (UKTR) chinook salmon (*O. tshawytscha*). Historically, spring chinook salmon utilized the lower reaches of Salt Creek, Big Creek, Tule Creek, and East Fork Hayfork Creek,[293] but no appreciable number of chinook are believed to use Salt Creek currently.

There are no proposed units in riparian reserves of perennial streams in the project area. Intermediate thinning units adjacent to perennial streams, but outside of the riparian reserves, include Units 1, 2C, 5 and 12 near Ditch Gulch, and Units 25A and 26 near Cold Creek. Seven plantation thinning units are also adjacent to the perennial stream riparian reserves.

Threatened, Endangered and Sensitive Species (TES) Critical Habitat and Essential Fish Habitat

The Trinity River and tributaries contain suitable habitat for anadromous fishes. The National Marine Fisheries Service designated critical habitat for coho salmon on May 5, 1999. Critical habitat includes all stream reaches accessible to anadromous fishes, regardless of the presence or absence of coho salmon. The Magnuson-Stevens Fishery Conservation Management Act, as amended by the Sustainable Fisheries Act of 1996,[294] designates essential fish habitat (EFH) for commercially valuable fish species as those waters and substrate necessary to fish for spawning, breeding, feeding, and growth to maturity. The Trinity River and tributaries contain EFH for coho salmon (*O. kisutch*) and chinook salmon (*O. tshawytscha*).

There is no coho salmon critical habitat or EFH in the project area. The distance downstream, outside of the project area, to critical habitat or EFH ranges from 0.4 miles to 1.4 miles as displayed in Table 91. The distance from the project area to occupied habitat ranges from 28 miles to 32 miles.

[292] USDAFS, unpublished data
[293] PWA 1994
[294] Public Law 104-297

Table 91: Summary of SONCC coho salmon designated critical habitat relative to Salt project analysis area and currently occupied coho salmon habitat (Hayfork Creek, near Corral Creek confluence).

Stream Name	Miles From Analysis Area to CH/EFH	Miles From Upstream CH/EFH Boundary to Occupied Habitat **
Ditch Gulch	0.4	28.2
West Fork (Salt Creek)*	1.2	31.8
Salt Creek	1.4	32.2

* West Fork is confluent with Salt Creek 0.8 miles below upper CH boundary. ** Includes reaches of Hayfork Creek below the confluence with each respective stream

The project will have no effect on a number of sensitive species because there is no suitable habitat in the project area. These species, which will not be analyzed further, include: California floater, Klamath Mountains Province steelhead, mountain peaclam, rough sculpin, hardhead minnow, McCloud River redband trout, Upper Klamath/Trinity chinook spring run, Upper Trinity River chinook fall run, nugget pebblesnail, scalloped juga, California floater, mainane peaclam.

Management Indicator Species (MIS)

Table 92 displays the Forest management indicator fish species, their associated habitat assemblage, whether or not they have habitat in the project area, and the conclusions of the effects analysis in the following section. There is no suitable habitat for the largemouth bass so it will not be analyzed further.

Table 92: Summary of Shasta-Trinity National Forest management indicator fish species

SPECIES	ASSEMBLAGE	PRESENT IN ACTION AREA: Habitat or Detections	EFFECTS DETERMINATION	REASONS OR MITGATION FOR NO EFFECT
Winter-run steelhead	Anadromous	Habitat	May affect/ Not likely to adversely affect	Operate only during minimal surface flow, control project sediment
Spring-run Chinook salmon	Anadromous	Habitat	May affect/ Not likely to adversely affect	Operate only during minimal surface flow, control project sediment
Summer steelhead	Anadromous	Habitat	May affect/ Not likely to adversely affect	Operate only during minimal surface flow, control project sediment
Rainbow trout	Inland Coldwater	Habitat	May affect/ Not likely to adversely affect	Operate only during minimal surface flow, control project sediment
Largemouth bass	Inland Warmwater	No	No effect	No suitable habitat

Survey and Manage Species

The project is not within the range or does not contain suitable habitat for any aquatic survey and manage species suspected to occur on the Forest.[295]

[295] Everest, L. Personal Communication 2008

3.11.3 Environmental Consequences

Alternative 1 – No Action

Direct and Indirect Effects

Since no activities would occur under Alternative 1 there would be no direct effects on TES fish species or MIS fish species, fish habitat or riparian reserves.

Some indirect effects on TES or MIS fish, fish habitat and riparian reserves may occur if this alternative is chosen. Although no new activities would be initiated, surface, ladder, and crown fuels would continue to accumulate in the absence of fire or treatment (Chapter 3.2.3). Eighty-eight percent of the area would continue to be susceptible to crown fire (Chapter 3.2.3). Large fires have impacted many areas within the South Fork and main-stem Trinity River Basins in the recent past, these events have illustrated the ability of fire to damage large areas of riparian and fish habitat.

Cumulative Effects

Timber harvest, grazing, road construction and road maintenance have all contributed cumulatively to existing habitat conditions in addition to natural events including wildland fires and unstable geology. The Telephone fire burned in the Upper Salt Creek-Hayfork Creek watershed in 2008 with 30 acres of low severity burn in the project area. The low severity burn was beneficial at the watershed level by promoting the sprouting of new vegetation, while retaining protective soil ground cover (Chapter 3.10.3). Both of the 7th field subwatersheds are in WCC I currently, but the Ditch Gulch – Salt Gulch subwatershed is close to a WCC II. The incremental effects of past management, when added to this alternative (no action) will maintain the current WCC for each subwatershed, unless another wildland fire event occurs in one or more of the subwatersheds.

Alternative 2 – Proposed Action

Direct and Indirect Effects

TES, MIS Fish and Assemblages

No direct effects to TES or MIS fish are expected. There are no aspects of the project that will occur in streams where anadromous fish are present. Water drafting outside of the project area is the only aspect of the project that may occur in critical fish habitat. There are several good water drafting sites located within the Salt project area[296] so drafting outside the project area is not anticipated. Within the project area water drafting sites will be located to minimize adverse effects on stream channel stability, sedimentation, and in-stream flows to maintain riparian resources, channel conditions, and fish habitat (Chapter 2.4.1, #16a). If, for any reason, drafting outside the project area did occur, National Marine Fisheries Service water drafting specifications[297] will be followed when using any water source in critical habitat.

[296] Paulo 2009
[297] NMFS 2001

Project resource protection measures, including riparian reserve specifications and restrictions (Chapter 2.4, #7, 18 through 20) will eliminate direct effects to resident rainbow trout in the limited section of Ditch Gulch that they currently occupy. Units are located at least 300 feet away from perennial streams that may support fish.

WEPP modeling indicates that there is a potential for 1.9 tons of sediment per acre per year, caused by project activities (0.3 tons per acre due to harvest activities and 1.6 tons per acre due to temporary road construction) (Chapter 3.10.3). However, this number is a "maximum potential situation", would be undetectable and un-measurable in the field, and would not be expected to occur, or reach streams (Chapter 3.10.3). Modeling was a worse case scenario and did not include implementation of BMPs and resource protection measures. The probability of any impacts has been greatly reduced through resource protection measures (Chapter 2.4, #7 through #29). Any runoff would have to pass through the duff-litter, forbs and shrubs of the riparian reserve. Monitoring of 130 harvest units found no evidence that sediment moved into the riparian buffer areas during or after harvest[298] providing support to the assessment that sediment is not expected to reach streams. If the sediment did reach the stream any turbidity would not be great enough to reach downstream to critical habitat. The proximity of the project area to the currently occupied habitats of SONCC coho and spring-run chinook salmon in the South Fork Trinity River basin (28.2 and 11.2 stream miles, respectively) and extremely limited use of the Salt Creek 5th field watershed by winter-run steelhead, highly limits the possibility of any measurable impacts from increased turbidity and sedimentation.

If sediment did reach streams within the project area, the probability of which is low as explained above, impacts to resident rainbow trout within and directly downstream (within 0.4 mi.) of the project area from increased turbidity would be short-term and limited in intensity and duration (no more than 3 seasons following implementation), so that no measurable population-level impact will occur.

Long-term sediment reductions of 45.9 tons of sediment, annually, will occur from road system improvements and improved drainage (Chapter 3.10.3) providing a long-term reduction in existing sedimentation.

Riparian Reserve Thinning

The Salt Timber Harvest and Fuels Hazard Reduction Project, Fisheries Biological Assessment/Biological Evaluation[299] includes an in-depth analysis of essential fish habitat (EFH) and riparian reserves. The results of those analyses are summarized here.

Riparian reserve thinning would occur only on ephemeral and intermittent streams. Intermittent streams generally flow only during the wet season (50% of the time or less) and ephemeral streams flow generally for a short time after extreme storms and the channel is usually not well defined.[300] These streams do not support fish, and are not wetted in the summer.

[298] USDA 2006, page 81
[299] Vanosdall 2009a and Vanosdall 2009b
[300] Hewlett 1982

The riparian reserve thinning activities associated with this alternative will lead to a reduced number of trees in stands that are currently overstocked (estimated 41 acres affected in intermediate thinning units and 60 acres in plantations). No riparian reserve thinning activities or equipment will be allowed within the equipment exclusion zone. The equipment exclusion zone extends 50 feet (slope distance) from the high watermark on slopes greater than 30% and extends 25 feet on slopes less than 30% (Chapter 2.4.1, #19). Riparian reserve crossings will be approved by a fisheries biologist and/or hydrologist (Chapter 2.4.1, #19), minimizing the potential for channel impacts.

Implementation of BMPs and project resource protection measures (Chapter 2.4.1, #7, #18-#20) in the riparian reserve thinning would result in non-measurable increases in potential sediment generation. Implementation of equipment exclusion zones are expected to provide sediment filter strips which would prevent any measurable sediment increases entering a given drainage. Project resource protection measures state that prescribed fire ignitions would not be set within Riparian Reserves, but would be allowed to back burn into these areas (Chapter 2.4.1, #19). Burning would take place under cool and moist conditions, minimizing burn intensity to soils and the potential for sediment generation. Since there would be no measurable sediment increases there would be no change to pool depth, or channel form.

Riparian reserve indirect effects are expected to be very localized (i.e. the microclimate scale) and may include slight reductions in humidity and slight increases in temperature due to increased sunlight due to thinning in outer portions of intermittent and ephemeral riparian reserves. Decreases in stream shade will remain too small to be measured and will not result in any measurable increases in water temperatures within streams. Fish will not be impacted because fish are not present in these streams and no water is in these streams in the summer when water temperature is of concern. The small openings in the canopy will begin to close in within the first season following implementation.

Short and long-term benefits will result from lowering the risk of severe fire events within approximately 100 acres of riparian reserves. Long-term positive effects will occur because thinned timber stands in the riparian reserve will be healthier and will have increased growth. Riparian reserves outside of riparian reserve thinning units (approximately 650 acres) will not be affected (neutral effects) by the project.

Road Work

WEPP modeling estimated that the four new temporary roads would generate between 0.8 to 2.4 tons of sediment annually (1.6 tons average) over the project life of 3 to 4 years (Table 88). This number is a maximum potential situation and was calculated without considering BMPs and project resource protection measures; hence, it is anticipated that BMPs and project resource protection measures will minimize the potential for any sedimentation due to temporary road construction. None of the proposed temporary roads are within a riparian reserve or cross a stream channel. After decommissioning, the proposed temporary roads would no longer be a source of potential sediment.

Preliminary GIS analysis determined that existing road densities within the project area, within 300 feet of streams, is 6.0 miles per square mile in the Ditch Gulch-Salt Creek watershed and 2.5

miles per square mile in the Upper Salt Creek-Hayfork Creek watershed. After project completion and implementation of road decommissioning, road densities within 300 feet of streams would drop to 4.9 miles per square mile, and 2.3 miles per square mile, respectively, for each watershed, reducing the amount of sediment available to drainage networks within the project area by 45.9 tons per year. As a result, long-term benefits from road system improvements and improved drainage are expected to occur.

Alternative 3

Direct and Indirect Effects

TES, MIS Fish and Assemblages

Effects to TES, MIS fish and assemblages are similar to Alternative 2; no direct effects expected and an undetectable and un-measurable amount of potential increased sedimentation. Potential impacts to fisheries from harvesting would be slightly less (0.2 tons of sedimentation vs. 0.3 in Alternative 2) as there are 204 fewer acres proposed for harvest. However, the difference in acres totals 0.01% of the project area and the difference in sedimentation would not be a detectable or measurable difference in the field (Chapter 3.10) and would not impact TES, MIS fish assemblages.

Riparian Reserve Thinning

There is no riparian reserve thinning or activity proposed under Alternative 3, therefore no direct effects will occur to riparian reserves or fish habitat (pool depth, channel form or temperature). While no disturbance associated with mechanical or hand treatments would occur existing potential for increased wildfire severity would remain (Chapter 3.3.3). Crown fire potential in the riparian reserves, and therefore impacts due to wildfire would be greater than if Alternative 2 was implemented (Chapter 3.3.3).

Road Work

Sediment production associated with temporary roads would not occur as none are proposed in Alternative 3. There is a low probability of a small amount of sedimentation (1.6 tons) expected from temporary roads in Alternative 2 (Chapter 3.10.3).

Road decommissioning is the same in Alternative 2 and 3. After project completion and implementation of road decommissioning, road densities within 300 feet of streams would drop to 4.9 miles per square mile in The Ditch Gulch-Salt Creek watershed, and 2.3 miles per square mile in the Upper Salt Creek Hayfork Creek watershed, reducing the amount of sediment available to drainage networks within the project area by 45.9 tons per year. As a result, long-term benefits from road system improvements and improved drainage are expected to occur.

Cumulative Effects for Both Alternative 2 & 3

Past activities in both the Upper Salt Creek-Hayfork Creek and Ditch Gulch-Salt Gulch watersheds include timber harvest (clearcuts, salvage and thinning), grazing, development and maintenance of transmission lines, and pipelines.

In the Upper Salt Creek-Hayfork Creek watershed recorded timber harvest has occurred from 1968-2004 and site preparation has occurred from 1982-1995. Grazing allotments within the project area include Salt Creek (3,348 acres), Post Creek (305 acres) and the Wildwood allotment (950 acres). In the Ditch Gulch-Salt Gulch watershed timber harvest has occurred from 1981-2004 and site preparation has occurred from 1982-1995. There is only one allotment within the watershed, and that is Post Creek (4,677 acres).

In the Upper Salt Creek-Hayfork Creek watershed 101 acres were burned in 1987 in an unnamed fire. In 2008 the Telephone wildfire burned predominantly at low and moderate severities and was considered in the hydrology section analysis of equivalent roaded acres (ERA) and watershed condition class (WCC) (Chapter 3.10.3). The fire did not affect baseline WCC conditions. In the Ditch Gulch-Salt Gulch watershed there is no recorded fire activity since 1910. No disturbed acreage was noted in regards to mining or cultural treatments in either watershed. In support of these past management activities roads have been built.

Currently in the Upper Salt Creek-Hayfork Creek watershed the overall road density is 3.9 miles per square mile and in the Ditch Gulch-Salt Gulch watershed the overall road density is 6.6 miles per square mile. See further discussion in Chapter 3.10.

A foreseeable activity within the cumulative effects analysis area is a thinning project located in T31N R11 W, Sections 26, 25 and 30. Only 14 acres, located in Section 30, would fall within the Salt analysis boundary and no cumulative effects are anticipated.

Timber harvest, grazing, road construction and road maintenance as well as natural events including wildland fires and unstable geology, have all contributed cumulatively to existing habitat conditions. Sediment is the most common factor determined to be at risk or not properly functioning in the subject watersheds. Both action alternatives would decommission 13.8 miles of road. WEPP: Road modeling indicated that decommissioning would reduce sediment input into streams by 45.9 tons per year (range of 22.9-68.9 tons per year). The Westside Watershed Restoration Project will decommission roads in these two 7th Code HUC watersheds that are that currently pose risks to water quality and watershed resources and that are not necessary for public or administrative access, including approximately 5.1 miles of short road segments within the Salt project area (Chapter 3.18.2).These actions cumulatively will reduce existing levels of sedimentation by reducing existing levels of road-related surface runoff and sediment. Not only would water quality be improved locally, these reductions would also improve channel condition and perhaps aquatic habitat. Implementation of either alternative would not affect existing conditions in the TMDL limited segment of the South Fork of the Trinity River, located an estimated nine miles downstream of the project boundary .[301]

[301] Fryxell 2009

The incremental effects of past management, when added to these alternatives will change the current WCC for the Ditch Gulch – Salt Gulch subwatershed from WCC I to WCC II (Chapter 3.10.3). Watersheds in condition class II may exhibit an unstable drainage network. Physical, chemical, and biologic conditions suggest that soil, aquatic, and riparian systems are at risk in being able to support beneficial uses.

The incremental effects of the past, present and reasonable foreseeable actions when considered cumulatively with Salt project actions is a potential short-term, small increase in turbidity and sediment levels (5-10 years).

3.11.4 Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Forest Plan: The Salt project is consistent with the Standards and Guidelines related to soils in the Forest Plan.[302]

Tribal Trust Resources: Implementation of the Salt project will not adversely affect any Native American subsistence or commercial fishery.

Consistency with Aquatic Conservation Strategy objectives for the selected alternative: The Northwest Forest Plan Record of Decision[303] describes findings that must be made regarding the Aquatic Conservation Strategy. The Salt project A Biological Assessment was prepared for this project which discusses effects to the riparian reserves. Appendix D of the EIS summarizes the Salt project's consistency with the Aquatic Conservation Strategy objectives.

Endangered Species Act Section 7 Consultation: Project compliance and consultation requirements under the ESA will utilize the Alternative Consultation Agreement. As required in the Alternative Consultation Agreement, the Forest Supervisor, J. Sharon Heywood, has authorized that the project is within the scope of, and will support, the National Fire Plan, because: Thinning and fuels treatments within the Salt Project area will result in more fire resistant timber stands.[304]

3.11.5 Summary of Key Issue Effect

Table 93: Key issue-effects of thinning riparian reserves on fish

Issue Indicator	Alternative 1	Alternative 2	Alternative 3
Key Issue **Thinning in riparian reserves may have unintended effects on the watershed, fisheries and wildlife.**			
Effects to fish habitat (pool depth, channel form, temperature) from thinning in riparian reserve	0	No effect to pool depth or channel form. Decreases in ephemeral and intermittent stream shade will remain too small to be measured and will not result in any measurable increases in water temperatures.	No effect to pool depth, channel form or temperature

[302] USDA 1995
[303] USDA FS, USDI BLM 1994
[304] Appendix A of Salt Fisheries BA/BE, Vanosdall 2009

Issue Indicator	Alternative 1	Alternative 2	Alternative 3
		Reduction in crown fire potential in approximately 100 acres of riparian reserves	No change in fire severity potential

3.12 Scenic Quality[305]

3.12.1 Methodology for Analysis

Issues Addressed

Scenery was not raised as an issue during public scoping. During internal scoping a key issue was identified that: ***Thinning next to Highway 36 in Unit 45, the fuel break, may be noticeable, not meeting a visual quality objective of retention.***

Issues Indicator: Acres treated in the visible foreground of Highway 36.

Methods

The methods for analysis included consideration of: site visits, photos, Forest Plan Standards and Guides, Visual Management System, Scenery Management System, other research and professional experience.

The Forest Plan utilizes the Visual Management System (VMS) 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. During the forest planning effort various Visual Quality Objectives (VQOs) were established for areas seen from travel routes. VQOs indicate allowable changes to scenery as a result of management activities. The VQO definitions and the VMS process are outlined below.

Visual Quality Objectives (as defined by the Visual Management System)[306]:

Retention: Management activities are not evident to the casual forest visitor.

Partial Retention: Management activities may be evident, but must remain subordinate to the characteristic landscape.

Modification: Management activities may dominate the characteristic landscape, but must follow naturally established form, line, color, and texture characteristics.

Maximum Modification: Management activities may dominate the characteristic landscape, but must follow naturally established form, line, color, and texture characteristics and should appear as a natural occurrence when viewed as background.

Unacceptable Modification: Size of activities are excessive or poorly related to scale or landform and vegetative patterns in characteristic landscape. Or overall extent of management activities is excessive. Or Activities or facilities that contrast in form, line, color, or texture are excessive. All

[305] Information in this Section is adapted from the Salt Scenery Report, Joyce 2008b
[306] USDA 1974

dominance elements in the management activity are visually unrelated to those in the characteristic landscape. Unacceptable modification includes those visual impacts, which exceed 10 years duration.

Visual Management System components used to develop the Shasta-Trinity VQOs

Sensitivity Level

Sensitivity levels are a measure of people's concern for the scenic quality of an area. Travel routes, use areas and water bodies were rated according to the volume of use, duration and National or local importance.

Distance Zones

The distance from which a landscape is viewed has an affect on how much detail, pattern, color, line, and texture a viewer sees. To capture this difference, various distance zones are established from sensitive viewing areas:

- Foreground – The portions of a view between the observer and up to 0.25 to 0.5 mile distant. The surface patterns on objects and visual elements are important in the 'foreground' views.
- Middleground – The portions of a view between 0.25 to 0.5 mile and 3 to 5 miles from the observer, (actual distance depends on actual viewing distances).
- Background – The view beginning 3 to 5 miles from the observer and as far into the distance as the eye can detect the presence of objects.

Variety Class

A third component of the scenic environment relates to the degree of variety within a visual landscape (variety class). The more distinctive the variety class the more restrictive the visual quality objective (VQO). For instance, if a site has unusual features such as water features or distinctive rock outcroppings, the landscape would be classified as a higher variety class. While, if a landscape has no distinctive features and has monotonous vegetation, it would be viewed as a more 'common' landscape, i.e. less visually interesting.

3.12.2 Affected Environment

The project area is within the Klamath – Siskiyou Landscape Province Character Type as defined by the Visual Management System. The province is typified by highly forested repetitive ridges of similar but rising elevations towards the east. The ridge tops are often quite narrow and the canyons are deep in most places. The Salt project area is typical of the Klamath-Siskiyou Character Type. The forest is comprised of mixed conifer stands with variable understory and hardwood species. Refer to the silvicultural section (Chapter 3.2) for stand densities and stocking.

The existing VQOs in the foreground of Highway 3 and 36 meet Retention to Partial Retention due to roads. The existing VQO for background views meets Partial Retention.

3.12.3 Environmental Consequences

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

Scenery would remain the same for the no action alternative, thus there would not be any direct effects. No action would be the least preferred alternative from a scenery perspective. The no action alternative could contribute to the future landscape character by perpetuating a forest with dense under growth, which would have less visual diversity and inhibit the sight distance of the viewer, thus resulting in a less interesting visual experience. This alternative could result in an increased tree mortality which would look 'natural', but may not meet the public's expectations to see a green and healthy forest. By taking no action eighty-eight percent of the Salt project area will continue to have moderate to high potential for stand replacing crown fires (Chapter 3.3.3). Charred, denuded forests are usually not preferred scenery. The no action alternative could reduce the scenic value of the area, if a stand replacing fire decimated the existing vegetation.

Alternative 2 – Proposed Action

A simplified description of the proposed action as it relates to scenery is: Two regeneration harvest - green tree retention units, two shelterwood-green tree retention units, multiple thinning units with 50% canopy closure retention and 1 shaded fuel break unit with 40% canopy closure retention after thinning. The fuel break is proposed to extend to the north side of Highway 36.

Direct and Indirect Effects

Alternative 2 proposes thinning the existing forest and creating a fuel break. Thinning the trees would remove some of the dense understory which would allow people to see further into the forest. The 40% to 50% canopy closure retention would considerably increase the amount of sun light on the forest floor resulting in shadow patterns and an increased growth of perennials and forbs the first year after the timber harvest. The new understory growth would diminish the visual changes from the timber harvest and add more interest visually.

Researchers believe, and analysis indicates, that reducing competing vegetation increases the diameter and health of trees resulting in stands that are more resilient to disease and insect mortality. Vegetation modeling for this project shows faster diameter growth in stands thinned to 50% canopy closure retention (Chapter 3.2.3). Larger, vigorous trees appear more scenic than small, diseased trees with dense understory to many people. The mature trees, increased visual access, and light-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.

Thinning in Unit 45, the fuel break, adjacent to Highway 36 would be thinning in the immediate visual foreground of this corridor, which may be noticeable.

Resource protection measures for units 1, 2C, 2B, 2A, 9A, 9B, and 26, (Chapter 2.4, #39) state: Vegetation treatments within an approximately 100-foot visual corridor adjacent to Highway 36 have the following design features within this corridor:

- A 60% canopy closure with random tree spacing will be retained. Some small groupings of young conifers and deciduous vegetation will be retained. Marking will be done on the backsides of the trees away from Highway 36. Low stumps (less than 6 inches) parallel to terrain and blacken the cut face within the visual corridor.
- A 'clean forest floor' look will be achieved adjacent to the highway by removing, chipping and/or masticating slash.
- Existing skid roads and existing landings will be used where possible. Locate new landings away from the highway.

By implementing these measures VQO of retention in the foreground of Highway 36 and 3 will be retained within 1 year of the project completion.

The regeneration harvest with green tree retention and shelterwood with green tree retention units are not visible from Highway 36.

Cumulative Effects

There are no cumulative effects since there are no significant direct or indirect effects.

Alternative 3 – Alternative in Response to Public Comments

Alternative 3 proposes no regeneration harvest - green tree retention units. Two shelterwood – green tree retention units and multiple thinning units, which will retain 60% canopy closure after treatment, will be treated. The fuel break would not cross Highway 36, and the boundary was moved out of site distance from the highway

Direct and Indirect Effects

Alternative 3 is the preferred alternative from a scenery perspective. It differs from Alternative 2 by retaining more trees in the thinning units and taking the fuel break boundary away from Highway 36 in the immediate foreground. Leaving more trees would result in a more forested look, but still open visual access into the stands.

By implementing the resource protection measures described above for units 1, 2C, 2B, 2A, 9A, 9B, and 26, a VQO of retention in the foreground of Highway 36 and Hwy 3 will be retained within 1 year of the project completion.

The shelterwood units are not visible from Highway 36.

Cumulative Effects

There are no cumulative effects since there are no significant direct or indirect effects.

3.12.4 Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The Salt project is in compliance with the numerous Federal laws that require all Federal land management agencies to consider scenery and aesthetic resources in land management planning, resource planning, and project design, implementation, and monitoring. These Federal laws include: National Forest Management Act of 1976, Wilderness Act of 1964; Wild and Scenic Rivers Act of 1968; National Trails System Act of 1968; National Environmental Policy Act of 1969; Environmental Quality Act of 1970; Forest and Rangeland Renewable Resources Planning Act of 1974; Surface Mining Control and Reclamation Act of 1977; Public Rangelands Improvement Act of 1978.

The Forest Plan states "Maintain a diversity of scenic quality throughout the Forests, particularly along major travel corridors, in popular dispersed recreation areas, and in highly developed areas."[307] The Forest wide Standards and Guides identified sensitive travel corridors. [308]

Alternative 1 – No Action

Scenery would remain the same for the no action alternative, thus would meet Forest Plan direction.

Alternative 2 – Proposed Action

The project should meet a Retention VQO in the foreground of Highway 36 and 3 per Forest Plan direction within 1 year of the project completion with the current harvest prescriptions with the implementation of the resource protection measures (Chapter 2.4, #39). Views to the middle-ground and background of Highways 36 and 3 should meet Partial Retention upon project completion. The green tree retention units are small in scale and are seen for short durations and/or intermittent views and would meet visual quality objectives.

Alternative 3

The foreground views would meet the same visual quality objectives as Alternative 2, however Alternative 3 would have less impact to visual resources due to retention of 60% canopy closure, no green tree retention units and the shaded fuel break is setback from Hwy 36. The VQOs would be met upon project completion.

3.12.5 Summary of Purpose and Need and Key Issue Effect

Table 94: Key issue-effects on scenery of thinning unit 45 next to Highway 36

Issue Indicator	Alternative 1	Alternative 2	Alternative 3
Key Issue Thinning in the visual foreground of Highway 36 in Unit 45, could be noticeable.			
Acres in the visible foreground of Highway 36 affected.	0	3 VQO still met	0

[307] USDA 1995, page 4-5
[308] USDA 1995, page 4-28

3.13 Threatened, Endangered, Sensitive, Survey & Manage Botanical Species[309]

3.13.1 Methodology for Analysis

Issues Addressed

No issues specific to botanical species were raised during public or internal scoping.

Methods

Potential rare plant habitat was assessed using the Order 3 Soil Survey of the Shasta-Trinity Forest Area[310], GIS records, the Forest GIS database, population records,[311] the California Natural Diversity Database (CNDDB), personal field visits, and past field visits in the project area.

Field surveys to verify presence or absence of plant species of concern were conducted in the proposed project area and in all proposed treatment units in 2007. All field surveys were performed at a time appropriate to make positive identifications of Sensitive plant species. All planned treatment units were surveyed with intuitive-controlled surveys by skilled botany personnel. No field surveys for Sensitive fungi were performed and therefore occurrence was assumed in the analysis.

There are no federally listed endangered or threatened plants known to occur on the Forest; there are no plant species proposed for listing. There are no Watch List plants present in the project area and no populations of “Survey and Manage” species were found during field surveys and there are no known documented populations in the project area. Since, there will be no effects to the above mentioned species this document will not address them further.

3.13.2 Affected Environment

Sensitive Plants and Forest Plan Endemic Plants

Two populations of Sensitive plants and 11 populations of Forest Plan Endemic plants were found during field surveys, including one population each of mountain and brownie lady’s-slipper orchids, eight populations of serpentine goldenbush (Forest Plan Endemic), and three populations of Dubakella Mountain buckwheat (Forest Plan Endemic). There are two historic documented populations of Sensitive plant species and 12 documented populations of Forest Plan Endemic plants within the proposed project area: one population of Peanut sandwort, one population of mountain lady’s-slipper, seven populations of Dubakella Mountain buckwheat, and five populations of serpentine goldenbush.

[309] Information in this Section is adapted from the Salt Biological Evaluation for Sensitive Plants and Supplementary Botany Report for Forest Endemic Plants, Survey and Manage Species, and Noxious Weeds Report, Baker 2008
[310] USDA 1983
[311] Nakmura and Nelson 2001

Table 95: Sensitive species and two Forest Plan endemic plants potentially in the project area

Scientific Name	Common Name
Buxbaumia viridis	Bug-on-a-stick
Chaenactis suffrutescens	Shasta pincushion
Dendrocollybia racemosa	Branched collybia
Cypripedium fasciculatum	Brownie lady's-slipper orchid
Cypripedium montanum	Mountain lady's-slipper orchid
Eriastrum tracyi	Tracy's wooly-stars
Harmonia doris-nileseae	Niles' madia
Harmonia stebbinsii	Stebbins' madia
Minuartia rosei	Peanut sandwort
Phaeocollybia olivacea	Olive phaeocollybia
Ptilidium californicum	Pacific fuzzwort
Smilax jamesii	English Peak greenbriar
Sowerbyella rhenana	Orange-cup fungus
Eriogonum libertini	Dubakella Mountain Buckwheat
Ericameria ophitidis	Serpentine Goldenbush

Sensitive Fungi Species

No surveys were performed for branched collybia, olive phaeocollybia, and orange-peel fungus, but there is approximately 5,990 acres of suitable habitat for all three species present within the project area (as shown in the M3G strata in the GIS database which are mixed conifer stands with trees with 13- 24-foot crown diameters and greater than 70% crown cover). Suitable habitat includes mid-to-late seral, late-seral conifer, or mixed conifer/hardwood forest types where species-specific host trees are found as well as adequate amounts of leaf litter and organic debris in the understory. Because of the lack of field surveys and the presence of suitable habitat, occupancy by these three species is assumed for analysis of potential effects. Little or no scientific research has been completed on the impacts from management activities to the three Sensitive fungi, but impacts are thought to be similar to those for common forest fungi. Results of research studies on impacts to these species are available to varying degree and those will be cited where applicable.

Habitat requirements for fungi at their most basic level include organic matter from which nutrients and water are extracted and a host tree for exchange of nutrients.[312] Water or moisture is almost always necessary to speed decomposition and to sustain plant biomass that would ultimately provide organic matter. Highest quality habitat in general includes abundant organic matter in the form of litter, duff, and down logs, associated host trees, and shade to provide cool, moist conditions that would facilitate decomposition of organic matter. Disruption of the belowground fungal network from host tree or duff layer removal would disrupt nutrient exchange, and moisture is essential to fungal organisms for survival. Underground fungal networks may go into dormancy when moisture is

[312] Castellano et al. 1999

lacking, but expansion of the mycelium is unlikely to occur and the population would eventually die if dry conditions were sustained over long periods.

Specific habitat requirements for the three species are as follows: [313]

- Olive phaeocollybia requires an oak or pine host tree
- Branched collybia (mycoparasite) requires the presence of another fungi species, this is provided in organic debris
- Orange-peel fungus (saprophyte and decomposer) requires decaying litter

3.13.3 Environmental Consequences

Alternative 1 – No Action

Direct and Indirect Effects for Sensitive Plant and Fungi Species

There would be no direct effects from the no action alternative because no treatments would occur. Not implementing the proposed action would retain, and over time, increase the possibility of the project area experiencing high-intensity wildfire (Chapter 3.3.3), which could result in adverse impacts to habitat for branched collybia, olive phaeocollybia, and orange-peel fungus as well as mountain and Brownie lady's-slipper. If none of the proposed treatments are realized, the current tree and shrub density levels that have higher fuel loadings and higher fire hazard would be maintained. Indirect impacts of higher-intensity wildfire in habitat for Sensitive fungi species include loss of organic matter for moisture retention and nutrients, soil sterilization and temperatures high enough to kill underground reproductive tissues, death of soil microorganisms essential to growth and reproduction of these species, and loss of soil and its nutrients through erosion. These are the same impacts that could occur in any wildfire; high intensity wildfire is expected to increase the degree of these impacts on plant species.

Habitat for bug-on-a-stick, Shasta pincushion, Pacific fuzzwort, English Peak greenbriar, branched collybia, olive phaeocollybia, and orange-peel fungus occurs in the project area in mature or late seral mixed conifer forested areas. These plant communities have evolved in a fire-dependent ecosystem[314]. High-intensity wildfires were not typical in the Klamath Mountains of California historically and many native plant species are not resilient to impacts of high-intensity wildfire. There is a higher chance of death of native species individuals or populations from lethal soil temperatures that can kill underground reproductive structures.

In the absence of high-intensity wildfire within the project area in the future, there would be no direct or indirect effects, therefore no cumulative effects, from the no action alternative. Habitat for branched collybia, olive phaeocollybia, and orange-peel fungus would continue to improve as necessary habitat components increase, such as organic matter layers, overstory shade and species richness and diversity. Habitat for Tracy's wooly-stars, Niles' madia, and Peanut sandwort would remain the same under the no action alternative and would continue to improve with lack of ground disturbance.

[313] Castellano et al. 1999 and Castellano 2003)
[314] Sawyer and Thornburgh, 1977

Direct and Indirect Effects for Forest Plan Endemic Species

If the proposed action were not to be implemented, there would be little or no change for existing populations of Dubakella Mountain buckwheat or serpentine goldenbush. Both species occupy open sites with little or no vegetation or woody fuel to carry fire, so catastrophic fire is not a threat. Habitat around populations of serpentine goldenbush that occupy historically disturbed soils would continue to recover and improve.

Cumulative Effects

No direct or indirect effects would occur in the project area from treatments proposed by the Salt project under the no action alternative; therefore, there are no contributions to cumulative effects.

Alternative 2 – Proposed Action, and Alternative 3

Direct, Indirect, and Cumulative Effects for Sensitive Plants

Brownie lady's-slipper and Mountain lady's-slipper: A single population each of mountain and Brownie lady's-slipper was found in Unit 11 in Alternative 2 (Unit 11r in Alternative 3). Both populations will be protected by excluding all treatment activities from within the buffered population areas and no impacts will occur to those populations (Chapter 2.4, #32). Resource protection measures assure that if a sensitive plant is newly discovered operations will be halted in the vicinity of the populations (Chapter 2.4, #31), further assuring that no effects to these species will occur. Other resource protection measures minimize impacts to potential habitat for these species, moist areas and older forests along riparian corridors, further reducing potential impacts to these species (Chapter 2.4, #18, 19, 20 and 33).

Peanut sandwort: A single large population of Peanut sandwort is known to occur in the project area in Units 33A and 32 (Units 32Ar, 32Br, 33Ar in Alternative 3). This population occupies serpentine openings dispersed throughout the two units. All subpopulations of Peanut sandwort within Units 33A and 32 will be flagged and excluded from treatment activities (Chapter 2.4, #32), resulting in no direct or indirect impacts to the species, therefore no cumulative effects.

Bug-on-a-stick, Tracy's wooly-stars, Niles' madia, Stebbins' madia, Pacific fuzzwort, English Peak greenbriar: No populations are known in the project area. Resource protection measures assure that if a sensitive plant is newly discovered operations will be halted in the vicinity of the populations (Chapter 2.4, #31), further assuring that no effects to these species will occur. There will be no direct or indirect effects to these species, therefore no cumulative effects.

Direct and Indirect Effects for Forest Plan Endemic Species

Dubakella Mountain Buckwheat

There are ten known populations of Dubakella Mountain buckwheat based on historic population records and results of the 2007 botany field surveys in the project area. One or more populations of Dubakella Mountain buckwheat are found in Units 21, 22, and 45 in Alternative 2 (Units 21r, 22r, and

45r in Alternative 3). Additional populations of this species are found outside of proposed treatment units and these will be unaffected by the proposed action.

This species is known to occur only on the southern half of Rattlesnake Creek Terrane on the South Fork Management Unit. Because of uncommonness and individual population numbers of Dubakella Mountain buckwheat, all populations in Units 21, 22, and 45 in Alternative 2 and Units 21r, 22r, and 45r in Alternative 3 will be excluded from all treatments utilizing tractors (Chapter 2.4, #34). Exclusion of treatments on populations found in these units would have little impact on effectively reducing hazardous fuels overall in the project area. Exclusion of treatments within Dubakella Mountain buckwheat populations will result in no impacts to the species. Populations of this species found outside of proposed treatment units, but within the analysis area would be fully protected from impacts.

There would be no direct or indirect impacts to Dubakella Mountain buckwheat, therefore no cumulative impacts.

Serpentine goldenbush

There are 13 known populations of serpentine goldenbush based on historic population records and results of the 2007 botany field surveys. This species is known exclusively from the southern half of the Rattlesnake Creek Terrane on the South Fork Management Unit. One or more populations of serpentine goldenbush are found in Units 14, 17, 18, 22, 30A, 32, 45, and on the border just outside Unit 1 in Alternative 2 (Units 14, 17, 18r, 22r, 30A, 32Ar, 45r and on the border outside of Unit 1r in Alternative 3). Additional populations of this species are found outside of proposed treatment units and these will be unaffected by the proposed action.

Because of the greater abundance throughout its range, large number of populations within the proposed project area, and its apparent affinity for disturbed sites, the species is capable of receiving some impacts without threatening its viability.

The four known populations would be excluded from all treatments utilizing tractors (Chapter 2.4, #34).

Adjacent areas would be disturbed and may provide habitat to recruit seedlings. Serpentine goldenbush prefers full sun for growth. As thinning treatments reduce the canopy, habitat for the species should improve.

Populations of this species found outside of proposed treatment units, but are within the analysis area would be fully protected from impacts. There would be no direct or indirect impacts to serpentine goldenbush, therefore no cumulative impacts.

Direct and Indirect Effects for Sensitive Fungi

Assuming occupancy in the absence of surveys within suitable habitat, impacts may occur to fungi under both alternatives. Direct impacts would include disruption of mycelial networks where machinery used in thinning, road construction, and machine piling churns up soil. Fungi typically fruit only when soil is cool and/or wet. Soil protection and Best Management Practices prohibit treatment activities while soil is wet to prevent compaction. Fungi would not be present above ground

during any periods that treatments are occurring, lessening potential impacts to aboveground fungal structures (Chapter 2.4, #15).

Indirect impacts can be longer lasting to fungi than direct impacts. Removal of mature overstory trees in green tree retention units would disrupt host tree connections for olive phaeocollybia. As trees are thinned, increased sunlight to the forest floor would dry out the soil and organic layer more quickly, reducing available moisture necessary for fungi growth and reproduction and slowing organic matter decomposition rates.

Plantation Thinning

Plantations offer little habitat for fungi. Treatments to move plantations to later seral stages, 481 acres and 421 acres in Alternative 2 and 3 respectively would improve habitat for the fungi species preferring older forest communities.

Intermediate Thinning

The proposed action would perform thinning treatments on 963 acres and 850 acres under Alternatives 2 and 3 respectively. Treatments would not reduce canopy closure below 50% on average in any treatment units in Alternative 2; and it would not be reduced below 60% in Alternative 3. Thinning from below would retain the largest trees to provide shade for ground-floor moisture retention that would contribute to organic matter accumulation, which provides a substrate for branched collybia and orange-peel fungus, and a source of fungal species biomass for reinoculation of disturbed soils in the project area. Thinning from below and generally retaining the largest trees on site will insure retention of an adequate number of host trees for olive phaeocollybia.

There is no information available on the exact amount of time branched collybia, olive phaeocollybia, and orange-peel fungus require to recover from minor, moderate or heavy impacts; however, that information is not necessary to analyze the effects of this project because retention of habitat elements such as organic matter (Chapter 2.4, #24), shade, and host trees would insure that at least a minimum of each of these elements is available after treatments for potential populations of the three species to survive within the treatment unit.

Green Tree Retention (Shelterwood and Regeneration)

Shelterwood and regeneration harvests with retention of 15% of the acres would occur on 58 acres under Alternative 2 and 30 acres in Alternative 3. Where overstory removal occurs, on 2 acres or less, recovery of the three fungi species may be expected to occur if regenerative inoculants material is provided from adjacent stands with the species present. Recovery is not expected to occur rapidly in larger overstory removals because there is greater chance of eliminating the entire organism (if original patch size is small), and because of the larger area of residual unsuitable habitat conditions. Thus, there is expected to be a temporary effect. As the trees fill in and shade develops from trees reaching mid-seral states, re-colonization by forest fungi is expected.

Harvest Treatment Methods

Helicopter yarding causes little or no impact on soil and would result in no impacts to any potential Sensitive fungi populations.

Fuel break maintenance and plantation thinning may be accomplished non-mechanically or mechanically. Like helicopter treatments non-mechanical treatments are expected to only create limited superficial effects to soil and fungi. However since mechanical treatments by mastication could occur, more effects can be anticipated than by hand treatments. Treatments by masticators are not as disturbing to soil compared to ground-based logging because the masticated material is typically driven on as the machine proceeds. As a result the machine leaves limited disturbed soil, soil design criteria prevent machines from working when significant soil compaction could occur, and a mulch layer of masticated shrubs is generated further benefiting soil fungi.

Tractors would be used to harvest timber on 10 acres of suitable sensitive fungi habitat in Alternative 2 and zero acres in Alternative 3. Ten acres represents 0.2% of the 5,990 acres of habitat available in the project area. Tractors can cause soil compaction when they operate on wet soil. [315] However, no sensitive fungi habitat would be lost from tractor activities because all tractor work would occur when soils are below maximum soil moisture content assuring soil porosity would not be reduced more than the Region 5 Standard of 10% and resource protection measures retain at least 50% of organic matter on a site (Chapter 2.4, #25). [316]

Post Activity Fuels Treatments

Slash-pile burning would occur on 150 acres, and result in localized areas of high soil heating under the piles. With standard operating procedures machine-made piles would generally be no greater than 8 feet by 12 feet in diameter on average and hand piles would not exceed 4 feet by 6 feet on average; reducing the area of affect. High soil temperatures are thought to be restricted to the top 5 centimeters (2 inches) of soil, while fungal and plant root biomass can reach much lower depths. [317] Recovery and reintroduction of any populations of branched collybia, olive phaeocollybia or orange-peel fungus is expected from residual fungal biomass in the areas surrounding burn piles.

Tractors would be used to pile slash within the project area, but habitat for Sensitive fungi occurs on only 10 acres within Alternative 2. No sensitive fungi habitat would be lost from tractor activities because all tractor work would occur when soils are below maximum soil moisture content assuring soil porosity would not be reduced more than the Region 5 Standard of 10% and resource protection measures retain at least 50% of organic matter on a site (Chapter 2.4, #25).

Shaded Fuel Break Thinning

This fuel break is located along the highest ridgeline in the project area. It is more exposed because of its elevation and does not provide a high degree of suitable habitat for sensitive fungus. Therefore

[315] Amaranthus 1996
[316] FSH 2509.18
[317] Visser 1995; Smith et al. 2004

few, if any impacts are expected to these species from fuel break construction and opening of the canopy.

Road Construction and Decommissioning

There are no differences in miles of roads between the two action alternatives. No new system road construction would occur under either alternative.

In Alternative 2 and 3, approximately 17.1 miles of roads would be reconstructed, and 13.8 miles of existing roads would be decommissioned as funding is available. Decommissioning actions include ripping, pulling pipes, adding water bars, and out-sloping after completion of project activities. There is no suitable habitat for branched collybia, olive phaeocollybia or orange-peel fungus because these existing roads are heavily compacted, and therefore no impacts to these species from decommissioning. Decommissioning roads and trails would accelerate the recovery of potential suitable habitat for Sensitive fungi when completed by ripping, which would reduce compaction and increase soil porosity, and through reintroduction of species diversity. A reduction of bulk density can take up to 45 years without ripping while organic matter accumulates and soil microorganisms are reintroduced; recovery time for recapturing suitable fungi habitat should decrease with ripping.[318]

Alternative 2 will use more new landings, 38, than Alternative 3, 9. No suitable habitat for these species exists on old landings because they are compacted and new landings would be constructed in disturbed areas; therefore, no impacts to these species would occur from landings. Landings would be seeded and mulched as needed to reduce erosion and weed spread potential, and if determined necessary ripped and obliterated at the end of the project, allowing them to recover from disturbance from the proposed action and past actions (Chapter 2.4, #21, 23). Some landings may be maintained for future use.

There would be no impact to sensitive fungi due to temporary roads because they are proposed for areas outside of suitable habitat.

Cumulative Effects for Sensitive Fungi

Past actions have contributed to modification or loss of 35% of the suitable habitat within the watershed. The proposed action would contribute to negative impacts on an additional 14 to 24 acres. In relation to the total amount of past and present suitable habitat for Sensitive fungi, the proposed action would contribute to an additional 0.15% in Alternative 2 and 0.25% in Alternative 3 of impacts to habitat for branched collybia, olive phaeocollybia, and orange-peel fungus. This incremental change is not sufficient to threaten the viability of the three species.

Several resource protection measures have been incorporated into the project design to minimize impacts to natural resources within the project area (Chapter 2.4 #25, 5, 33). The following measures, when applied on suitable habitat, would reduce impacts to and benefit branched collybia, olive phaeocollybia, and orange-peel fungus. As a result effects could occur on 10 acres in Alternative 2,

[318] Froelich et al.1985

but with the soil protection design criteria in place the effects are not expected to be on all 10 acres or be long-term.

3.13.4 Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Endangered Species Act of 1973

The Salt project is in compliance with the Endangered Species Act. There are no federally listed endangered or threatened plants known to occur on the Forest, nor is any plant species proposed for listing.

USDA Forest Service Sensitive Plant Regulations and Manual Direction.

The Region 5 **Sensitive Plant List** was updated and signed October 1, 2006 by the Regional Forester last appended October 15, 2007). This list was used to determine species to consider in the Salt project analysis.

Forest Plan **Endemic species** are afforded the same protection as sensitive species by mandate of the Forest Plan. The species present in the area are addressed in this analysis.

There are no **Watch list plants** in the project area, so the project is compliant with watch list plant policies.

The Salt project is in compliance with the 2001 **Survey and Manage** ROD.

3.14 Invasive Weeds[319]

3.14.1 Methodology for Analysis

Issues Addressed

No issues specific to weeds were identified during public or internal scoping.

Methods

Information on weed presence and abundance was documented with field surveys for sensitive plants. Analysis assesses impacts on high priority weed species and other weed species in the area. A high priority weed species is an important local management concern because they currently have limited distribution on the Forest, are highly invasive, and have a demonstrated potential to displace large geographic areas of native plant communities.

3.14.2 Affected Environment

There is one high priority weed species within the proposed project area, Canada thistle (*Cirsium arvense*). Two populations of Canada thistle are known; one population is located along Route

[319] Information in this Section is adapted from the Salt Biological Evaluation for Sensitive Plants and Supplementary Botany Report for Forest Endemic Plants, Survey and Manage Species, and Noxious Weeds Report, Baker 2008

U29N55B and another population is located along Route U36TRI03. Both populations are less than 0.25 acres in size. The U29N55B population is moderately dense and the U36TRI03 population has a very low density.

Treatment options for Canada thistle do not include manual removal because the species is stimulated by pulling. In the absence of herbicides as a tool to treat Canada thistle, prevention by eliminating disturbance to populations is the most effective way to avoid increasing numbers. To avoid disturbance, Road U29N55B was eliminated from consideration as a haul route and would be decommissioned with implementation of Alternative 2 or 3. U36TRI03 is planned for decommissioning through the Forest's West Side Watershed Restoration Project. The population is not right on the road; there is a barrier of dry, upland soils between the population and the road, leaving a large space to avoid disturbance to the thistle population during decommissioning. Both occurrences of Canada thistle would be avoided during mechanical road decommissioning to prevent disturbance to the roots.

Annual grasses were the dominant weed species present in the project area, particularly in areas of past heavy disturbance such as old fuel breaks and roadsides. Isolated populations or individuals of yellow starthistle on roadsides and bull thistle within treatment units were found but only in low to moderate amounts. Annual grasses occupy a large portion of wildland and agricultural California, so exportation of these weeds to un-infested areas by service vehicles is of low concern.

Herbicides would not be used to treat any noxious weeds in the Salt project area.

3.14.3 Environmental Consequences

Alternative 1 – No Action

Implementation of the no action alternative would result in no increase in suitable habitat for noxious weeds from project related activities. Suitable habitat for weeds decreases with full canopy closure. Lack of disturbance and maintenance of the canopy would continue to discourage the establishment of weeds, allowing native species to occupy the majority of habitat in the project area. Other factors that contribute to introduction and establishment of weeds, such as off-road vehicle use, transport on vehicles traveling through the Salt project area, spread of existing roadside noxious weeds, and potential wildfires would continue.

Alternative 2 – Proposed Action

Direct and Indirect Effects

Because both populations of Canada thistle will be protected from direct disturbance, the action alternatives would not contribute to spread of noxious weeds (Chapter 2.4, #36).

There is a slight difference between Alternatives 2 and 3 in terms of impacts on or from known noxious weeds with more acreage being proposed for treatment in Alternative 2 (204 acres) it has a slightly higher risk from weeds than Alternative 3 because of additional ground disturbance which can lead to weed invasion or spread.

Noxious weed habitat is created when soil is disturbed by removing competing vegetation, exposing bare soil, and accelerating water loss. Noxious weeds have developed strategies that allow them to out-compete native species by germinating and occupying land faster than native species and under environmental conditions that are not as well tolerated by native species.

Major components of the proposed action, including mastication, helicopter yarding, and biomass chipping, would result in very little soil disturbance or creation of suitable habitat for noxious weeds. These activities take place on or above the soil surface and are not very invasive into the soil. Mastication treatments would grind up vegetation and leave it on the ground, creating a layer of mulch that may actually work to prevent introduction of noxious weeds. Yarding with tractors may provide some light soil disturbance, but limited tractor passes combined with overstory canopies of 50% or greater will discourage introduction or establishment of weeds.

Under the action alternatives, soil disturbance would occur through skid trail development, road and landing construction and decommissioning, pile burning, and machine piling.

The Forest Plan restricts the dedication of land harvested by uneven-aged systems to non-productive purposes such as roads, trails and landings to no more than 20%.[320] A project specific resource protection measure, which is more protective, states: "Dedicate no more than 15% of a harvest unit to primary skid trails and landings" (Chapter 2.4, #22). Assuming 15% of tractor-harvested acres would be in skid trails, skid trail development could create suitable habitat for noxious weeds on 148 acres in Alternative 2 and 130 acres in Alternative 3.

Road reconstruction, temporary road construction, landing construction, and decommissioning of roads and landings by ripping would result in heavy soil disturbance twice during project implementation. Total disturbance from these activities would be approximately 31.2 miles plus 57 landings (13.8 miles of decommissioning, 17.1 miles of existing road reconstruction, and .3 miles of temporary road construction in Alternative 2), or about 67 total acres in Alternative 2, and 57 acres in Alternative 3 (no temporary road construction = 30.9 miles and 20 landings).[321] Initial construction and reconstruction could facilitate weed introduction by service vehicles traveling through the project area. Roads that are reducing access due to poor condition could in effect reduce some vehicular vectors and reconstruction could continue the presence of weed vectors in the long-term. Decommissioning roads and landings would then create loose, bare mineral soil that is excellent habitat for noxious weeds. Habitat would be available until the disturbed site is occupied by native species.

Machine piling would result in the greatest amount of soil disturbance and creation of suitable habitat for noxious weeds. Dozer blades with teeth would dig into the surface 6-12 inches of soil, exposing bare mineral soil that is suitable for weed introduction and establishment. One goal of this project is to improve forest health and resiliency. To accomplish this objective conifer stands will be thinned resulting in an overstory of at least 50% canopy closure (which would help to shade out weeds), but until an overstory is achieved or the soil surface is occupied by native vegetation, there

[320] USDA 1995, page 4-25
[321] A 14 foot road width and ¼ acre per landing were assumed.

would be suitable habitat for noxious weed introduction and establishment. Tractor piling with site prep or for jackpot burning would occur on 161 and 130 acres in Alternative 2 and Alternative 3 respectively within the proposed project area.

The opportunity for new weeds to occupy the area will be reduced by requiring equipment operators to insure equipment is free of weed seeds or propagules prior to entering the project area (Chapter 2.4, # 35). In addition, disturbed sites will be seeded with native grass seed and non-persistent cereal grains and all seeded areas will be mulched with certified weed-free straw (Chapter 2.4, #21)

Cumulative Effects

Temporal and Spatial Bounding

The cumulative effects analysis area is spatially bounded by the following:

- Southwest to Forest Service Road 29
- Southeast to Forest Service Road 30
- Northwest and northeast to Highway 36

Major highways and roads are a somewhat unusual basis for bounding, but they identify the main vectors that are responsible for transporting and introducing noxious weeds into the project area. Identification of all activities that have occurred along the entire length of these highways would not contribute well to a discussion of cumulative effects, so listing of past and future activities would be restricted to the geographic area identified above. The spatial cumulative effects analysis area encompasses a geographic area of 26,400 acres.

The cumulative effects analysis is bounded in time by the amount of time required for native plant communities to become stabilized enough to once again resist invasive weed introduction and establishment; approximately 10-25 years. The date of the first introduction of noxious weeds into the Salt project area is unknown, but it is most likely the time when roads were built to harvest timber in the area. A complicating factor to identifying the future timeframe for analysis is that as more weed species displace native species and establish in an area, the potential for native plant communities to recover and dominate over noxious weeds decreases.

Past, Present, and Reasonably Foreseeable Future Activities

There have been 3,243 acres of past timber harvest within the cumulative effects analysis area that occurred after 1980 when the chance of introducing noxious weeds from outside areas was greater. Commercial thinning and clearcutting caused soil disturbance that created suitable habitat for noxious weeds, especially on gentler slopes where tractors were used for yarding and site preparation for tree planting. Limited tractor passes combined with overstory canopies of 50% or greater discouraged introduction or establishment of weeds outside of skid trails.

Non-native invasive weeds occupy a large portion of Trinity County. Weeds are commonly found on roadsides, in urban developments, in early-seral forested habitats and in open valleys. Weed control in Trinity County has been difficult because environmental analysis for the use of herbicides

for weed control on the Forest has not been completed and County officials have discouraged their use on other lands within the County. It is difficult to estimate the actual number of acres occupied by weed species, but for cumulative effects analysis an estimate of 20% of all land within the cumulative impacts analysis, 13,200 acres will be assumed.

There are 169 miles of roads within the cumulative effects analysis area. All of the roads provide a vector for transportation and introduction of noxious weeds, although the more primary transportation routes are the most responsible. Vehicle traffic within the Salt project area is fairly low, with most traffic resulting from fuel wood collection, seasonal hunting, and visitation to Hall City Cave. This reduces the chance of introduction of noxious weeds from areas outside Trinity County, and spread of weeds already present along roads.

Table 96: Summary of cumulative actions affecting noxious weed habitat within the Salt Creek watershed

Action	Total Project Acres	Acres with Potential Negative Effect	Explanation of Effects
Past			
Past timber sales-skid trail development	3,243	649	bare soil exposure, loss of moisture from soil
Wildfire	352	352	bare soil exposure
Future			
Total Past and Future Action Impacts	3,595	1,001	
Proposed Action			
Skid Trail Development-Timber Sale Associated	--	Alt.2: 148 Alt 3: 130	bare soil exposure, loss of moisture from soil
Road and landing (re)construction and decommissioning	--	Alt.2: 67, Alt 3: 57	heavy disturbance in the absence of native vegetation, bare soil exposure, loss of moisture from soil
Machine Piling Including Shaded Fuel break Construction	--	Alt.2: 264, Alt 3: 130	bare soil exposure, loss of moisture from soil, lethal soil temperatures for native vegetation
Treat on Site (removal, chipping, or concentration for burning within treatment units)	--	Alt.2: 1,306, Alt 3: 1,158	limited base soil, but due to soils considerations and needle-cast from overstory trees short-term risk
Handpiling	--	Alt.2: 152, Alt 3: 127	
Total Proposed Action Impacts	--	Alt 2: 1,616 Alt 3: 1,415	
Past, Future, Proposed Action Combined	--	Alt 2: 5,214 Alt 3: 5,010	

The proposed action may contribute up to an additional 2.4% of suitable habitat for noxious weeds. With implementation of equipment cleaning, seeding, and mulching measures, weed introduction and spread from the proposed action is expected to be minor relative to current level of weeds.

3.14.4 Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Forest Service Manual 2080

Current direction for management of noxious weeds is given in Forest Service Manual 2080, amendment No. 2000-95-5, and effective 11-29-95. The Salt project is compliant with this policy because:

- The analysis determines the risk of introducing or spreading noxious weeds associated with the proposed action from ground disturbing activity
- Any project decision document will identify noxious weed control measures that must be undertaken during project implementation.
- Contract and permit clauses to prevent the introduction or spread of noxious weeds by contractors and permittees will be used. For example, a clause requiring operators or permittees to clean their equipment prior to entering national Forest system lands will be used.

2081.2 - Prevention and Control Measures

The project is compliant with this measure because the first priority is prevention of the introduction of new invaders and protection measures for the Salt project were developed to reduce the risk of importation and movement of non-native invasive plant species across the project area.

Executive Order 13112 of 1999

Salt project is compliant with this order because:

- Actions that may affect the status of invasive species were identified.
- Relevant programs and authorities will be used to: (a) prevent the introduction of invasive species;
- Actions that are likely to cause or promote the introduction or spread of invasive species would not be approved. Federal strategies to address the problem of noxious weeds.

USDA Policy 9500-10

Salt project is complaint with this policy because it would integrate noxious weed management into its activities and would apply the essential science, technology, and stewardship to effectively manage and prevent the spread of these plants.

3.15 Recreation[322]

3.15.1 Methodology for Analysis

Issues Addressed

No recreation issues were identified during public or internal scoping.

[322] Information in this Section is adapted from the Salt Recreation Report, Joyce 2008a

Methods

The method of analysis included site visits, research of existing recreation use, and analysis of the recreation opportunity spectrum (ROS). The appropriate Forest Service policy and goals, objectives and standards of the Forest Plan[323] were reviewed. The existing condition was compared with possible changes to recreation use if alternatives were implemented.

A basic premise of the ROS is that a diverse range of opportunities should be available to allow individual users to choose the experience they seek while protecting natural resources. The ROS system provides a framework for stratifying and defining classes of outdoor recreation environments, activities, and ranges of experiences. The settings, activities, and range of opportunities are arranged along a continuum or spectrum and divided into six classes: Primitive, Semi-primitive Non-motorized, Semi-primitive Motorized, Roaded Natural, Rural and Urban.[324]

The project area is within the Roaded Natural ROS class. "The Roaded Natural ROS class is characterized by predominately natural-appearing settings, with moderate sights and sounds of human activities and structures. Evidence of human activity varies from area to area and includes improved highways, railroads, developed campgrounds, small resorts and ski areas, livestock grazing, timber harvesting operations, watershed restoration activities, and water diversion structures. Roads and motorized equipment and vehicles are common in this setting."[325]

3.15.2 Affected Environment

The recreation experience of the visitor is intrinsically tied to the setting of the environment per the ROS system. [326] The project area is forested with a variable understory on the slopes of Dubakella Mountain. The project area is adjacent to State Hwy 36 and has numerous dirt roads. The overall road density for the Salt Creek watershed is approximately 3.0 mile per square mile (Chapter 3.18 and 3.10). The primary recreation activities are dispersed camping and hunting. The closest developed recreation facility is the Philpot campground approximately five miles away by road.

3.15.3 Environmental Consequences

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

Alternative 1 would not have any direct, indirect or cumulative effects on recreation within the project area.

[323] USDA 1995
[324] USDA 1986, page II-1
[325] USDA 1986, page IV-31
[326] USDA 1986

Alternative 2 – Proposed Action

Direct, Indirect and Cumulative Effects

Dispersed camping and hunting are the main recreational activities with some off-highway vehicle activity within the project area.

There are three factors within the project design that could possibly affect recreational access; temporary road construction, decommissioning roads, and understory removal.
Temporary roads from logging operations could potentially be used by visitors seeking off highway vehicle experiences, hunting and camping opportunities. None of the temporary road spurs will be more than 0.1 miles long and will be ripped and seeded after logging activities have been completed (Chapter 2.4, #21, 26), thus there should not be any affects from the temporary roads.

Dispersed camping and hunting are intrinsically tied to road access. Alternative 2 would decommission approximately 13.8 miles of roads that currently pose risks to water quality and watershed resources and that are not necessary for public or administrative access. Approximately 9.5 miles proposed for decommissioning are "unauthorized" roads, meaning they are not officially within the Forest road system and are not included in the Forest Transportation Atlas. The remaining 4.3 miles are classified roads, meaning they are currently tracked as Forest Service System roads. The classified roads being decommissioned are currently closed as shown in the Salt Road Analysis Report.[327] There will still be access throughout the project area, thus access for recreational activities should not be affected. Roads adjacent to known dispersed campsites will remain open; thus there should not be any effects to dispersed camping.

It has been noted that in some cases after other vegetation treatment projects the lack of overgrown understory increased the use of off highway vehicles throughout the treatment area. The Travel Management Planning effort, which is a reasonable foreseeable activity, would prohibit all cross country travel unless on a designated trail or road – so accessing the opened stands would be illegal, reducing the probability of occurrence. There are no cumulative effects because there are no discernable direct or indirect effects to recreation.

Alternative 3 – Alternative in Response to Public Comments

Direct, Indirect and Cumulative Effects

The effects of Alternative 3 should be similar to the effects of Alternative 2. Even though there would be more residual canopy left in Alternative 3 than in Alternative 2; the difference in vegetation prescriptions would not warrant substantial differences between the two alternatives for dispersed camping, off highway vehicle use and hunting.

[327] USDA 2007, page 7-27, 8-27 & 10-27

3.15.4 Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The Forest Plan shows a portion of the project area is within the matrix-roaded recreation land allocation. Road access is the primary foundation for hunting and dispersed camping. All of the alternatives will meet the objectives of this prescription. The project area will also meet the Roaded Natural ROS description; therefore meet Forest Service recreation policy.

3.16 Cultural Resources[328]

3.16.1 Methodology of Analysis

Issues Addressed

No issues specific to cultural resources were identified during public or internal scoping.

Methods

Agency and State files were reviewed which included previous cultural resource inventory reports, site forms, maps, and other data sets. Tribal governments and public scoping was also conducted. These reviews confirm that Class I-III historic properties, and traditional use areas, exist within the project area. In accordance with the Regulatory Framework cited previously, a cultural resource study of the proposed project was conducted. [329]

3.16.2 Affected Environment

It is recognized that cultural resource surveys contribute to our knowledge of past lifeways. It is desired to protect historical sites. The above referenced cultural resource laws and regulations are designed to protect sites that are important to our understanding of past lifeways. The resource laws and regulations also provide for inventory and protection. Four known archaeological sites are recorded within the project area. None of these sites are eligible for the National Historic Register.

3.16.3 Environmental Consequences

Alternative 1 - No Action

Direct, Indirect and Cumulative Effects

Alternative 1 will not cause any direct environmental consequences to cultural resources, as no activities likely to affect such resources or their attributes will occur.

Past wildfires have affected cultural resources by consuming prehistoric and historic structures, features and fabrics. Cultural resources within the identified project area have features and fabric that could be lost from the continued effects of high-intensity wildfire.

[328] Information in this Section is adapted from the Salt Archeology Report, Nykamp 2008
[329] Arnold 2007

Alternative 2 & 3

Direct and Indirect Effects

Known sites will not be affected by project activities in either Alternative 2 or 3 because the project was designed to restrict ground disturbing activities near known sites (Chapter 2.4, #30). Project specific management plans that provide site protection have been developed (information resides with the Trinity Archeologist - Arnold 2007).

There is the potential that sites (unanticipated discoveries) do exist that are currently obscured by vegetative cover. If unanticipated discoveries are found, ground disturbing activities will stop until the Trinity Archeologist can assess the situation (Chapter 2.4, #30).

Indirect effects of fuel reduction activities could be considered beneficial, as impacts from wildfires that may affect cultural resources would be reduced. No other indirect effects (e.g. erosion) are likely to occur to known cultural resources as a result of this project.

Cumulative Effects

The cumulative effects area is the Salt project area boundary. For context, historical impacts to cultural resources on National Forests in general are considered to assess potential benefits of vegetation treatments.

Since Alternative 2 and 3 will have no direct or indirect negative effects on cultural resources, there are no cumulative negative effects from this project.

3.16.4 Compliance with the Forest Plan and Other Regulatory Direction

This project is in compliance with regulations of the National Historic Preservation Act (NHPA), 1966, as amended (P.L. 89-665, 80 Stat.915); the National Environmental Protection Act (1969), Archaeological Resources Protection Act of 1979 (ARPA), Native American Grave Protection and Repatriation Act (1990: P.L. 101-601), and American Indian Religious Freedom Act (1978: P.L. 95-341), the Forest Plan and the Regional Programmatic Agreement with the California State Historic Preservation Office.

Cultural resource design features for the Salt project follow the “Programmatic Agreement” and “Interim Protocols”, formally known as the First Amended Regional Programmatic Agreement Among The U.S.D.A. Forest Service, Pacific Southwest Region California State Historic Preservation Officer, And Advisory Council On Historic Preservation Regarding The Process For Compliance With Section 106 Of The National Historic Preservation Act For Undertakings On The National Forests Of The Pacific Southwest Region (Regional PA), and the 2004 Interim Protocol for Non-Intensive Inventory Strategies for Hazardous Fuels and Vegetation Reduction Projects (Interim Protocol).

There are no federally recognized tribes in the South Fork Management area requiring direct consultation as provided by 36 CFR 800. However, in this area there is one non-recognized Native American group the Nor-Rel-Muk Wintu. They were contacted as part of normal section 106 consultations for this project as an interested party.

No comment has been received from the interested parties concerning any potential adverse effects to recorded archaeological sites. No response has also been received expressing concern how this project may affect areas of spiritual or traditional use.

3.17 Air Quality[330]

3.17.1 Methodology for Analysis

Issues Addressed

No key issues related to air quality were identified through scoping. The following analysis issue was identified during public scoping and is considered in this analysis: Removing trees may affect climate change.

Methods

The Salt project was divided into two phases in terms of air quality impacts. First phase would be Timber Sale that will take three to five years for completion followed by prescribed fires phase (under-story and pile burns) that will also be spread over three to five years. The pollutants that are released with prescribed burning are PM10, PM2.5, Carbon Monoxide (CO), Nitrogen Oxides (NOx), Volatile Organic Carbons (VOCs) and minute quantities of non-criteria air toxics. These pollutants and air toxics are considered unhealthy for the public. In addition, Green House Gases like Carbon Dioxide (CO2) and Methane (CH4) are also emitted. These gases are known to impact climate change.

The National Ambient Air Quality Standards (AAQS) are designed to minimize unhealthy pollutant levels. These standards were used to assess the effects of the prescribed burning for the action alternatives.

Table 97: National and California ambient air quality standards

National and State Ambient Air Quality Standards in ugms/m³ (ppm)			
Primary Standards			
Pollutant	**Averaging Time**	**Federal**	**State**
PM10	Annual	--	20
	24 hours	150	50
PM 2.5	Annual	15	12
	24 hour (07/12/1997)	65	35
PM 2.5	24 hour (12/18/2008)	35	35
NO2	Annual	100 (0.053)	56 (0.03)
	1 hour	--	338 (0.18)
CO	8 hours	10,000 (9.0)	10,000 (9.0)
	1 hour	40,000 (35)	23,000 (20)
SO2	Annual	80 (0.03)	--

[330] Information in this Section is adapted from the Salt Air Quality Report, Lewis 2009a

National and State Ambient Air Quality Standards in ugms/m³ (ppm)			
Primary Standards			
Pollutant	**Averaging Time**	**Federal**	**State**
	24 hours	365 (0.14)	105 (0.04)
	3 hours	--	--
	1 hour	None	655 (0.25
O3	1 hour	--	180 (0.09)
	8 hour	157 (0.08)	137 (0.07)
Pb	Calendar Average	1.5	None
	30-day Average	None	1.5

•Annual standards are never to be exceeded. Other standards are not to be exceeded more than once a year.
•. 8hr ozone standard not to be exceeded three year average of the fourth highest 8-hour average ozone value --

For modeling it was assumed that all of the units prescribed to treat un-merchantable fuels on site (treat on site) would include burning.[331] It is not likely that all units will require burning after treatments.

3.17.2 Affected Environment

Project Location and Existing Air Quality

The Salt project area is located approximately 10 miles south of Hayfork, California which is located in Trinity County. Trinity County is a large remote county located in Northwestern California. The geography is rugged with heavily forested mountains.

The project vicinity is primarily forested federal and private lands. The project lies in the North Coast Air Basin and is managed by the North Coast Unified Air Quality Management District (NCAQMD), which consists of Del Norte, Humboldt, and Trinity counties.

According to the NCAQMD website (www.ncuaqmd.org) the ambient air in portions of the NCAQMD exceeds the State PM10 standard during many of the winter months. Trinity County is identified as attainment for PM10 and PM2.5 for federal standards. Therefore the project is exempt from conformity determination. For state PM10/PM2.5 standards Trinity County is designated as "non-attainment" area for PM.10.[332]

In Trinity County, PM10 generally comes from motor vehicles, wood burning stoves, dust from construction and logging operations, wildfires and slash burning. Trinity County is in "attainment" status for ozone, a product of volatile organic compounds or nitrogen oxides; and is considered "unclassified" for CO. Biogenic sources are the biggest contributors to the production of total organic gases (TOGs) and reactive organic gases (ROGs) in Trinity County. Wildfires and prescribed burns contribute the most to CO, particulates (PM10 and PM2.5) and NOx. Mobile sources emit, TOGs, ROGs, CO and NOx.

[331] Lewis 2008, Personal conversation
[332] Data (published in 2007) http://www.arb.ca.gov/app/emsinv/emssumcat.php

Green House Gases (GHGs) and Climate Change

The temperature of the earth's atmosphere is regulated by a balance between the radiation received from the sun, the amount reflected by the earth's surface and clouds, and the amount of radiation absorbed by the earth and atmosphere. The so-called greenhouse gases, which include carbon dioxide (CO2) and water vapor, keep the earth's surface warmer than it would be otherwise because they absorb infrared radiation from the earth and, in turn, radiate this energy back down to the surface. While these gases occur naturally in the atmosphere, there has been a rapid increase in concentrations of greenhouse gases in the earth's atmosphere from anthropogenic sources since the start of industrialization, which has caused concerns over potential changes in the global climate.

The atmospheric concentration of CO2 has increased from a pre-industrial value of about 280 parts per million (ppm) to 379 ppm in 2005, which is an increase of about 35%. During the last 10 years, the rate of increase of CO2 since 1980 was about 1.9 ppm (0.5%) per year. Most of the anthropogenic CO2 emissions are primarily attributed to fossil fuel burning, with land-use changes, especially deforestation, providing another significant contribution (Intergovernmental Panel on Climate Change [IPCC], 2007). [333] The level of CO2 in the atmosphere is determined by a complex cycle that involves the exchange of carbon between the atmosphere, the biosphere and the oceans. It is estimated that the oceans and terrestrial biota absorb about half of all CO2 emissions, while the rest accumulates in the atmosphere (IPCC, 2001a).

Class I Wilderness Areas

The nearest Class I Area is Yolla Bolla-Middle Eel Wilderness which is approximately 10 air miles south of the proposed Salt project. The Marble Mountain Wilderness (also a Class 1 Area) is located approximately 90 miles northwest of the project area. The Trinity Alps Wilderness (a Class II Wilderness Area) is located approximately 35 miles north of the project area. The Environmental Protection Agency and CARB approved IMPROVE (Interagency Monitoring of Protected Visual Environment). A IMPROVE monitoring site managed by the forest service is located near Trinity helipad base. The collected samples are analyzed for PM10, PM2.5, SO4, NO3, Organic Carbon, Elemental carbon, dust and soot. The data will help identify sources that generate pollutants for visibility degradation. The data will be used in the development of the visibility State Implementation Plan by the state and then showing progress towards achieving visibility goals.

Transport of aerosols probably occurs from north along Willamette Valley and Pacific, east from Northeast Plateau, southeast from Sacramento Valley. Route 299 corridor along Trinity-Klamath Rivers allows oceanic-interior transport.

According to the California Air Resource Board,[334] long-range Sulfate transport is substantial. Out-of-state contributions to total sulfate concentration on worst days is almost 6 times that from California and approximately 5 times California's on best days.

[333] Intergovernmental Panel on Climate Change [IPCC], 2007
[334] CARB 2008

Organic matter carbon (OMC) is the overwhelming cause of worst haze days followed by sulfate and nitrate. Average Sulfate concentration on worst days is twice that of best days. The ammonium sulfate particles are very efficient at scattering light and visibility impairment. Nitrate is occasional cause of a winter haze day. Coarse mass and fine soils contribute extremely small amounts to total extinction.

3.17.3 Environmental Consequences

Alternative 1 – No Action

Direct and Indirect Effects

Under this alternative, no treatments would occur, and there would be no anthropogenic emission contribution for air quality degradation. This will lead to increased accumulation of ground fuel leading to increased high intensity wildfires in the future.

One objective of the project is to prevent the occurrence of large uncontrolled wildfires. Wildfires present a risk to the public health and result in damage to both the environment and property. Wildfires are known to result in high levels of emissions including green house gases and associated NAAQS violation and worst visibility. Vegetation management treatments provide the opportunity on a long-term basis to reduce the magnitude of wildfire air quality problems.

Cumulative Effects

Past, present, and reasonably foreseeable activities were reviewed to determine cumulative effects to air quality. Because impacts to air quality in regards to smoke from past wildfires and prescribed fire activities are short-lived, past activities do not contribute to cumulative effects. Past activities do influence the amount of available material, which would be available for consumption in the event of a future wildfire.

With the no action alternative gaseous pollutants and airborne particulate matter would continue to be present. The primary emission sources would include wood burning stoves, motor vehicle exhaust, emissions from recreational campfires, emission associated with development of private lands, prescribed fire, fugitive dust, and wildfires within or adjacent to the project area. Burning associated with foreseeable actions, as well as adjacent agencies outside of the area can be expected, and would have short-term effects.

Future wildfire frequency is expected to continue as it has been observed in the past. The effects from past prescribed and wildfire activities are no longer a concern because smoke impacts are short-term in nature and are only a concern while smoke is being produced and soon thereafter. However, if an unwanted wildfire occurs in the future these effects could lead to negative cumulative effects. These negative cumulative effects are dependant upon the size and intensity of the unwanted wildfire. Visibility impairment and hazardous health impacts, due to sudden and dramatic releases, are likely with a large unwanted wildfire event. These events may temporarily reduce visibility and air quality. These events lead to production of high amounts of green house gases and reduced carbon sequestration from the burnt area for the next few years following the fires. The cumulative effects

are unknown, because the intensity and size of a wildfire is unknown. Research has indicated that Wildfires can produce nearly twice the amount of smoke as prescribed fire.[335]

Alternative 2 & Alternative 3

Direct and Indirect Effects

Vehicular Fugitive Dust: 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 (Chapter 2.4 #44). Logging operations are generally done over several years and localized dust from skidding and hauling dissipates rapidly.

Mobile Equipment: Table 98 and Table 99 show exhaust emissions (tons) expected from logging equipment, pickup trucks, water trucks, chipper engines and transport vehicles for Alternatives 2 and 3. Primary emissions generated from the mobile sources include emissions from engines during idle and operation mode.

Table 98: Emission production from equipment used for timber sale under Alternative 2

Emission Production in tons from Equipment Alternative 2					
Activity and Equipment	**Total Hours**	**CO**	**Nox**	**VOCs**	**PM10**
Log and Chip Hauling					
Log truck	353	0.63	0.23	0.03	0.02
Water Tender	78	0.07	0.16	0.01	0.02
Loader	353	0.10	0.33	0.04	0.03
Road Work					
Dozer	59	0.01	0.05	0.00	0.00
Grader	59	0.01	0.04	0.00	0.00
On Site Treatment					
Chainsaw	470	0.00	0.00	0.00	0.00
Tractor logging, Yarding					
Skidder	353	0.63	0.23	0.03	0.01
Yarder	353	0.63	0.23	0.03	0.01
Total for Alt 2		**2.09**	**1.26**	**0.17**	**0.11**

U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, General Technical Report PNW-GTR-355, October 1995, in cooperation with: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. General Technical Report PNW-GTR-355

Alternative 2 generates higher amounts of CO, NOx, VOCs and PM10 than Alternative 3. The emissions shown in the tables are over the life of the timber sale. If the timber sale lasts three to five years then annual emissions will be 3 to 5 times less than shown in the tables. These emissions

[335] General Technical Report PNW-GTR-355

represent less than 0.0% of the total Trinity County Daily Emissions. Therefore, the pollutants correlated with equipment emissions associated with this project are estimated to be almost negligible and insignificant.

Table 99: Emission production from equipment used for timber sale under Alternative 3

Emission Production from Equipment Alternative 3					
Activity and Equipment	**Total Hours**	**CO**	**Nox**	**VOCs**	**PM10**
Log and Chip Hauling					
Log truck	130	0.23	0.08	0.01	0.01
Water Tender	29	0.03	0.06	0.00	0.01
Loader	130	0.04	0.12	0.02	0.01
Road Work					
Dozer	22	0.00	0.02	0.00	0.00
Grader	22	0.00	0.01	0.00	0.00
On Site treatment					
Chainsaw	173	0.00	0.00	0.00	0.00
Tractor logging, Yarding					
Skidder	130	0.23	0.08	0.01	0.01
Yarder	130	0.23	0.08	0.01	0.01
Total for Alt 3		**0.77**	**0.46**	**0.06**	**0.04**

Vegetation Combustion: The action alternatives would produce smoke from burning activities. Table 100 shows emissions under Alternative 2 and 3. Smoke from the proposed project is expected to remain in the area for about one to two days each time burning occurs. Permissive burn days are determined by the North Coast Unified Air Quality Management District. An estimated 169 tons (Alternative 2) and 156 tons (Alternative 3) of particulate matter (PM10) would be produced from prescribed burning activities in the Salt project area. The tables also show emissions (in tons) of PM2.5, NOx, CO, CO2, CH4 and NMHC (non-methane hydrocarbons) from burning activities.

NOx and VOCs (precursors of ozone) emissions are below the minimum even for non-attainment area under both alternatives. In addition, the burns are generally conducted under low temperatures and high humidity (a situation not conducive for ozone formation). The project area is in attainment for all criteria pollutants for federal standards so no Conformity determination is required.

Table 100: Emissions (in tons) from prescribed burning under Alternative 2

Emissions (in tons) from prescribed burning under Alternative 2 and 3								
	Acres	**PM10**	**PM2.5**	**NOx**	**CO**	**CO2**	**CH4**	**NMHC**
Alternative 2	1,138	169	160	43	2,283	22,555	82	52
Alternative 3	1,077	156	148	40	2,119	20,936	76	48

Under air quality regulations prescribed burning is usually considered a temporary, intermittent source of air pollution and therefore is not subject to the same visibility requirements as a major

prevention of significant deterioration (PSD) source. Besides causing visibility impairment, smoke can also create a nuisance and generate numerous complaints from the public. Burns are allowed only on declared "Burn days." Burn-day determination is based on metrological conditions that tend to disperse the smoke. The burning on worst visibility days and best visibility days would be avoided. The forest will follow North Coast Air Quality Management District's Smoke Management Program in order to avoid creating a nuisance, visibility impairment or impacts to public health (Chapter 2.4, #42, #43). Two additional resource protection measures will help to minimize nuisance, visibility or health effects including:

- Reduction of Fuels Loading - Pretreatment methods will be used to minimize smoke emissions and/or reduce fuel loadings, such as biomass removal, and public firewood utilization opportunities. (Chapter 2.4, #40)
- Fuel Moisture Content - The burn prescription shall specify an acceptable range of fuel moisture contents for the burn to proceed. Allow for adequate cure time before igniting slash material, and cover hand-piled slash where necessary for more efficient burning conditions. (Chapter 2.4, #41)

Class I Wilderness Areas: The burns will be conducted when the prevailing wind direction is away from the Class I area (Chapter 2.4, #45).

Action Alternatives Cumulative Effects (Air Quality)

Within the Fire and Fuels cumulative effects analysis area, there has been pile burning over the past ten years. There has also been an un-estimated amount of burning on private lands within this area. Compliance with burn day designations and permits from the North Coast Unified Air Quality District has minimized the effects of burning so that Federal and State air quality standards have not been exceeded.

The Salt 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 under-burning should be about the same as the current ten year average.

The North Coast Air Quality Management District (NCAQMD) regulates permissible burn days for prescribed fire use within their district. A Smoke Management Plan (contained in all prescribed burn plans) must be submitted and approved by the NCAQMD prior to using prescribed fire on federal lands. Overall cumulative emissions are expected to be similar to the past years and are not expected to exceed Federal or State air quality standards.

The improved wildfire suppression characteristics created by prescribed burning and thinning should lead to a reduction in size and intensity of wildfires in the treated areas. In the long-term, the emissions from wildfires are expected to be reduced as a result of reduced fuel loading.

The summary of other management actions considered in the evaluation of cumulative effects within the Salt project area is displayed in Appendix B. Past, present and foreseeable projects have been listed and potential for air quality impacts indicated. Management actions include timber harvest

activities, road work (construction and decommissioning), mining activities, prescribed burns and wildfires. Overall cumulative emissions are expected to be similar to the past years and are not expected to exceed Federal or State air quality standards.

Climate Change

Analyses of the impacts of green house gas and CO2 emissions or sinks at the project level are too low to provide meaningful information to translate the information into climate change. The Forest Service is heading toward approaches that lead to reduced GHG emissions or increased sinks of these gases. Activities that result in reduced fuel combustion will release less green house gases. The production of greater biomass (removing merchantable wood and biomass) will result in greater carbon sequestration.

3.17.4 Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

Shasta-Trinity Forest Plan

Implementing either action alternative would be consistent with the Forest Plan goals, standards and guidelines related to air quality. *Specific Salt compliance items are in italic font below.*

Management Direction Air Quality

I. Maintain air quality to meet or exceed applicable standards and regulations. [336]

Implementation would meet applicable standards and regulations.

Forest-wide Standards and Guidelines [337]

1a. Protect air quality while achieving land and resource management goals and objectives, Base line levels will be established and available technology will be used to predict and monitor changes. Activities such as burning, which are under the Forests' control, will be coordinated with affected landowners and control agencies.

Resource protection measures assure this will be done (Chapter 2.4, #43)

b. Identify, assess, and monitor significant air quality related values (AQRV) and sensitive indicators of those values in the Yolla Bolla-Middle Eel Wilderness in cooperation with the Mendocino National Forest.

This effects analysis considered all significant air quality related values and sensitive indicators of those values in this Wilderness area.

c. Establish and maintain close coordination with Federal, State, and local officials in the research and application of new air quality standards particularly in relation to smoke and dust management.

d. Incorporate smoke management controls into the development of prescribed burn plans, and coordinate with local authorities.

Resource protection measures require this (Chapter 2.4, #43).

[336] USDA 1995, page 4-4
[337] USDA 1995, Chapter 4

Laws and Regulations

Implementation of any of the alternative would be consistent the following laws and regulations related to air quality.

1. Federal-- Clean Air Act

The original Air Quality Act was passed in 1963. This act was followed by Clean Air Act Amendments in 1970, 1977, and 1990. The project will meet National Ambient Air Quality Standards (NAAQS) set forth under this act.

2. State-California Clean Air Act (CCAA)

The California Clean Air Act of 1988 is administered by the California Air Resource Board (CARB). The act added several requirements concerning plans and control measures to attain and maintain the state ambient air quality standards.

3. Local Regulators—North Coast Air Quality Management District

The California Clean Air Act established a number of legal mandates to facilitate achieving health-based state air quality standards at the earliest practicable date.

3.18 Transportation

3.18.1 Methodology for Analysis

Issues Addressed

No issues related specifically to transportation were identified during public or internal scoping.

3.18.2 Affected Environment

The Salt project area encompasses approximately 6.7 square miles. Within the project area, there are currently approximately 27.6 miles of existing Forest Service system roads, and 19.8 miles of existing unauthorized routes. Forest Service system roads are permanent roads which were planned and constructed as a part of a transportation system designed to meet the needs of the agency in managing the resources over a large area. Unauthorized routes are official system roads and are not included in the Forest Transportation Atlas.

The current road system in the Salt project is adequate for the purposes of the project: hauling timber and biomass materials from the project area, and providing access for pre-commercial thinning, fuel break thinning, hand fuel treatment, and road decommissioning. New short temporary roads will be needed to access several critical landings. Table 101 summarizes the types of roads within the project area and their usage for project activities.

Table 101: Exiting roads by type and project need

Road Type	Needed for Project Activities	Miles
System	Yes	24.4
System	No	3.1
Unauthorized	Yes	8.1
Unauthorized	No	11.7
Total Miles		**47.4**

Most of the existing roads in the project area have not received maintenance in a number of years. The roads identified for use under this project will require some level of reconstruction, pre-haul maintenance, or reopening prior to use. Reconstruction is defined as road improvements required due to an anticipated increase in traffic, service level or haul capacity. Reconstruction activities may include culvert upgrades, grading, rocking, paving, and drainage. Generally, reconstruction activities take place within the existing road prism. Maintenance is defined as work needed to bring the road back into its original condition. Maintenance activities include brushing, culvert replacement, grading, and rocking. Reopening of roads applies to the unauthorized routes. Road reopening activities include barrier removal, brushing, grading, and temporary culvert installation. Table 102 summarizes the reconstruction and maintenance needs for the roads identified for use for both action alternatives in this project.

Table 102: Project road pre-use work miles by road type

Road Type	Pure-use Work Needed	Miles
System	Maintenance	5.0
System	None Needed	2.3
System	Reconstruction	17.1
Unauthorized	Reopen	8.1
Total Miles		**32.6**

In 2007, a Roads Analysis Process (RAP) was performed on the Salt project area. [338] The purpose of a RAP is to balance the needs of the agency and the public for a transportation system with the impacts of the system on other resources. During a RAP, an interdisciplinary team weights the management and social benefit of each road against the resource impact of the road, resulting in a recommended disposition for the road to be further revised and analyzed (through the NEPA process) and implemented on a project specific basis. The RAP originally identified 18.5 miles of road which could be decommissioned in the project area. During the development of the scoping document, eight miles of road decommissioning were proposed for this project

Subsequent to scoping two things occurred. The Forest decided to analyze the decommissioning of all roads identified in the Salt RAP for ‘short-term decommissioning’ (5.1 miles), in a separate

[338] USDA 2007

NEPA process (Westside Watershed Restoration Project) along with roads identified in other RAPs conducted on the South Fork Management Unit. Short-term decommissioning means these roads are not needed for future management or project activities and could be decommissioned in the short-term. Secondly, more analysis determined two routes (0.2 miles) were needed for management that had initially been planned for decommissioning. Currently, 13.8 miles of roads are identified which could be decommissioned after using them to access areas for treatment in this project (Table 103).

A decommissioned road is removed from the Forest Service transportation system after it is effectively closed. Decommissioning may include removing culverts, ripping road surfaces, installing effective vehicle barriers, as well as other measures to meet site-specific needs. The goal is to prevent future uncontrolled use, and to control surface runoff, erosion, and mass failure.

Table 103: RAP decommissioned roads and project decommissioned roads

Road Number	RAP Decommission Road	RAP Miles*	Will be analyzed for Decommissioning in Westside Watershed Restoration EA Analysis	Miles*	Salt Project Decommission Road	Salt Project Miles*
29N31D	X	0.3	X	0.3		
29N55A	X	0.6			X	0.6
30N07	X	0.7			X	0.7
30N07A	X	0.4			X	0.4
30N14A	X	0.4	X	0.4		
30N16Y	X	0.7			X	0.7
30N18A	X	0.3	X	0.3		
30N18B	X	0.8	X	0.8		
30N18C	X	1.0			X	1.0
30N27A	X	0.3	X	0.3		
30N45A	X	0.9			X	0.9
U29N31E	X	2.8			X	2.8
U29N31EAA	X	0.3	X	0.3		
U29N31EB	X	0.3	X	0.3		
U29N55B	X	0.8			X	0.8
U29N55BA	X	0.2			X	0.2
U30N07A	X	0.0			X	0.0
U30N07AA	X	0.1			X	0.1
U30N07AB	X	0.0			X	0.0
U30N07AC	X	0.1			X	0.1
U30N07AD	X	0.2			X	0.2
U30N14A	X	0.1				
U30N14AA	X	0.2	X	0.2		
U30N14B	X	0.1	X	0.1		
U30N16YA	X	0.1			X	0.1
U30N18E	X	0.4			X	0.4

Road Number	RAP Decommission Road	RAP Miles*	Will be analyzed for Decommissioning in Westside Watershed Restoration EA Analysis	Miles*	Salt Project Decommission Road	Salt Project Miles*
U30N27A	X	0.1	X	0.1		
U30N27AA	X	0.6			X	0.6
U30N27AB	X	0.1	X	0.1		
U30N27B	X	0.1	X	0.1		
U30N27D	X	0.1	X	0.1		
U30N27F	X	0.1	X	0.1		
U30N27G	X	0.2	X	0.2		
U30N27H	X	0.2			X	0.2
U30N27I	X	0.2			X	0.2
U30N27J	X	0.1			X	0.1
U30N27K	X	0.0	X	0.0		
U30N27O	X	0.2			X	0.2
U30N27Q	X	0.8			X	0.8
U30N27S	X	0.1				
U30N27W	X	0.1	X	0.1		
U30N27X	X	0.2	X	0.2		
U30N27Z	X	0.0	X	0.0		
U30N28C	X	0.1	X	0.1		
U30N28D	X	0.1	X	0.1		
U30N28F	X	1.9			X	1.9
U30N28FA	X	0.2	X	0.2		
U30N28H	X	0.1			X	0.1
U30N45A	X	0.0	X	0.0		
U30N45B	X	0.2	X	0.2		
U36TRI03	X	0.5	X	0.5		
U36TRI03B	X	0.1			X	0.1
U36TRI05	X	0.1	X	0.1		
Total Miles		18.5		5.1		13.8

3.18.3 Environmental Consequences

Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

The existing road system is currently receiving very little maintenance. Some roads are contributing sediment through erosion, have compromised drainage structures, and may in some cases constitute a safety hazard. The no action alternative would not correct these problems.

Alternative 2 & Alternative 3

Direct, Indirect and Cumulative Effects

The transportation systems needed to accommodate the proposed actions are common for both action alternatives; and, the effects are identical.

Harvest and treatment unit access, and log and chip hauling would utilize the existing road network and short, temporary roads. Road reconstruction and road maintenance on haul roads would be performed prior to and during harvest activities. Maintenance activities include clearing of brush and small trees within the road right-of-way, surface blading to provide a smooth road surface, water drainage control and dust abatement.

All temporary roads (0.3 miles in Alternative 2) used in conjunction with harvest activities would be waterbarred, revegetated and closed to vehicle use following harvest activities (Chapter 2.4, #26). In addition to this, Alternatives 2 and 3 would close an additional 0.4 miles of Forest System roads, and decommission 13.8 miles of system and unauthorized existing roads (Chapter 2.4, #23). These roads could be reopened in the future to allow access for timber management. Table 104 summarized the changes to the transportation system for the action and no action alternatives.

Table 104: Changes to the transportation system by alternative

Management Activity	Alternative 1 No Action	Alternatives 2	Alternative 3
Miles of System Roads Closed	0.0	.4	.4
Miles of Roads Decommissioned	0.0	13.8	13.8
Miles of New System Roads	0.0	0.0	0.0
Miles of Haul Maintenance	0.0	32.6	32.6
Miles of Temporary Road	0.0	0.3	0.0

How the changes to the transportation system effect forest resources are analyzed in other resource reports.

3.19 Additional Considerations[339]

3.19.1 Short-term Uses and Long-term Productivity

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).

[339] This section was compiled from conclusions described in Chapter 3 as well as interdisciplinary discussions.

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 2.4.

Short-term use (2 to 5 years during harvest operations and subsequent treatments) for the Salt project will remove forest products and generate revenue for the Federal Government, Trinity County and workers in the wood products industry. With Alternative 2 there would be a loss of five acres of foraging habitat and a downgrading of 28 acres of moderate quality nesting habitat for the Northern Spotted Owl; this is not the case in Alternative 3. There would be a loss of soil productivity on a small number of acres 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) due to logging activities and hauling traffic.

In the long-term (5 to 15 years), removal of dead and dying trees will reduce the spread of disease pathogens and move forest stands toward Forest Plan desired conditions while reducing wildland fire hazard. Thinning will improve forest health and make stands of trees more resistant to insects and disease. Soil productivity will be improved by decommissioning roads with residual soil compaction. Thinning riparian vegetation will improve stand vigor and reduce potential for severe fires which will protect stream channel processes and have a beneficial effect toward meeting the Aquatic Conservation Strategy objectives (Appendix D). Road density will be reduced by 1.2 miles per square mile in Ditch Creek-Salt Creek drainage and 0.3 miles per square mile in Upper Salt Creek-Hayfork Creek drainage.

3.19.2 Unavoidable Adverse Effects

Implementation of any of the alternatives, including no action, could cause adverse environmental effects that cannot be effectively mitigated or avoided. These are discussed by resource throughout Chapter 3. 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. Three thousand seven hundred and eighty acres, 88% of the project area, would remain at a moderate to high risk for crown fires (Chapter 3.2.3). Crown fires can be stand replacing fires, affecting several hundred, if not several thousand acres of surrounding forest. Forest health could be adversely affected by allowing overstocked stands to remain susceptible to drought, insect and diseases. Alternative 2 and

Alternative 3 would reduce the area with a moderate to high risk for crown fires to 58% and 63% of the area respectfully (Chapter 3.2.3).

Regeneration harvest treatments in Alternative 2 would remove trees from approximately 27 acres, creating 10 and 17 acres openings but retaining 15% of the area with green trees and retaining snags greater than 19 inches in diameter and hardwoods. Even though these areas will be reforested, creating openings in the forest is seen by some as an adverse effect to the environment.

Approximately 10 acres of foraging habitat for the Northern Spotted Owl will be "removed" and approximately 28 acres of moderate nesting roosting habitat downgraded in the short-term in Alternative 2. This is not critical habitat and no owls are known to use the project area currently, but this is considered an adverse effect to northern spotted owl (Chapter 3.5.3, Appendix E, and Appendix F).

In Alternative 2 approximately 162 acres of commercial forest lands will be not be available for timber production for a time (i.e. trees will be removed and take time to regenerate after project implementation and these lands are again available for tree growth. These acres will be used for conventional ground based logging operations including landings (14 acres)[340] and main skid trails (148 acre)[341] and temporary road construction (0.4 acres)[342]. In Alternative 3 approximately 135 acres will be unavailable for timber production for a period of time; including, landings (5 acres)[343], and, main skid trails (130 acres) and zero acres for temporary road construction. Although the acres lost are within Forest Plan standards, it is an impact to the environment. The construction of the 0.3 miles (0.4 acres) of temporary roads will result in the death of some small organisms.[344]

3.19.3 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 162 acres in Alternative 2 and 187 acres in Alternative 3) and new temporary roads (approximately 0.4 acres in Alternative 2, 0 in Alternative 3).

[340] Assumes ¼ acre per landing. Includes all landings – 38 that would be newly constructed and 19 existing. (19+38) x 0.25 = 14 acres
[341] See Chapter 3.14.3
[342] Temporary roads generally have a 12 foot wide foot print, so the disturbed area from 0.3 miles of temporary road would be 0.4 acres (0.3 miles x 5280 feet/mile x 12 feet wide = 19,008 sq. feet = 0.4 acres). See Chapter 3.9.3.
[343] (9+11) landings x 0.25ac/landing = 5 acres
[344] Trombulak and Frissell 2000

- No effect on designated spotted owl critical habitat, but a long-term loss of approximately 4 acres of foraging habitat and downgrading of moderate nesting roosting habitat for the Northern Spotted Owl in Alternative 2. This loss would be regained in 50 years or more as the stand regenerates or the canopy fills in. No habitat would be removed of downgraded with Alternative 3.

Chapter 4 – Consultation and Coordination

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4.1.1 List of Preparers – Interdisciplinary Team Members[345]

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4.2 Consultation or Coordination

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this environmental impact statement.

4.2.1 Federal, State, and Local Agencies

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U.S. Fish and Wildlife Office, Red Bluff, CA
National Marine Fisheries Service
California Regional Water Quality Control Board

[345] For team member experience and qualifications please see http://www.fs.fed.us/teams/about/employees-alpha.shtml

4.2.2 Native American Tribal Organizations

Nor-Rel-Muk Wintu

4.3 Circulation of the Environmental Impact Statement

This draft environmental impact statement will be distributed to the following government agencies as well as to those organizations and individuals who submitted comments during scoping. Hard copies will be distributed to those with "(copy)" after their name; compact disks will be distributed to those with "(cd)" after their name. Other parties on the project mailing list will get a summary of the DEIS and be notified that the full document is on the Forest Web Site.

4.3.1 Native American Tribal Organizations

Nor-Rel-Muk-Wintu

4.3.2 Federal Agencies

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Director, Planning and Review Advisory Council on Historic Preservation

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Natural Resources Conservation Service National Environmental Coordinator U.S. Department of Agriculture

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U.S. Army Engineer Division, South Pacific CESPD-CMP

US Environmental Protection Agency Office of Federal Activities EIS Filing Section (5 copies)

Environmental Protection Agency Region 9 EIS Review Coordinator (2 copies)

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Appendix A

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Summary of Comments Received During Scoping

And Disposition of those Comments
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Summary

Scoping letters sent to individuals/groups: March 19, 2008
NOI Published in the Federal Register: March 26, 2008`
Articles in Record Searchlight: March 25, 2008 and Trinity Journal: April 2, 2008.
Scoping Comments Requested by : April 25
Salt interdisciplinary team considered 46 pages of scoping comments from 8 individuals and organizations (Table 1) prior to preparing the DEIS. In 2006 comments were received from three members of the public concerning this project. Those comments were also considered in this process.

Key Issues

The following key issues were identified through the public scoping process. They are presented here as concise issue statements, developed by the interdisciplinary team, to capture the essence of the issue. These issues were used in the development of Alternative 3. The EIS analysis indicates that the some of the following perceived negative effects of implementing Alternative 2 would not occur, others would to some degree.

1. Regeneration Harvest - green tree retention in the proposed action may increase the risk from fire
2. Retaining less then 60 percent canopy closure after thinning could affect wildlife habitat.
3. Thinning in riparian reserves may have unintended effects on the watershed, fisheries and wildlife.
4. Treatments may remove or downgrade suitable northern spotted owl habitat or, when considered cumulatively with past projects, negatively affect spotted owls.
5. Construction of new temporary roads may negatively impact hydrology and soil health and could impact wildlife.

The key issues were analyzed through the EIS process. Table 2 summarizes the conclusions and/or informs the reader where the information can be found in the EIS analysis.

Analysis Issues

The following preliminary issues, raised by the public during scoping, were considered in the analysis of this project as well. They are presented here as concise neutral issue statements, developed by the interdisciplinary team to capture the essence of the comment(s). Analysis determined that none of these issues are significant, either because: there is no effect or, the effects are clearly and supportably on the non-significant side of a reasonable, definable, threshold of significance. Table 2 summarizes these conclusions or informs the reader where the information can be found in the EIS. The analysis of these issues often will occur in more then the one resource area mentioned here.

Air Quality:

1. Removing trees may affect climate change.

Fire/Fuels:

2. Canopy removal may increase fuel hazard issues.
3. Decommissioning roads can have negative impacts on future fire suppression and vegetation management.

Soils:

4. Yarding with tractors could negatively impact soil heath and productivity.

Economics:

5. Helicopter yarding can make implementation financially unfeasible in some areas.

6. Completing all of the work planned for including mitigations may exceed the value of the timber products.

Wildlife:

7. Treatments may destroy, alter or fragment forest habitat suitable for fishers.

8. Thinning within the project area and when considered cumulatively with other effects to Neotropical bird habitat may contribute to declining populations.

9. Treatments, when considered cumulatively with past projects in the watershed may fragment habitat.

10. Vegetation treatments may impact management indicator species (MIS) and threatened, endangered and sensitive species (TES) habitat and ability to survive.

11. Removing old legacy trees may impact wildlife habitat including future snag habitat.

Aquatics (Watershed & Fisheries):

12. Landings and use of roads for this project could contribute to sedimentation and cumulative impacts leading to degradation of riparian areas and the watershed.

Not Analyzed in Detail

Comments that have no cause and effect relationship to the specific actions of this proposal were considered. These comments generally do not warrant further analysis in the NEPA document because the NEPA document analyzes effects of implementing the proposed action and its alternatives.

Responses & Disposition

NEPA (§ 1503.4) states that there are five possible responses to comments.

1) Modify alternatives including the proposed action. [Includes changing the design features to avoid an anticipated effect, or adding mitigation measures to mitigate an expected effect].

2) Develop and evaluate alternatives not previously given serious consideration by the agency. [If an issue is not easily resolved by modifying an alternative, it may need to be resolved through the creation of an alternative.]

3) Supplement, improve, or modify its analyses.

4) Make factual corrections.

5) Explain why the comments do not warrant further agency response, citing the sources, authorities, or reasons which support the agency's position and, if appropriate, indicate those circumstances which would trigger agency reappraisal or further response.

Key issues are ones for which Alternative 3 was developed to help the decision maker consider the issue.

All comments were reviewed by the interdisciplinary team and the manner in which to respond to the comment was considered.

Commenters, Comments and Content Analysis Process:

Table A-1 presents a list of individuals and organizations that provided scoping comments for our consideration in developing the environmental impact statement. Each commenter was assigned an independent identification number (ID#). A content analysis process helps us assure we consider all comments and helps us categorize similar comments together. A description of each of the column headers in Table A-2 follows. These descriptions will also help describe the content analysis process.

A – ID#: Each commenter was assigned an independent identification number (ID#). This number is the same in Table A-1 and Table A-2.
B- Comment #: Each letter or comment received was reviewed through what we call a content analysis process every individual comment is given a comment number (Comment #). This process is done so that we are sure we consider each comment.
C – Subject Code: Each comment number is also assigned a subject code to generally describe the type of comment. For example one comment may be related to soils, code 300, and another related to the NEPA process, code 900. This grouping helps to assure the proper specialists are able to consider comments related to their area of expertise. Some comments are related to several subject codes. A list of subject codes is displayed at the end of Table A-2.
D- Comment (Not necessarily verbatim): This column displays enough of the comment to get the sense of the comment. Some comments are verbatim, and some are truncated. All interdisciplinary team members had all of the comment letters in their entirety for review.
E – Issue Statement: The issue statement is a preliminary synthesis of similar comments into a concise cause and effect statement. These statements correspond with the Key Issues and Analysis Issues listed above and tracked through the environmental impact statement analysis.
F – Comment Disposition: The Comment Disposition provides a response to the comment and/or shows the reader where the comment was addressed in the development of the environmental impact statement.

Table A-1: List of Comment Letters/Emails Received on the Salt Project Scoping Letter

ID #	Last Name	First Name	Organization	Street/ PO	City	State	Zip	Type	Date Received	Pages
1	Carroll	John	Columbia Helicopter	P.O. Box 3500	Portland	OR	97208	Phone	3/26/08	1
2	Boggs	Denise	Conservation Congress	P.O. Box 5	Lewiston	MT	59457	Phone	4/1/08; 4/23/08 and 11/8/06*	9
3	Hadley	Ryan	Sierra Pacific Industries	P.O. Box 10939	Anderson	CA	96007	Letter	4/14/08	1
4	Svilich	Richard	American Forest Resource Council	104 N. Dewitt Way	Yreka	CA	96097	Emailed letter	4/14/08 and 11/3/2006*	8
5	Robinson	Maggie	California Regional Water Quality Control Board	5550 Skylane Boulevard, Suite A	Santa Rosa	CA	95403	Letter	4/18/08	4
6	Jolley	Stephen	DG Fairhaven Power	97 Bay Street	Samoa	CA	95564	Phone and email	4/23/08	2
7	Baker	Kimberly	EPIC; Klamath Siskiyou Wildlands Center; and the Northcoast Environmental Center	#122, 600 F. St., Suite 3	Arcata	CA	95521	Emailed letter	4/24/08	19
8	Bower	Joseph	Citizens for Better Forestry						10/26/06*	1
9	Fuji	Laura	EPA	75 Hawthorne Street	San Francisco	CA	94105	Letter	5/5/2008	1

* Three comments were received on an earlier scoping document for this project. Those comments were also considered.

Table A-2: List of Comments and Issue Disposition

A	B	C	D	E	F
ID #	**Com-ment #**	**Subject Code**	**Comment (not necessarily verbatim)**	**Issue Statement**	**Comment Disposition**
2 7 8	11, 31 13, 3, 5, 11 1*	100 – Vegetation 1400 – Fire/Fuels	We are opposed to this type of harvest [green tree retention regeneration harvest] that would remove most tree vegetation and then be planted creating more plantations. The STNF can't manage the current plantations it has and should not be destroying native habitat to create more plantations. We request this prescription be dropped from further consideration. Dense young plantations are more susceptible to severe fire effects than unmanaged older forests (DellaSala et al. 1995, Weatherspoon & Skinner 1995). The increased susceptibility of plantations to severe fire is due to: Structural characteristics that promote high heat energy output by fire (Sapsis & Brandow 1997). Warm, windy and dry microclimates compared to what would exist in an unlogged burned forest that possessed more structural diversity and ground shading (Countryman 1955, van Wagtendonk 1996). Accumulations of large volumes of fine logging slash on the ground surface (Weatherspoon & Skinner 1995). In a study of fire severity in northwest California, researchers found that tree plantations of any age were "more receptive to combustion" than other forests (Odion et al., 2004). Perry (1995) suggested that once even-age tree plantations are established on a proportion of forest landscape, "the potential exists for a self-reinforcing cycle of catastrophic fires." Extensive networks of roads constructed to facilitate logging and planting also increase the risk of human-caused ignitions during hot, dry conditions (USDA 2000). Two fires in 2002 on the Umpqua National Forest were evaluated for their effect on the forest. Excerpts from the March 2003 Wildfire Effects Evaluation Project by the Umpqua N.F. make clear the impact of creating more tree plantations: "Plantations had a tendency to increase the rate of fire spread and increased the overall area of stand replacement fire effects by spreading to neighboring stands."	Key Issue #1 Regeneration Harvest - green tree retention in the proposed action may: Increase the risk from fire	Key Issue: Alternative 3 Developed. Alternative 3 would not treat stands with the green tree retention prescription. We acknowledge that the commenter has a general opposition to green tree retention harvest. Alternative 3 was designed to provide the decision maker with comparative information with Alternative 2 on potential affects, positive and negative of regeneration harvest-green tree retention. Chapter 1 of the EIS presents all of the goals, standards and guidelines that support improving forest health and growth and yield for the lands being proposed for management with regeneration harvest-green tree retention. One commenter during scoping cited literature that found that dense plantations are vulnerable to fire (DellaSala et al. 1995; Weatherspoon & Skinner 1995; Sapsis & Brandow 1997; Countryman 1955; van Wagtenonk 1996; as examples). This is part of the purpose and need of this project to thin plantations (481 acres in Alternative 2 and 421 acres in Alternative 3). The Forest Service has made a considerable investment in plantations, estimated at $1,000 to $3,000 per acre, for the future benefit of productive timber stands (Clark 1995). A study assessing the damage the 1987 fires caused to plantations on the Hayfork District concluded that "...for the short interval, low to moderate severity fire regimes studied … if fuels are left untreated, damage from wildfires could increase significantly." (Skinner and Weatherspoon 1995). This supports the

A	B	C	D	E	F
ID #	**Com-ment #**	**Subject Code**	**Comment (not necessarily verbatim)**	**Issue Statement**	**Comment Disposition**
			Page 4 "Fire burned most plantations with high intensity and spread rapidly through the canopy of these young stands." Page 20. "Plantation mortality is disproportionately high compared to the total area that plantations occupied within the fire perimeter." Page 26-27. "Crown fire spreads readily through these young stands: rates of fire spread can be high, and significant areas or mortality can occur in and adjacent to these stands." Page 32. SEE LETTER FOR MORE CITATIONS Green Tree Retention/Even Age Management Will Not Contribute to Resiliency, Stand Health, or a Reduction in Fuel Hazard. We remain opposed to even-age harvest mechanisms (green tree retention). Please note that the remaining GTR units would increase the percentage of acreage in the shurb/poll size class, which "is susceptible to high fire mortality." We urge the agency to avoid the cumulative watershed impacts and adverse fire behavior associated with plantation forestry. Please note that the effects of even-age management and plantation forestry on fire behavior are well established.		thinning planned in the plantations in this project, in both Alternative 2 and 3 as is also reflected in the modeled change to fire behavior. The study also found that fire damage to plantations was strongly associated with damage in the adjacent stand in the direction, which the fire apparently came. Reducing fuels adjacent to plantations will reduce risks to plantations as well. A foreseeable future project, the Westside plantation project will also thin plantations. The commenter used the information about plantations to imply that regeneration harvest-green tree retention treatments will increase fire risk. In fact, analysis shows these treatments will reduce crown fire potential in these units. Forest Health and Resiliency is a Purpose and Need for Action – not an undesirable effect or issue. The units planned for regeneration harvest-green tree retention are already experiencing high levels of mortality and increased decadence. Planting disease resistant species such as sugar pine, ponderosa pine and Incense cedar will improve the resistance of the future stand.
2 8	32* 4*	100 – Vegetation	Please explain "Thin from above (OR)" for sapling/pole-sized young pine stands. Why is OR the preferred method of thinning? Thinning from above sound like high grading. Taking the biggest and the best trees seems in conflict with the purpose and need to build fire resilience into the stands.	Not a cause/effect of this proposal.	Overstory removal is not included in treatments in this proposed action; therefore no discussion of this treatment type is necessary in the EIS.
2 4	33* 8, 17,	100 – Vegetation	This project is estimated to produce 8,860 tons (BDU) of biomass. Will landings be needed to hold this amount of biomass? If so, how much forested acreage will be sacrificed	Not a cause/effect of this proposal.	Alternative 2 would use 38 new landings (approximately 10 acres, assuming ¼ per landing) and 19 existing ones (5 acres).

A	B	C	D	E	F
ID #	**Com-ment #**	**Subject Code**	**Comment (not necessarily verbatim)**	**Issue Statement**	**Comment Disposition**
	23*		to create landings? Landing locations should be no further than ¼ mile from harvest units. Landings further than this greatly increase yarding costs and make harvesting very prohibitive. Insure landing size is adequate to support the proposed harvest systems. If whole tree yarding is proposed make sure landings can accommodate the merchantable and unmerchantable material.		Alternative 3 would use 9 new landings (2 acres) and 11 existing (3 acres). Landings would be located in areas as efficiently and cost effectively as possible.
4	3, 25*	100 – Vegetation	The analysis needs to display how long the treatments will be effective in meeting the designed purpose and need. Commercial thinning is the dominant prescription (Rx) for the commodity removal portion of your project. When developing the prescriptions we ask that you identify the long range desired condition, how long you want the proposed treatments to be effective, and then design the Rx to meet the desired condition and time frame. Stands will probably not be entered again for at least 30-40 years. Design the treatment that allows for fire effectiveness and stand health for at least that time frame. The Forest Vegetation Simulator (FVS) can project timeframe effectiveness.	Not a cause/effect of this proposal.	Vegetation Analysis – The thinning treatments are anticipated to be effective in forest health improvement and fuel reduction for approximately 20 years. The regeneration with green tree retention and shelterwood with green tree retention will likely need follow-up management (thinning) also in 20 years. Growing conditions for residual trees would be improved and sustained over the next 20 years in Alternative 2. Alternative 3 would result in higher tree densities, than Alternative 2, and increasing tree mortality. The Forest Vegetation Simulator (FVS) was used to anticipate the crown canopy closure percentage 50 years after treatments. FVS also indicates that Alternative 2 will produce larger trees faster than Alternative 3.
4	4	100 – Vegetation	One of the design criteria stated all hardwoods that have a reasonable chance of surviving and thriving after stand treatment will be retained. In those areas where hardwoods are retained it will be very important to develop an adequate prescription that will allow for long term hardwood maintenance within the stands. Hardwoods are generally early seral (pioneer) species that tend to be eliminated as stands develop over time. In order to meet the objective of retaining hardwoods, considerable space will need to be left	Not a cause/effect of this proposal.	Alternative 2 will remove more canopy closure than Alternative 1 or 3, providing more space around hardwoods. Alternative 2 will remove approximately 50% of the existing canopy closure in thinning units (except in the shaded fuel break where 60% will be removed and in a portion of intermittent and ephemeral streams where 40% would be removed. Alternative 3 would generally remove approximately 40%

A	B	C	D	E	F
ID #	**Com-ment #**	**Subject Code**	**Comment (not necessarily verbatim)**	**Issue Statement**	**Comment Disposition**
			to provide adequate sunlight, water, and nutrients for the remaining hardwoods. Over the long term, in order for these treatments to be effective a considerable amount of conifer material will need to be removed during project implementation.		percent of the canopy closure in thinning units, and would not remove any canopy closure around intermittent and ephemeral streams. Resource protection measures assure the retention of all hardwoods that have a reasonable chance of surviving and thriving after stand treatments (Chapter 2.4.1, #6)
4	5, 24*	100 – Vegetation	It will be very important during the environmental analysis that the need for GTR be clearly articulated. Identify how treating these stands directly meets the intent of current Land Management Plan direction for the Matrix land allocation. Clearly display the current stand conditions, why regeneration is needed, and what will happen to these stands with no treatment. We know you will get challenged on attempting to do the right thing for the ground and support your efforts at reasonable and prudent land management actions. We are glad to see the proposal for GTR.	Not a cause/effect of this proposal.	Chapter 1.3.1 displays the existing conditions that are not consistent with desired conditions that necessitate the regeneration and shelterwood with green tree retention units. It also clearly displays the need as described in the Forest Plan Vegetation Analysis includes the need for regeneration harvest and seed tree harvest green tree retention treatments.
4	13, 16	100 – Vegetation	We are very aware there will be undue pressure put on the decision maker to not develop any temporary roads for this project. We take the opposite view point. Temporary roads can allow for more effective and efficient management of the publics land. They can provide for better economics and in many cases reduce environmental impacts as compared to alternative treatments such as long skids and large clearings for helicopter landings. It is important an adequate road system be developed and utilized in order to effectively and efficiently harvest the timber from this project… We encourage the building of temporary spurs where feasible to reduce the harvest costs and more effectively treat the land base.	Not a cause/effect of this proposal	Alternative 2 would use 0.3 miles of temporary road to access treatment units. Alternative 3 would not use temporary roads. The impacts of additional skidding distances necessary in Alternative 3 because temporary roads are not used are displayed. The analysis does not show any direct cost impact. Analysis also shows that there would be no difference in the number of stream crossings; Alt. 2 could generate 1.9 tons of sediment annually over the life of the project more then Alt. 3, and that Alt 2 could affect a very small amount (0.4 acres) of wildlife habitat with the construction of the temporary roads.
4	14	100 – Vegetation	We ask that you only close roads that are truly no longer needed for future public access, land management activities, and/or fire suppression. A very careful analysis must occur to insure that future opportunities are not foregone due to road	Analysis Issue #3. Decommissioning roads	Analysis Issue. The need for future use of roads for both fire suppression and vegetation management was considered in determining which roads could be decommissioned after

A	B	C	D	E	F
ID #	**Com-ment #**	**Subject Code**	**Comment (not necessarily verbatim)**	**Issue Statement**	**Comment Disposition**
		400 – Economics & 1600 – Transportation	closures. Closing existing roads is a popular item for current projects. We have seen numerous times where roads have been closed only to find they were actually needed for future options. This has been especially true … for out-year stand maintenance operations. Closing roads can also have negative impacts on future project viability as costs associated with treatment and haul are greatly increased. Please look at all current and future impacts, environmental and operational, before determining which roads actually need to be decommissioned.	can have negative impacts on fire suppression and vegetation management.	use for this project (RAP Sept. 2007, p. 11-26 to 16-26). The benefit that each road provides for fire protection, fuels management, and commodity production was ranked with a score from “0”benefit to a score of “5”. All of the roads that will be closed with this alternative were ranked as 0 for benefit for fire protection, meaning their removal will not significantly affect time of fire response. A ranking of 0 was given to 9.2 miles of the roads for benefit to fuels management a rank of 1 was given to 0.8 miles and a rank of 3 was given to only 3.8 miles. This means that there would be very little impact to fuel management from these closures. These benefits were considered in light of the environmental risks, also rated for each road, before a decision was made that a road could be decommissioned.
4	19	100 – Vegetation 900 – Process	As a forest industry and being professional foresters we are very concerned that good forestry be practiced on the Forest Service land base. We ask you to develop prescriptions that truly meet the particular needs of the stands and land base. We have recently seen too many instances where prescriptions are developed to address public concerns from entities that have personal agendas and biases and have no background or knowledge of the forest environment and ecosystem. Prescriptions developed in these instances do not meet the needs of the stands, land allocation standards and guides, project purpose and need, and long term forest protection and health.	Not a cause/effect of this proposal	Ultimately the decision maker looks at multiple factors in their decision of what activities will be approved; project implementability and public concerns factor into those decisions.
7 7	1 33	100 – Vegetation	The scoping notice states that in general these units are young, single storied pre-harvested units. Please be more specific in the EIS on age class/seral stage of each unit, condition of stands and fire class condition.	Not a cause/effect of this proposal	The Vegetation Analysis provides more specific information on size class and seral stage for each unit, and the conditions of stands, including fuel conditions.

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			How many hazard trees will be felled and removed pursuant to the project? What is the number and location of trees over 20" to be harvested or removed to facilitate roading, yarding or landing activities in the project? What is the proposed location of tractor and cable yarding corridors?		Resource Protection Measure: #27 - Reuse existing primary skid trails and landings whenever possible - will help reduce the need to remove additional trees. Hazard trees are determined on site, given the specific actions being conducted, and can not be specifically quantified, nor located ahead of implementation. Likewise, site specific layout will determine where the four short lengths of temporary road corridors and new landings will be located. Tractor and cable yarding corridors will also be determined during implementation.
7	4, 12, 18	100 – Vegetation	Our organizations recognize and support the general shift towards "thinning from below" in mixed conifer stands and recommend an alternative that includes this practice. We concur that such an approach will better meet the purpose and need of improving stand health and restoring forests to a state in which they are more resistant to natural events.	Desirable effect - purpose for project	Alternative 2, the proposed action includes removing smaller trees by thinning from below-in intermediate harvest on 960 acre, 103 acre of thinning in a shaded fuel break and 14 acres of hand thinning
7	9	100 – Vegetation	What percentage of the project area is in late seral condition?	Not a cause/effect of this proposal	1.4%.
7	31	800 – Air	Please be specific in the DEIS on the effects logging will have on climate change. There are multiple scientific findings that concur with the fact that our forests, especially Pacific Northwest Forests are storing much of the nation's carbon which are mitigating threats to the earths' climate. Please see the following information on line for example: This first article is actually a slideshow entitled "Myths and Facts…Forests, Carbon, and Global Warming written by Doug Heiken of Oregon Wild" http://www.slideshare.net/guestf419ee/debunking-myths-about-forest-carbon-and-globalwarming/ Here are some excerpts from a recent article by Sharon Levy in On Earth (NRDC) on line at: http://www.onearth.org/article/the-giving-trees?page=1 SEE LETTER FOR EXCERPTS	Analysis Issue # 1 Removing trees may affect climate change	Analysis Issue. Air Quality Analysis of the impacts of green house gas and CO2 emissions or sinks at the project level is too low to provide meaningful information to directly translate the information into climate change. Each of the action alternatives will remove biomass as a result of timber harvest and prescribed burning. This will reduce the amount of carbon stored in the treated stands. A portion of the carbon removed will remain stored for a period of time in wood products. Management actions - such as those proposed – that improve the resilience of forests to climate-induced increases in frequency and

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					intensity of disturbances such as fire, and utilize harvested trees for long-lived forest products and renewable energy sources may help sustain the current strength of the carbon sink in U.S. forests (Birdsey et al. 2007). The short-term reduction in carbon stocks and sequestration rates resulting from the proposed project are imperceptibly small on global and national scales, as are the potential long-term benefits.
2	39*	1000 – Information to Note	At first blush, the Salt Project appears to be yet another ill-conceived logging project geared towards supplying saw timber to industry with little thought for community safety or natural resource values.	Not a cause/effect of this proposal.	We hope that on further consideration the commenter will see that providing timber products is one of the three project objectives, but not the only one. The others are: Improve forest health and resiliency and Reduce hazardous fuels conditions and the potential for adverse impacts from wildfire to the National Forest and neighboring land. Design features and mitigations will be carefully planned to minimize or eliminate undesirable effects of these actions.
7	37 thru 42	1000 – Information to Note	When developing alternatives for the Salt Timber Sale and Fuel Reduction project please consider an alternative that does not include: new “temporary” road construction, downgrading NSO habitat, GTR, 40% canopy closure, removal of overstory trees or decadent trees. Please do consider an alternative that: would keep 60% canopy, thin from below and not entering into riparian reserves. Because the taxpayers would be paying for this project please do not allow continued destruction of Late Seral Stage Wildlife habitat or continuing the antiquated process of turning 16 our forests into fiber farms that increases fuels risk and destroys the values that so many Americans hold dear. We would however welcome a project by the agency that concentrates on thinning of small diameter fire-suppressed		Commenter’s comment is simply repeated in its entirety here – we have broken up this comment into individual statements and incorporated them elsewhere in this Appendix. To retain the context we’ve repeated here.

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			stands as a means towards protecting forest health and old-growth characteristics, where timber volume can be a byproduct of variable density thinning aimed at restoring fire-suppressed stands. Please consider a proposed action that would not include large diameter logging in order to ensure widespread support for this project.		
1 3 5 6 7	2 3 7 3 43	1000 – Information to Note	He said he has given a power point presentation to representatives of the Shasta Trinity National Forest to describe the use of these cut-to-length processors and would be available to give the same information to planners for the Salt project. He said Rick Toupin, a logging systems engineer in Region 6 might be a good contact for us for information on how this system has worked on helicopter ground in Oregon and Washington. Thank you for the opportunity to comment, I hope that serious considerations will be taken into the points I have brought up. I would be happy to talk by phone to further explain or clarify anything I have mentioned above. We look forward to working with the Project Team on the Salt Timber and Fuels Hazard Reduction Project. If you have any questions regarding these comments or other information in this letter, please contact me. He said he plans to visit the project area and one of the things he will consider is if the roads are suitable for chip vans. He said logging trucks can travel where it would not be safe for chip vans. Steve said he would be happy to meet with Forest Service staff on site. We appreciate that the agency has generally prioritized forests that have been previously logged for treatment in this project. However, the selection of mature late-successional trees for commercial thinning greatly concerns us. We hope to work collaboratively with the Forest Service to ensure that variable density thinning of small-diameter stands occurs in an environmentally benign manner. We urge the agency to work with us to develop a project that promotes the historic	Not a cause/effect of this proposal	We appreciate the interest in working with the Forest on this project.

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			species composition and fire regime, while avoiding the adverse environmental effects associated road construction and excessive ground-based logging and tractor piling.		
8	6*	1000 – Information to Note	I hope you will rethink this project and take a more comprehensive ecosystem approach. Please provide me with a map of proposed units so I can visit the area. I look forward to receiving a copy of the EA when finished.	Not a cause/effect of this proposal	A map of the proposed units was mailed to the commenter on 4/10/08.
2	14	1000 – Information to Note (Monitoring)	We request that any monitoring data used to substantiate claims made by the Forest Service be included in the DEIS. We remind the STNF of its monitoring obligations in the LRMP.	Not a cause/effect of this proposal.	All Monitoring needs are summarized in Chapter 2. Past monitoring, as available and appropriate are considered in each resource Section.
2	10, 34*	1000 – Information to note.	What is the current road density in the analysis area and project area, and how will the proposed road reconstruction contribute to road density? We are opposed to further road construction and reconstruction on the Forest.	Not a cause/effect of this proposal.	Hydrology Analysis: See the comparison table in the hydrology analysis. Road density ranges from a high of 6.6 mi per square mile in Ditch Gulch-Salt Creek drainage to a low of 2.6 in Salt Gulch-Salt Creek. The current road density will be reduced overall by 1.5 miles/square mile after project completion due to the planned decommissioning in both action alternatives. Road density will be decreased by 1.2 miles per square mile in Ditch Gulch-Salt Creek drainage (the most densely roaded drainage) and by 0.3 miles in Upper Salt Creek-Hayfork Creek. Road reconstruction is defined as road improvements required due to an anticipated increase in traffic, service level or haul capacity. Reconstruction activities may include culvert upgrades, grading, rocking, paving, and drainage. Generally, reconstruction activities take place within the existing road prism so there is no effect to road density. No new system roads will be constructed. The commenter does not explain why they are opposed to further road construction or

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					reconstruction.
9	1	1000 – Information to Note	We have no comments at this time	Not a cause/effect of this proposal.	Statement considered.
3 4	1 2, 20, 26*	1001 – General support for project	The Salt Project sounds like a good proposal for the Hayfork Adaptive Management Area. The area is very much in need of some type of management for forest health and watershed restoration. AFRC wants to go on record in support of the Salt Timber Harvest and Fuels Reduction Project.	Not a cause/effect of this proposal.	Statement considered.
2	21*	1100 – Cumulative Effects	Salt is the sixth in a series of watershed scale projects occurring in a south to north pattern throughout the management unit. The scoping document mentions Post Mountain, East Fork and Upper Dubakella projects in the central portion of the management unit. What are the other two projects? Where are the five projects at in their implementation?	Not a cause/effect of this proposal.	Correction/clarification made concerning the restoration strategy The watershed scale restoration projects on the South Fork Management Unit include: Dubakella, Jones Thin, and East Fork I & II all to the south of Salt; Gemmill and Knob Peak, to the east of Salt; and Post Mountain, to the west of Salt. A map showing these project areas is in the EIS.
2	7	1400 – Fire/Fuels	The residential communities identified in the scoping letter that may be potentially at risk if a wildfire were to occur are from 1 to 3 miles away from the project area. The Forest Service's own research (Cohen) shows WUI areas are generally within ½ mile of National Forest lands. We ask that the analysis include data for all fires in the area for the past decade and which communities have actually been threatened by a previous wildfire.	Not a cause/effect of this proposal.	Fire/Fuels Analysis: The Salt project is not within a wildland urban interface (WUI). Three different WUI's however are within 2 miles of the project area. Treatments of fuels within and around developed areas are not sufficient to insure protection of neighborhoods and individual, privately owned structures. Firebrands from crown fires may be carried long distances, and fires that start from firebrands in or immediately around homes can ignite structures. There have been 15 fire starts within the project area, and numerous fires adjacent to the project – including one in 2008.
2 7	25* 7, 9	1400 – Fire/Fuels	The scoping document states the Salt Project would improve the current fire condition classes of 2 and 3 within the project area that is 4,560 acres. Please provide the fire condition projections for post implementation. Explain reasoning for	Desirable effect - purpose for project	Fire/Fuels Analysis shows that both Alternative 2 and 3 would improve fire behavior for an estimated 20 years, with Alternative 2 providing more benefits. Analysis shows the green tree

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			increase fire risk and susceptibleness to high fire mortality. What fire class condition will GTR units be in post harvest?		retention treatments would reduce the potential for crown fires. The fire condition class in the green tree retention units post harvest could be characterized as condition class 1, because though it is not really a natural state, immediately following treatment fire behavior would be most similar to that which would occur if the forest was in condition class 1. Though a green tree retention unit is not a natural state on occasion naturally there would be a close to stand replacement fire in limited areas with a few residuals.
2	26*	100 – Vegetation	The scoping document states the high fuel hazard occurring in the project area needs to be lowered by removing the number of trees growing in dense stands. It further states that thinning treatments applied to young dense stands meets the need to restore them by “increasing growth” among other conditions. How does increasing growth address the problem that is alleged to be dense stands? It sounds like the Forest Service is proposing to create more tree plantations that will in turn become dense stands that in turn will be cut, and will become dense stands again.	Desirable effect - purpose for project	The growth is in added growth to the trees that are retained. The vegetation analysis used the forest vegetation simulator which shows that by thinning stands the trees that are left add diameter faster than they would otherwise. It also shows that by thinning more on this entry (50% retention in Alternative 2) the trees add more diameter faster than with less thinning at this time (60% retention in Alternative 3).
7	17	1400 – Fire/Fuels	Our organizations are concerned that the scoping notice indicates that the project is designed to greatly reduce the canopy closure of forests in the project area including 40% for shaded fuel break. We believe that most fire science literature confirms our field observations that canopy removal in forest stands often increases rather than decreases fuel hazard issues. Instead of removing overstory forest canopy, we urge the agency to focus on thinning from below in which the larger/older trees are retained and fuel reduction efforts focus on ground and ladder fuels.	Analysis Issue # 2 Canopy removal may increase fuel hazard issues.	Analysis Issue. Fire/Fuels Analysis. The thinning of 103 acres in the shaded fuel break will allow it to be used again as a point of control for wildfire and prescribed burning activities. This will be accomplished by removing most understory vegetation within the approximately 200- to 330-foot fuel break and retaining approximately 40% canopy closure (reduced from current 50-70%). Fire modeling shows that this treatment will reduce the potential for crown fires and reduce fire intensity (flame length) in the fuel break.
4	15	1400 – Fire/Fue	We have seen numerous times where roads have been closed only to find they were actually needed for future	Analysis Issue #3	Analysis Issue. The need for future use of roads for both fire suppression and vegetation

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		ls Analysis	options. This has been especially true during fire suppression activities	Decommissioning roads can have negative impacts on future fire suppression.	management was considered in determining which roads could be decommissioned after use for this project (RAP Sept. 2007, p. 11-26 to 16-26). The benefit that each road provides for fire protection, fuels management, and commodity production was ranked with a score from "0"benefit to a score of "5". These benefits were considered in light of the environmental risks, also rated for each road, before a decision was made that a road could be decommissioned.
2	27*	1500 – Fisheries	What is the current condition of anadromous fisheries and their habitat in the Salt Creek fifth field watershed? Does the Forest Service have actual quantitative population and trend data for all affected species? Please include this information in the analysis that is released to the public for comment.	Not a cause/effect of this proposal.	Fisheries Analysis. Please see the fisheries analysis and the biological assessment for full information. The fisheries analysis area is within the 6th level Salt-Creek-Hayfork watershed within two 7th field watersheds (Ditch Gulch-Salt Creek and Upper Salt Creek-Hayfork Creek Watersheds). Salt Creek, above its confluence with Hayfork Creek supports a limited run of KMP steelhead (USDAFS, unpublished data). Upper Hayfork Creek (above the confluence with Salt Creek) currently supports anadromous runs of Klamath Mountain Province (KMP) steelhead (Oncorhynchus mykiss), Pacific lamprey (Lampetra tridentata), and a remnant run of UKTR Chinook salmon (O. tshawytscha). Historically, spring Chinook salmon utilized the lower reaches of Salt Creek, Big Creek, Tule Creek, and East Fork Hayfork Creek (PWA, 1994), but no appreciable number of Chinook are believed to use Salt Creek currently. Population data available is discussed in the BA, however there is no effect to anadromous fish from proposed activities in this project.
5	4	1500 – Fisherie	The South Fork Trinity River is USEPA 303(d)-listed for temperature and sediment and provides habitat to	Not a cause/effect of	Information noted.

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		s	anadromous salmonids, including Oncorhyncus tshawytscha (chinook salmon), Onchorhyncus kisutch (coho salmon), and Oncorhyncus mykiss (steelhead). In the South Fork Trinity River watershed, coho salmon are a state and federally listed threatened species under the Endangered Species Act.	this proposal	
2 5 7	28* 5 14, 36, 40	1500 – Fisheries, 700 – Watershed, and 600 – Wildlife	Please explain how riparian reserves would be managed in the Salt Project to maintain and restore conditions described in the nine ACS objectives? In December 1998, USEPA approved the total maximum daily load (TMDL) for sediment and temperature in the South Fork Trinity River watershed. In addition, the Basin Plan temperature water quality objective specifies that, "The natural receiving water temperature of intrastate water shall not be altered unless it can be demonstrated to the satisfaction of the Regional Water Board that such alteration in temperature does not adversely affect beneficial uses." The Project should be designed and implemented in a manner that complies with the Basin Plan and should maintain all vegetation that provides shade to water bodies during the critical summer months (Le. June, July, August and September). It appears from the map that some of the GTR units contain riparian reserves. Please be specific, especially within these proposed units as to riparian reserve boundaries. Logging in riparian reserves: LRMP pg. 3-17, “Some of the most productive, sensitive, and diverse sites on the Shasta-Trinity NF are within riparian reserves.” “Riparian areas provide important habitat for fish and other aquatic life-forms, as well as a variety of wildlife species, including the willow flycatcher, fisher and bald-eagle. Riparian areas have high wildlife values because of the close proximity of water and structural diversity of the vegetation.” LRMP pg. 3-18 (riparian reserves) “Ecosystem management programs including wildlife and fisheries are emphasized while forest management activities that emphasis commercial product development and	Key Issue #3 Thinning within riparian reserves may have unintended effects on the watershed, fisheries and wildlife.	Key Issue: Alternative Developed. Alternative 3 was developed, based on scoping comments, and would not thin within riparian reserves. Alternative 3 was designed to provide the decision maker with comparative information with Alternative 2 on potential affects, positive and negative of thinning within a portion of the riparian reserve adjacent to intermittent and ephemeral streams. Analysis Issue and Design Criteria. An Appendix to the EIS describes how each of the nine ACS objectives would be met with the proposed action. No treatment will occur in perennial stream riparian reserves in Alternative 1, 2 or 3. The regeneration harvest with green tree retention and shelterwood with green tree retention will not occur in riparian reserves. Alternative 2, will thin within the portion farthest away from the stream channel, approximately 101 acres of ephemeral or intermittent riparian reserves. No treatments will occur within the Equipment Exclusion Zone (see EIS for definitions) and at least 60% of the overstory canopy will be retained in the riparian reserves. These design criteria will assure shade along stream courses is minimally affected. The analysis shows that there would be no measurable difference in potential sedimentation between the alternatives due to

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			extraction, and other non-dependant resource practices are not emphasized." Shasta-Trinity LRMP, pg. 4-163: Dispersion habitat requirements for the northern spotted owl/late successional dependent species are met by a combination of: 1.) riparian reserves; 2.) 15% OG over entire Watershed within units; 3.) Half of all regenerated stands over time will be 50-60 years old, which on average or better sites results in stands of conifers that will provide for dispersion habitat; an 4.) Over the life of the plan, a substantial portion of the untreated landscape meets dispersion requirements. LRMP pg. 3-27, "Current management direction is to provide a network of suitable habitat to include linkage in the form of dispersal habitat. This direction is being fulfilled with the implementation of the LSR and riparian reserve systems." LRMP pg. 3-27 "The willow flycatcher is a Region 5 sensitive species and a State listed threatened species." "Current management direction is to provide for population viability through the protection of habitat in the form of riparian habitat such as riparian management reserves and wet meadows." As shown in the Shasta-Trinity LRMP riparian reserves are extremely important for multiple reasons including serving as refugia and wildlife corridors. Any activity in riparian reserves must be explained in detail in DEIS, including location, specific conditions, age class, and vegetation type to name a few. Overstory and canopy must be retained in order to provide characteristic moist ecosystem associated with riparian reserves. Please note this as a serious concern. Please do consider an alternative that would not enter into riparian reserves.		riparian reserve thinning. Neither action alternative would effect pool depth or channel form. Thinning within the riparian reserve in Alternative 2 could result in very localized, short-term increases in temperature due to increased sunlight. However, these streams do not support fish and the increase in temperature would not occur in the summer when temperature is a concern because the streams are not watered in the summer. Shading will start to return the first season following implementation.
2	16, 36*	200 – Botany	As stated in our previous scoping comments, the entire geographic range for Nile's madia is in MA-19. Please include any monitoring data in the DEIS for this species, as well as when and where the surveys were conducted. We request the actual dates and units of all surveys be included in the analysis.	Not a cause/effect of this proposal.	See Chapter 3.13 and the Botany specialist report for more information. Niles' madia is a sensitive plant. There are 27 known populations on the Shasta-Trinity National Forest, with the closest known population found within 1 mile of the project area. Field surveys to verify presence or absence of plant species of concern were conducted in the project area on

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					15 days in 2006. All field surveys were performed at a time appropriate to make positive identifications of Sensitive plant species. No Nile's madia were found. Field data can be found at the district/Forest.
7	20	300 – Soils 700 – Watershed	LRMP pg. 4-25 "Give full recognition to the tendency for erosion, mass land movement, and severe watershed damage potential when implementing vegetation management and related land management activities." We are very concerned about the potential impacts of tractor logging systems on soil health and productivity. Please flag this as an issue of concern for the project. The Forest Service may only yard timber if the activity will be "carried out in a manner consistent with the protection of soil." 16 USC §1604(g)(3)(F)(v); 36 CFR §219.27(c)(6). Management plans and projects must "insure that timber will be harvested from National Forest System lands only where-"soil, slope, or other watershed conditions will not be irreversibly damaged." 16 USC § 1604(g)(3)(E)(i). By enacting this section, Congress intended that the Forest Service "provide empirical guarantees that timber harvesting will not damage soils, water conditions, and fish habitats."(Wilkinson and Anderson 1987) Further, the NFMA regulations require the "conservation of soil and water." 36 CFR §219.27. Section 219.27(a)(1) provides that "[a]ll management prescriptions shall-[c]onserve soil and water resources and not allow significant or permanent impairment of the productivity of the land." Section 219.27(b)(5) provides that "[m]anagement prescriptions that involve vegetative manipulation of tree cover for any purpose shall-[a]void permanent impairment of site productivity and ensure conservation of soil and water resources." Further, [c]onservation of soil and water resources involves the analysis, protection, enhancement, treatment, and evaluation of soil and water resources and their responses under	Analysis Issue #4 Yarding with tractors could negatively impact soil health and productivity.	Analysis Issue and Resource Protection Measures – Ultimately became a Key Issues. Several resource protection measures will reduce the effects of tractor yarding (Chapter 2.4, #7 through #16) A unit specific issue was identified by the interdisciplinary team in Unit 6 (3 acres) through the initial EIS analysis process. This unit specific issue was addressed by eliminating that unit in an alternative to the proposed action, Alternative 3, in the EIS analysis. Considering all effects of actions both Alternative 2 and 3 would have moderate impacts to soil productivity. Moderate impacts are measurable and long-term but the effects would be local and soil productivity, with mitigations, would still meet standards See Chapter 3.9 and the Soils resource report for more information.

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			management and shall be guided by instructions in official technical handbooks." 36 C.F.R. §219.27(f). Please note that ground-based logging causes higher incidences of root damage and scarring of residual trees (compared to skyline systems). (Kellog et al). Soil loss with respect to method of harvest is directly related to the amount of soil disturbed and bared by harvest activity, especially the density of skid trails and roads required to access the timber. Megahan (1981) found tractor logging on granitics to result in 28 percent of the soil disturbed, ground cables with 23 percent, suspended cables with five percent and helicopter logging with two percent. Similarly, Swanston and Dyrness (1973) found tractor yarding in granitics to result in 35.1 percent bare soil, hi-lead in 14.8 percent and skyline in 12.8 percent. In a Trinity County study on mixed soil types, skid trails averaged four to eight percent (6-12 km/sq.km) for clearcut areas (Scott et al., 1980). http://www.krisweb.com/biblio/klamath_srcd_sommarstrometal_1990.pdf		
1 3 4	1 4 7	400 -- Economics	Helicopter yarding can be financially unfeasible. Using a cut-to-length processor and pre-bunching the timber for the helicopter yarding can reduce costs of helicopter units by 25-35%. The additional Helicopter portion of the sale will likely push this project over the top by itself, unless the tractor portion of this sale contained timber valuable enough to compensate for it. Helicopter logging has become increasingly expensive and the small amount of volume is not nearly enough for a helicopter to yard profitably. Cable yarding would have the same financial difficulties although it may be less overall in comparison to a helicopter. Helicopter harvesting – desire, as a minimum to average over 10 mbf/acre. The project should have at least 1-2 mmbf of helicopter volume that is mixed with lower cost harvest	Analysis Issue #5. Helicopter yarding can make a unit financially unfeasible.	Analysis Issue. Economic Analysis Design Feature: Based on this comment, and the IDT a cut-to-length processor and pre-bunching in the only helicopter unit in this project, Unit 32 on areas less than 50%; however, only analysis showed that only a portion of this unit could environmentally support this kind of processor because of the steep slopes in the stand and soil effects could have been a concern. For these reasons a mechanical harvester will not be used in Unit 32. Unit 32 is analyzed for helicopter skidding and hand felling. The helicopter unit in the proposed action would be combined with helicopter yarding from

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			systems. In order to capture the highest economic value, the helicopter units should have the most flexibility in yearly operating availability. More value can be captured if helicopter harvesting is not exclusively limited to the height of fire season when helicopters are not as available due to fire suppression needs. Species consideration is also an important factor. Currently white fir and ponderosa pine are low value species and not conducive to helicopter harvesting. Douglas fir has more value and should be the preferred species to be included in helicopter harvesting proposals. Explore options for pre-bunching within the helicopter units and assess as part of the environmental analysis. Helicopter Expertise: Much of the logging system expertise has been lost within the agency. It is recommended that the Forest solicit some advice from the helicopter logging companies concerning the economic considerations listed above.		an adjacent project that is currently being planned (EA planned to be issued in 2008). For this reason in the EIS we will show the project economics of the helicopter unit separately in the economic feasibility analysis. In the Economic analysis it shows that Alternative 2 without the helicopter unit has and estimated sale value of $202,651. With the helicopter unit the estimated sale value a loss with -$8,304. Alternative 3 shows a loss of -$344,445 with out the helicopter unit and a loss of -$567,905 with.
3 4	2 6, 10, 22*	400 – Econom ics	The many types of proposed actions while necessary do have substantial economic impacts on the feasibility of the project in its entirety. It is important to consider the costs of handwork, road decommissioning and reconstruction as they impact the costs of logging and the value of the products being removed. These additional costs added with logging, hauling, chipping and pre/post haul road maintenance for small sized timber of marginal value in today's market is the determining factor for a feasible project. Perhaps consideration should be taken into splitting the Project up and making portions of it Stewardship Contracts, such as the handwork and road decommissioning. This could be added with the plantation thinning for economic incentive. As stands are assessed it will be very important to assess the	Analysis Issue #6 Completing all of the work planned for including mitigations may exceed the cost of the timber products.	Analysis Issue. Economic Analysis This project is not intended to just be a viable timber sale; providing timber products is one of four objectives. As stated in the scoping letter, it is understood that service contracts and appropriated dollars may be required to complete all planned work necessary to meet all the objectives of this project. The precise implementation tools (such as stewardship contracts, timber sales, and partnership projects) will not be prescribed in the EIS but all such tools will be considered for implementation. The analysis shows the estimated cost to implement all of the work in Alternative 2 is $228,000 and $1,117,000 for

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			feasibility of each logging system in relation to volumes per acre, size of trees being removed, distance to landing, species of tree being removed, current delivered log prices, etc. Conventional harvesting (tractor) should have at least 3-5 mbf/acre as a minimum to help pay for associated logging costs. These restrictive limited operating periods will have significant increases in logging costs as contractors cannot afford to utilize very expensive equipment for such a short time period. It is also more difficult to hire employees with such a short guarantee for work. These factors need to be included in your logging cost assessment. During your analysis seriously consider sale economics. Please refer to the September 26, 2006 monitoring meeting documentation concerning harvest systems and the associated figures for viable offerings. We ask that you do an in-depth analysis to see if the commodity removal can offset the cost of removing biomass. If the District desires to have the biomass removed to a processing plant please calculate how much subsidy is required.		Alternative 3.
4	1, 18	400 – Econom ics	Many of our members have their operations in communities within or adjacent to the Hayfork Ranger District and the management on these lands ultimately dictates not only the viability of their businesses, but also the economic health of the communities themselves. We feel this project needs to treat as many acres as possible in order to fully meet your designated purpose and need. We encourage you not to reduce the project (total acreage, total volume, and volume per acre) any further. Industry infrastructure is very important in terms of implementing your projects. This needs to be a consideration when assessing economics and project design. As project size and volumes shrink during the NEPA analysis it may not individually seem to have any impact on industries ability to implement. But cumulatively, as all projects shrink, it has a major impact on the ability to maintain adequate infrastructure to accomplish your land management activities.	Desirable effect - purpose for project	Economic Analysis Alternative 2 would provide a Viable Timber Sale with a positive Total Sale Value of $202,651 (excluding the helicopter unit), and an estimated 11.1 jobs. Alternative 3 would not provide a viable timber sale with a negative total sale value of -$344,445 (excluding the helicopter unit) and an estimated 6.3 jobs.
6	2	400 –	The project appears to be at the half-way point between	Desirable	Information noted.

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		Econom ics	going east to Hwy 5 and going west to Hwy 101. He said he estimates his biomass plant would be approximately 100 miles west. This project is exactly the kind of opportunity he is looking for and said that getting more biomass from federally managed lands will be key to making plants like his and biofuel in general work.	effect - purpose for project	
2 8	12, 35* 5*	501 – Project Objectiv es	Many of the management prescriptions for this project are in wildlife units yet the purpose and need for the project fails to include any wildlife related goals. In addition, the entire project area is in MA-19 that requires specific management objectives for water quality, riparian reserves, old growth, LSR habitat, NSO habitat, key wildlife species, and other resource values. We object to projects being developed in these types of areas that have only a timber output emphasis. When an area is vitally important to non-timber related resources, then project designs should include goals to protect these other resources. Knowing how heavily roaded this area is, more than what is proposed should be done to restore watershed conditions and make it part of the logging project so there is assurance that the work will get done.	Not a cause/effect of this proposal.	It is uncertain what the commenter means by “wildlife units”. There are three Forest Plan land allocations within proposed treatment units including (roaded recreation; commercial wood; and riparian reserve). The commenter is correct in stating that the area is within Management Area 19. Chapter 1.3 of the environmental impact statement describes in detail, with page references, how the purpose and need for this project (the need to improve forest health; the need to reduce hazardous fuel conditions; the need to provide timber products; and the need to retain roads needed for management and decommission those no longer needed) are all desired conditions of the Shasta-Trinity Land and Resource Management Plan as reflected in its goals and objectives and the Middle Hayfork Creek and Salt Creek Watershed Analysis. Additionally, each resource specialist report, including wildlife, identifies relevant Forest Plan goals, objectives, standards and guidelines and considers the project’s consistency with those standards. Chapter 2.4.1 presents numerous resource protection measures designed to protect the resources. The roads analysis report identified the water quality risks of the roads in the Salt project area and identified those that required improvements and those that are no longer needed for management. Those roads that will not be

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					needed for management after the Salt project, but will be used for the Salt project will be decommissioned through the logging operations. The other roads that are not longer needed for management will be decommissioned through a watershed restoration environmental assessment the Forest decided to initiate after the scoping for the Salt project was sent out. The watershed restoration environmental assessment's objective will be focused on restoring watershed conditions through appropriate sediment reduction from roads.
7	10	501 – Project Objectiv es	Why should taxpayers pay for this?	Not a cause/effect of this proposal	The need for doing this work on public forest land is described in Chapter 1 (Section 1.3) of the EIS.
2	8	600 - Wildlife	The scoping document states "LOPs would be applied to avoid direct adverse impacts to spotted owls if territories are occupied." First, we remind the FS that it has a statutory duty under the ESA as well as the FSM to do more than maintain habitat for threatened species. It is supposed to be working to improve habitat as well as conserve the species. Part of this strategy would include avoiding indirect impacts as well as direct impacts. If the project is in NSO habitat we request that LOPs be enforced regardless of occupation status. Project by project the STNF continues to chip away at NSO habitat and then wonders why territories aren't occupied.	Not a cause/effect of this proposal	We know of no research, and the commenter did not supply any, that supports the contention that activities during the breeding season in unoccupied spotted owl habitat would indirectly disturb spotted owls. The USFW service states in their Biological opinion (p.43) that "Noise related disturbance to any northern spotted owls present is very unlikely and thus discountable because a LOP is proposed as part of the proposed action. The LOP would prohibit all activities that create loud noise or smoke (e.g., chainsaws, heavy equipment, etc.) within ¼ mile of spotted owl NR habitat from February 1 through July 10 , unless protocol surveys indicate that nesting owls are not present. With implementation of this LOP, adverse effects to owls resulting from continuous loud noise or smoke is very unlikely and thus discountable." For these reasons the limited operating season will not be applied if surveys indicate that

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					nesting owls are not present and this perceived issue will not be carried through the environmental impact statement analysis. If in comment to the draft EIS the commenter provides research that indicates disturbance can occur in non-occupied habitat this will be considered.
2	13	600 -- Wildlife	The NSO has been identified in the scoping notice as occurring in the area but other key wildlife species also likely occur. We request a substantive analysis be conducted for each species	Not a cause/effect of this proposal.	Wildlife Analysis - The Wildlife, Botanical and Fisheries sections of the environmental impact statement display potentially affected threatened, endangered, sensitive and appropriate management indicator species and analyze potential affects of the proposed action on them.
7	24	600 -- Wildlife	On April 8, 2004, the U.S. Fish and Wildlife Service ("FWS") issued a decision finding that the listing of the Pacific fisher is warranted under the Endangered Species Act due to its imperiled status, but deferring action due to workload constraints (a "warranted but precluded" decision). FWS concluded in 2004 that the West Coast population of the fisher (the "distinct population segment" or "DPS") warrants listing under the Endangered Species Act. 69 Fed. Reg. 18769 (April 8, 2004). According to the FWS, "preliminary analyses indicate West Coast fisher populations ... may be at significant risk of extinction." Id. at 18789. The FWS cites logging as one of the primary causes of fisher decline across the U.S. Id. At 18778. The FWS ultimately concluded that: "Federal, State, and private land management activities may affect key elements of fisher habitat; reduction of any of these key habitat elements could pose a risk to the fisher. Current regulations provide insufficient certainty that conservation efforts will be implemented or that they will be effective in reducing the level of threat to the fisher. We, therefore, believe that the existing regulatory mechanisms are not sufficient to protect the DPS as a whole from habitat pressures." Id. at 18792. The USFWS warranted but precluded findings contain a detailed review on the conservation status of the fisher,	Analysis Issue # 7 Treatments may destroy, alter or fragment forest habitat suitable for fishers.	Analysis Issue. Wildlife Analysis Effects of the project on fisher, including consideration of fragmentation are detailed in the EIS.

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			including a comprehensive analysis of threats to the continued existence of the species. 69 Fed. Reg. 18770, 18770 (April 8, 2004). For example, FWS noted, that "habitat loss and fragmentation appear to be significant threats to the fisher. Forested habitat in the Pacific coast region decreased by about 8.5 million acres between 1953 and 1997." Id. at 18780. "Forest cover in the Pacific coast is projected to continue to decrease through 2050, with timberland area projected to be about 6 percent smaller in 2050 than in 1997." Id. "Thus fisher habitat is projected to decline in Washington, Oregon, and California in the foreseeable future." The FWS status review also discloses that "[v]egetation management activities such as timber harvest and fuels reduction treatments . . . can destroy, alter, or fragment forest habitat suitable for fishers." Id. at 18778. "A number of studies have shown that the fisher avoids areas with little forest cover or significant human disturbance and conversely prefers large areas of contiguous interior forest." Id. at 18773. "The fisher's need for overhead cover is very well documented. Many researchers report that fishers select stands with continuous canopy cover to provide security cover from predators." Id. "Fishers probably avoid open areas because in winter open areas have deeper, less supportive snow which inhibits travel, and because they are more vulnerable to potential predators without forest cover." Id. "Furthermore, preferred prey species may be more abundant or vulnerable in areas with higher canopy closure." Id. In the annual Candidate Notice of Review, issued by the FWS each year, the FWS reiterated the concerns highlighted in the fisher's warranted but precluded determination, noting that "extant fisher populations are small and isolated from one another" and that "[m]ajor threats that fragment or remove key elements of fisher habitat include various forest vegetation management practices such as timber harvests…." 71 Fed. Reg. 53777 (Sept. 12, 2006).		

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			These findings and conclusions must be included in the analysis of the proposed project. The forthcoming NEPA document must address the impacts of harvest activities and road construction on Pacific Fishers.		
2 7	2, 9 24, 41	600 – Wildlife	The cumulative effects of green tree removal from one project to the next as it relates to spotted owl habitat is a concern. The Forest Service has a duty to not only to maintain habitat but to improve it and it is being degraded in the short term. The owl will become extinct before the benefits of the long term habitat improvements are realized. Since this is the sixth project in the watershed and all are likely in NSO habitat, the cumulative effects analysis should take a hard look at this issue. It is imperative that the project avoids removing or downgrading suitable habitat for this federally listed species. We cannot emphasize that point strongly enough. Recent significant information regarding NSO population decline across its range, and the emergence of new threats not contemplated when the Northwest Forest Plan or the Shasta-Trinity LRMP were signed, require the agency to consider and disclose information that contradicts the assumptions of the Forest Plan and the LRMP prior to issuing a decision to implement this timber sale. We urge the agency to avoid actions (such as road/landing construction and commercial thinning) that will remove or downgrade suitable habitat for this federally listed species. When developing alternatives for the Salt Timber Sale and Fuel Reduction project please consider an alternative that does not include: …downgrading NSO habitat.	Key Issue # 4. Treatments may remove or downgrade suitable northern spotted owl habitat or, when considered cumulatively with past projects negatively affect spotted owls.	Key Issue. Alternative 3 was developed, based on scoping comments, and it will not remove or downgrade Northern Spotted Owl Habitat. Alternative 3 was designed to provide the decision maker with comparative information with Alternative 2 on potential affects to spotted owl habitat. The wildlife analysis shows the following. No critical owl habitat or high quality nesting and roosting habitat would be affected in Alternative 2 or 3. Alternative 2 would remove 4 acres of foraging habitat (Portion of Unit 37), which is 0.1% of the foraging habitat available in the owl action area. It would downgrade 28 acres of moderate quality nesting and roosting habitat (Portions of Units 33C and 32) which is a fraction of the available moderate quality nesting and roosting habitat in the owl action area. Alternative 3 would not remove or downgrade any habitat. The Biological Assessment (p. 16 of 27) considers cumulative effects of past, present and future action, in conjunction with the actions of this proposal. It says that the past activities have led to the current conditions in the project area and states that while the project area “meets the 11-40 condition of owl connectivity habitat, they are currently so dense as to prohibit the free movement of owls.”
2	3	600 –	Deer in the area have declined because of high grading.	Not a	This comment was mentioned in a phone

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		Wildlife		cause/effect of this proposal.	conversation, and was not repeated in their letter. It was not stated as a cause or as an effect of our proposal. Additionally there was no supporting information or basis for this statement given. For these reasons, no further analysis is needed.
2 7	15 25	600 – Wildlife	Regarding MIS, we also remind the FS that the LRMP and accompanying EIS, as well as the NWFP, clearly identifies which MIS should be used for each habitat assemblage. Lately the STNF has been using BBS data exclusively for MIS analysis and we object to this inadequate level of analysis that has been struck down by the courts in the Ninth Circuit. All project analyses that continue to violate the LRMP will be challenged. The forthcoming NEPA document needs to analyze and disclose the potential impacts of the project on Management Indicator Species (MIS). The DEIS should include MIS Assemblages such as the Late Seral, Multi-Habitat, Hardwood Assemblage, the Snag and Down Log Assemblage and the Riparian and Aquatic Assemblages. The role of management indicator species in National Forest planning is described in the 1982 implementing regulations for the National Forest Management Act (NFMA) of 1976: “In order to estimate the effects of each [Forest Plan] alternative on fish and wildlife populations, certain vertebrate and/or invertebrate species present in the area shall be identified and selected as management indicator species and the reasons for their selection will be stated. These species shall be selected because their population changes are believed to indicate the effects of management activities. In the selection of management indicator species, the following categories shall be represented where appropriate: Endangered and Threatened plant and animal species identified on State and Federal lists for the planning area; species with special habitat needs that	Not a cause/effect of this proposal.	The Shasta-Trinity LRMP states that the Forest is to “use appropriate indicator species or habitat components to represent the assemblage” (USDA 1995, pages 5-16). The project file will include a management indicator species assemblage (MIA) report. The findings of this report are disclosed in the EIS.

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			may be influenced significantly by planned management programs; species commonly hunted, fished or trapped; nongame species of special interest; and additional plant or animal species selected because their population changes are believed to indicate the effects of management activities on other species of selected major biological communities or on water quality [36 CFR 219.19 (a)(1)].” (emphasis added)		
2 7	19 28	600 – Wildlife	The LRMP includes a forest-wide standard regarding migratory birds on page 4-29. How will the Salt Project comply with this standard? What mitigation measures will be enforced to protect migratory birds during the breeding, nesting, and fledgling periods? Does the STNF have a MOU in place adhering to EO 13186? The regional decline of migratory birds is a significant issue for this project. Numerous studies have reported local and regional trends in breeding and migratory bird populations throughout North America (e.g., DeGraaf and Rappole 1995, Sauer et al. 2004). These studies suggest geographically widespread population declines that have provoked conservation concern for birds, particularly neotropical migrants (Askins 1993, Terborgh 1989) The 2005 report from the Klamath Bird Observatory entitled Local and Regional Trends in Breeding and Migratory.	Analysis Issue # 8 Thinning within the project area and when considered cumulatively with other effects to neotropical bird habitat may contribute to declining populations.	Analysis Issue. Wildlife Analysis in EIS and Landbird Report in project file. The Forest wide standard and guideline the commenter mentions states: “Manage habitat for neotropical migrant birds to maintain viable population levels.”
2 7	22* 29	600 – Wildlife	What are the cumulative effects to the Salt Creek watershed of these past 5 projects? The scoping document states “Salt strategically connects fuels treatments from Post Mountain, East Fork, and Upper Dubakella.” What level of fragmentation is occurring throughout the Salt Creek watershed from the previous five projects? We are very concerned with connectivity within the project area and all those species are reliant on forest connectivity. The DEIS should address the current functioning of LSR’s near the project area. Due to lack of recovery plan, continued degradation to habitat, and range-wide bared owl encroachment, connectivity for spotted owls is a particular	Analysis Issue # 9 Treatments, when considered cumulatively with past projects in the watershed may fragment habitat.	Analysis Issue. Wildlife Analysis (cumulative effects) – habitat fragmentation is considered throughout the wildlife analysis in the EIS.

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			concern.		
2 8	30*, 37* 2*	600 – Wildlife	How much of the 1,210 acres proposed for harvest is in LSR and/or old growth habitat? How many acres are in critical Spotted owl habitat? Eliminating remnant old growth in the AMA would appear to be a LRMP violation. GTR prescription is inappropriate…and ignores direction in the NWFP ROD citing the need to retain fragmented patches of old growth within Matrix lands .	Not a cause/effect of this proposal.	Wildlife Analysis. There are no treatments proposed in LSR's or old growth habitat, therefore this project will not harvest within LSR or old growth habitat. None of the proposed treatments are within Management prescription VII in the LRMP (Late-successional reserves - LSR, managed late-successional areas, and other threatened, endangered or sensitive species prescription areas). There is no critical spotted owl habitat in the project area. There are no treatments proposed in old growth (defined as all size class 4 (or greater) stands with a canopy closure of G or N (Biological Assessment page 21 of 27 – see page 9 of 27 for full code descriptions). Total late-successional conditions in the Salt Creek Watershed are currently well above the 15% standard and guideline threshold of concern (approximately 78% of federal forest land in the watershed).
2 7 8	38* 22, 26 3*	600 – Wildlife 300 – Botany 1500 - Fisheries	We are also concerned about the lack of quantitative and trend data for MIS and TES species throughout the Forest. Continued logging and removal of habitat without population/trend data can't ensure species survival. LRMP pg. 3-26 "Forest Service activities and programs are intended to assist in the recovery of T&E species and to avoid actions that may cause a species to become threatened or endangered." LRMP pg. 3-27, "Future management goals for T&E species will be directed towards (1) reaching viable populations in the case of T&E species; and (2) maintaining or if possible, increasing existing viable populations of sensitive species." LRMP pg. 5-17 of Table 5-1 [Monitoring Action Plan] states under Wildlife –	Analysis Issue #10 Analysis Issue Vegetation treatments may impact MIS and TES species habitat and ability to survive.	Analysis Issue. The wildlife, fisheries and botany analysis's considered the viability of all MIS and TES species that could be affected by the proposed actions and concluded that actions would not likely affect viability.

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			Threatened, Endangered and Sensitive species (TE&S) Goshawk: Activity: "Determine population and habitat trends". Under Techniques: "Identify and document habitat conditions in nest groves; survey habitat and determine occupancy and reproductive success." Page 5-18 under Furbearers: Activity: "Determine population and habitat trends within designated fisher and pine marten habitat." Page III-122 of the LRMP FEIS states "Six of the Forest' threatened, endangered, and sensitive (TE&S) wildlife species have been selected as management indicators…." Page III-27 continues, "Forest personnel will continue to survey for additional populations and habitats of TE&S species… These surveys will intensify as management activities continue on the Forests. Additional inventory and/or surveys will be necessary to determine location, distribution, and habitat requisites of additional species and populations." The Shasta-Trinity National Forest Land and Resource Management Plan (LRMP, 1995) identified nine habitat assemblages as management indicators for terrestrial wildlife LRMP pg. 4-29, "Manage habitat for neotropical migratory birds to maintain viable population levels." The agency must provide information describing population numbers, locations, and trends for key wildlife species, and monitoring data to determine that the proposed action would maintain numbers and distribution of these species sufficient to ensure long-term viability. We believe it is necessary for the DEIS to disclose information and analysis regarding MIS population trends in these watersheds. Please note that in Utah Environmental Congress v. Zieroth, 2002 WL 406715; --- F.Supp.2d (D. Ut. 2002) the Federal District Court held that Service's use of habitat trend data rather than actual or trend population data to analyze effect of proposed timber clearing project on management indicator species was insufficient to comply with requirements of National Forest Management Act (NFMA). The DEIS establishes that the Forest Service is relying on MIS habitat modeling and not conducting on the ground surveys as required by NFMA. The National Forest Management Act (NFMA) imparts on the Forest Service a substantive duty to provide for the diversity of plant and		

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			animal communities on National Forests. 16 U.S.C. § 1604(g)(3). To achieve this goal, the regulations implementing NFMA specify that the agency ensure that viable populations of native animals are maintained by monitoring the impacts of the Forest Plans on selected MIS. 36 C.F.R. § 219.19(a)(6). The Forest Service is required to determine the effects of the timber sale on MIS through the analyses put forward in the DEIS and the Wildlife Biological Assessment/Biological Evaluation. The Biological Evaluation (BE) is required to "ensure that Forest Service actions do not contribute to loss of variability of any native or desired non-native plant or contribute to animal species or trends toward Federal listing of any species," and to "provide a process and standard by which to ensure threatened, endangered, proposed, and sensitive species receive full consideration in the decision-making process." F.S.M. § 2672.41. To accomplish this task, BEs are required to assess cumulative effects of the proposed activity in relationship to all past, present, and reasonably foreseeable future actions regardless of what agency (Federal or Nonfederal) or person undertakes such other actions. 40 C.F.R. § 1508.7; F.S.M. § 2672.42. The findings of the DEIS and Wildlife BA/BE must provide the decision maker and the public with enough information to conclusively know that the project will have no significant effect on threatened, sensitive, and management indicator wildlife species. 40 C.F.R. § 1508.27. Please do not fail to substantively address the cumulative watershed effects of all actions in the affected watersheds and the impact on MIS by discounting cumulative impacts as individually minor impacts without examining their collective significance. This duty to monitor management indicator species is non-discretionary. "Population trends of management indicator species will be monitored." 36 C.F.R. § 219.19(a)(6). The Forest Service must constantly monitor the Shasta-Trinity National Forest Land and Resource Management Plan's (LRMP) impact, including the impact of specific management actions, so that compliance with the Forest Plan is achieved		

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			and any needed revisions are ascertained. Inland Empire Public Lands Council v. United States Forest Service, 88 F.3d 754, 760 n.6 (9th Cir. 1996). In attempting to shirk its non-discretionary duty to survey, the USFS is fond of contending that Inland Empire only requires MIS population survey information when there is not enough underlying data to support habitat analysis. While this contention is incorrect and the duty to monitor (from both NFMA and the LRMP) is non-discretionary, even using the Forest Service's reading of Inland Empire we find that population surveys are required here. Lastly, the FS may wish to re-familiarize itself with the holding in KS Wild v. USFS, Eastern District of California 2004, (which is binding precedent for this project) in which the federal district court held that the Klamath National Forest violated its LRMP, and NFMA, by failing to monitor and survey for snag associated MIS species. The Rx [GTR] leads to further MIS and Endangered Species problems.		
7	21, 39	600 – Wildlife and 100 -- Vegetation	Our organizations are very concerned about removing decadent fire resistant old growth trees under the guise of forest health. Healthy forests contain do contain some level of decadence, multiple species rely on old growth trees and these trees are also future sources of snags. Please be specific in the DEIS as to the effects of removing this important ecological component and also how removing decadent trees affects climate change. Our organizations have thousands of members and supporters who would be outraged to find that it is the American people who would be paying for forest destruction on public lands and that despite public opinion and need to protect these legacy trees the agency continues to target old growth ecosystems. When developing alternatives for the Salt Timber Sale and Fuel Reduction project please consider an alternative that does not include: … removal of overstory trees or decadent trees.	Analysis Issue #11 Removing old legacy trees may impact wildlife habitat including future snag habitat.	Analysis Issue. Wildlife and Vegetation Analysis Neither action alternative (Alts 2 or 3) removes old-growth habitat. The intermediate thinning in both Alternative 2 and 3 would thin smaller trees that are competing with the larger trees for limited water, sunlight and nutrients. The thinning treatments would improve, to differing degrees, the ability of the remaining trees to withstand future drought conditions, insect attacks and fires. Generally the largest healthiest trees would be retained and snags greater than 19" (Chapter 2.4, #4). Some large trees may be removed if they are in skid trails, temporary road locations, immediately adjacent to a larger healthier tree or in landing locations.

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					We do not disagree that healthy forests can contain some level of decadence. The District Ranger asked the Silviculturist to propose regeneration harvest only in those stands that could not benefit from other silvicultural prescriptions, and that needed to be treated in this management cycle. These stands are highly susceptible to increased activity from insects and diseases. Alternative 2 would remove old, over-mature trees (from a timber production standpoint) from 27 acres within the Commercial Wood Products management prescription of the Forest Plan using a regeneration harvest-green tree retention prescription. These trees will provide a timber product, which is one of the objectives of this project, as well as regenerate the stand with insect and disease resistant species. Alternative 3, would not include green tree retention – regeneration harvests. The shelterwood-green tree retention prescription on 31 and 30 acres respectively in Alt. 2 and 3, will generally leave the large healthy trees, however some large unhealthy trees may be harvested.
7	2, 38	600 – Wildlife Habitat 100 – Vegetation	Our organizations highly recommend leaving at least 60% canopy on Northerly slopes and 80% on Southerly slopes [in intermediate thinning units]. When developing alternatives for the Salt Timber Sale and Fuel Reduction project please consider an alternative that does not include: …, 40% canopy closure, …. Please do consider an alternative that: would keep 60% canopy…	Key Issue #2 Retaining less then 60% canopy closure after thinning could affect wildlife habitat. [Note: some inference was used to	Key Issue: Alternative Developed. Alternative 3 would retain at least 60% canopy closure in treated units. Analysis Issue. The EIS fully analyzes this issue. The commenter's note concerning 80% canopy closure retention on southerly slopes had no citation or supporting evidence why this was desirable, or even within the range of historic variability. Stands with 80% canopy closure would easily carry canopy fires and would not meet the objective of reducing hazardous fuel conditions and the potential for

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				establish cause and effect]	adverse impacts from wildfire to the National Forest and neighboring land. The commenter's request for developing an alternative (see ID#7, Comment #38) did not include the retention of 80% canopy closure. For these reasons it will not be further analyzed.
7	27	600 – Wildlife, 200 – Botany, and 1500 – Fisheries	The scoping notice contains no discussion or information whatsoever about the influence of surveys on project layout and design. The forthcoming NEPA document must disclose the timing, results and influence of surveys. Please be advised that pursuant to the 2001 S&M ROD the government placed some hard-to survey species in a category that required strategic surveys by a certain date, and if/when that deadline was missed, the USFS is required to stop logging LSOG forests OR complete "equivalent effort surveys." Currently Equivalent Effort Survey are required for Nine species: Lichens: Bryoria subcana, Tholurna dissimilis; Bryophytes: Kurzia makinoana, Marsupella emarginata v. aquatica, Orthodontium gracile, Tritomaria exsectiformis; Mullusks: Deroceras hesperium, Hemphillia pantherina, Monadenia chaceana. The Forest Service must not rely on the illegal non-NEPA plan amendment "of the 2003 Annual Species Review" to avoid surveys that were anticipated by the Northwest Forest Plan and the Six River LRMP. The Forest Service cannot rely on non-NEPA documents to significantly amend the Northwest Forest Plan and the LRMP so-as to expedite regeneration logging. See KS Wild v. Boody, 9th Cir 2006. No. 06-35214 (CV 03-3124, District of Oregon). Please be advised that should this project rely on the Bush Administration's illegal 2007 ROD eliminating the survey and mange program that it is highly likely that implementation of your project will be enjoined by a federal court. We would prefer that the agency take the necessary survey and manage steps to ensure that this project is not halted by the foreseeable injunction of the Bush Administration's 2007 ROD.	Not a cause/effect of this proposal	Wildlife, botany and fisheries analyses disclose the surveys conducted.
2	5	700 –	Please identify the watersheds involved in this project; their	Not a	Watershed Analysis discusses the current

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7	5	Watershed	current level of degradation; and how the Salt Project will help achieve the restoration strategy. Currently, the majority of watersheds on the STNF are in poor health and in a degraded condition. Are the project watersheds impaired? Are these key watersheds? How much of the analysis area has been clearcut? Will GTR lead to increases in peak flows?	cause/effect of this proposal.	watershed conditions in the analysis area. Chapter 3.10.2and 3.10.3.
2 7	6 15	700 – Watershed 1500 – Fisheries	The STNF continues to propose large timber harvests that require roads and/or landings that contribute to sedimentation and further degradation to riparian areas and the watershed. Often claims are made that these projects are necessary to "restore" the watershed when in fact they continue to degrade the watershed for up to 20 years. The FS often makes claims these are "short-term" impacts. We disagree that impacts lingering for decades are short-term, especially for the wildlife and fisheries dependent upon the watershed. The other five projects should be included in the analysis stating at what level of implementation they are at; if any water quality monitoring data been obtained for them; and how the Salt Project will contribute in direct and indirect impacts to the current condition. The forthcoming EIS should disclose impacts of other projects in the area as this is one of multiple projects in the area that would be proposing large amounts of tractor logging, road construction, entering riparian reserve and building new landings. Please disclose if some or all of these projects are likely to increase sediment into stream courses. The fact that so many timber sale projects are scheduled increases the cumulative impact risk, the DEIS should disclose future, past and present projects in as much detail possible.	Analysis Issue #12. Landings and use of roads for this project could contribute to sedimentation and cumulative impacts leading to degradation of riparian areas and the watershed.	Analysis Issue. Hydrology Analysis Chapter 3.10.3. Analysis shows that neither Alternative would add any stream crossings. Alternative 2 could contribute 1.9 tons of sediment annually over the life of the project (3-4 years), while Alternative 3 could contribute 0.2 tons. The increase in sedimentation would steadily decline in the years following harvest. Both alternatives would reduce sedimentation in the long-term by 45.9 tons annually. Cumulative effects are a key consideration in the analysis of potential effects for all of the resources. The impacts of other projects are considered throughout Chapter 3 by resource and Appendix B displays the past, present and future activities in the Ditch Gulch-Salt Gulch and Salt-Hayfork 7th level watersheds.
2	23*	700 – Watersh	The Salt Project is located within the upper reach of the Salt Creek fifth field watershed. What is the current water quality	Not a cause/effect of	Watershed Analysis. Chapter 3.10.3. The cumulative effects boundary for this project

A	B	C	D	E	F
ID #	**Com-ment #**	**Subject Code**	**Comment (not necessarily verbatim)**	**Issue Statement**	**Comment Disposition**
7	19	ed	in the fifth field watershed? Will the fifth field watershed be used as the analysis area for the Salt Project? LRMP pg. 4-25 Under Standards and Guidelines Developed Through the Forest Planning Process that Apply Forest-wide – Soils and Water – "Analyze each land disturbing project for it's effect on the appropriate 2nd or 3rd order watershed (average size about 1,000 acres), to prevent excessive cumulative impacts on stream channel condition and water quality." "Management activities within 5th order watersheds, which are in condition class 3, will emphasize watershed improvement and overall reduction in ERA levels."	this proposal.	is the Upper Salt Creek-Hayfork Creek and Ditch Gulch-Salt Gulch 7th level watersheds. This is an appropriate cumulative effects boundary For the following reasons. The Salt project is at the headwaters (upper 1/3) of both of these 7th order watersheds and effects that occur in the project area would not be measurable or detectable further downstream outside of these two watersheds. Since effects of the project can not be measured outside of these two 7th level watersheds there would be no cumulative effects to our actions outside this boundary. The two 7th order watersheds are also of appropriate sizes (9,766 acres and 5,081 acres) to analyze equivalent roaded acres (ERA). Larger areas were discussed as appropriate for context (examples: Telephone fire and TMDL discussion). Alternative 2 would thin 52 acres in the Rattlesnake Creek watershed and Alternative 3 would thin 51 acres. This represents less than 0.7% of the watershed area. The proposed activity is thinning an existing fuel break. No temporary road construction is proposed. No hauling over roads in the Upper Rattlesnake Creek watershed is proposed and no road decommissioning would be implemented. As a result, there would be no discernible direct, indirect or cumulative effects for Upper Rattlesnake Creek. For this reason modeling was not done on the Upper Rattlesnake Creek watershed.
5	1, 2	700 – Watersh	Pursuant to the Management Agency Agreement (MAA) between the U.S. Forest Service (USFS)	Not a cause/effect of	Watershed and Soils Analysis: Chapter 3.10 and 3.9.

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ID #	**Com-ment #**	**Subject Code**	**Comment (not necessarily verbatim)**	**Issue Statement**	**Comment Disposition**
		ed 300 – Soils	and the California State Water Resources Control Board, your agency will facilitate early State involvement in the project planning process for all projects that have a potential to impact water quality. State law assigns responsibility for protection of water quality within North Coast watersheds to the Regional Water Quality Control Board, North Coast Region ("Regional Water Board"). All forest projects must comply with all substantive and procedural requirements of the Porter-Cologne Act (California Water Code §13000 et seq.) and the Water Quality Control Plan for the North Coast (Basin Plan). Additionally, the Salt Timber and Fuels Hazard Reduction Project must comply with the Regional Water Board's Categorical Waiver For Discharges Related to Timber Harvest Activities On Federal Lands Managed by the United States Department of Agriculture, Forest Service in the North Coast Region, Order No.R1-2004-0015. The full text of Order R1-2004-0015, a guidance document, and pertinent forms may be accessed at the following web address: http://www.waterboards.ca.gov/northcoastlpublications_and_forms/available_documents/timber_waiverl Order R1-2004-0015 requires that, prior to commencement of timber harvest activities, the USFS shall, in writing, file with the Regional Water Board a Notice of Intent (NOI), in which the USFS certifies they understand and intend to comply with all criteria and conditions of this Order and applicable water quality regulations.	this proposal	The watershed analysis displays the regulatory framework for the water resource including California State Water Resource Control Board requirements. The scoping letter initiated early State involvement in planning for this project. The project is in compliance with the Clean Water Act.
5	3	700 – Watershed	One of the more important eligibility criteria is B.2., which states: "2. The USFS has conducted a cumulative watershed effects (CWE) analysis of the proposed Project and included specific measures in the proposed Project needed to reduce the potential for CWEs in order to assure compliance with applicable water quality control plans. The scale and intensity of cumulative watershed effects (CWE) analyses will be commensurate with the scale and intensity of the Projects seeking coverage under this waiver. Cumulative watershed effects analyses may range from qualitative reasoning to application and	Not a cause/effect of this proposal	Comment noted. Cumulative watershed affects are considered in the analysis.

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ID #	**Com-ment #**	**Subject Code**	**Comment (not necessarily verbatim)**	**Issue Statement**	**Comment Disposition**
			interpretation of quantitative models."		
5	6	700 – Watershed	Issues that should be addressed in the environmental document are the proposed Project's compliance with the Water Quality Control Plan for the North Coast Region (Basin Plan) and Order R1-2004-0015, timing of the project implementation, cumulative watershed effects, yarding methods, proposed activities within riparian reserves, identification of areas of geologic concern, and detailed mapping of project area activities. Additional issues that should be addressed in the environmental document include: wet weather operations, erosion control on roads and landings, long term road maintenance for both system and non-system roads, any mitigation measures to offset cumulative watershed effects, and service areas for yarding equipment.	Not a cause/effect of this proposal	Comment considered. The approved resource protection measures for this project are displayed in Chapter 2 and potential affects, in light of these protection measures are considered.
7	30, 37	700 – Watershed, 1500 – Fisheries, 300 – Soils, 600 – Wildlife	We cannot overstate our extreme concern regarding the long-term impacts to soil health and hydrology from the reconstruction and construction of new (temporary) logging roads in the project area. We encourage to the Forest Service to develop and implement an action alternative that does not require the proposed new road construction and reconstruction. Clearly the vast majority of the project can be accomplished without resorting the construction of yet more logging roads in these watersheds. The small minority of units that "require" new road construction should be altered to hand work units, helicopter units, prescribed burn units, or simply deferred from the project. Please see peer-reviewed article by Trombulack and Frissell (2000) detailing some of the negative impacts of road construction and use on Terrestrial and Aquatic ecosystems. The forthcoming DEIS should address and avoid the harmful impacts detailed in this study. SEE LETTER FOR ABSTRACT When developing alternatives for the Salt Timber Sale and Fuel Reduction project please consider an alternative that does not include: new "temporary" road construction…	Key Issue #5 Construction of new temporary roads may negatively impact hydrology and soil health and could impact wildlife	Key Issue: Alternative Developed. No new system roads will be constructed. Alternative 3 will address this comment by not constructing any temporary roads. Trombulak (note this is the correct spelling) and Frissell's 2000 paper states that Roads of all kinds have seven general effects. Where those effects are addressed in the analysis is noted 1.mortality from road construction (Chapter 3.19.2, 3.13), 2.&3 mortality from collision with vehicles (Chapter 3.6), 4. alteration of the physical environment (Chapter 3.9, 3.13), 5. alteration of the chemical environment (Chapter 3.10), 6.spread of exotics (Chapter 3.14), and 7.increased use of areas by humans (not open to the public). The paper concludes that "Thus, it is critical to retain remaining roadless or near roadless portions of the landscape in their natural state.

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ID #	**Com-ment #**	**Subject Code**	**Comment (not necessarily verbatim)**	**Issue Statement**	**Comment Disposition**
					Because of the increasing rarity of roadless areas…" The Salt project area is not in or near roadless areas. Analysis shows that neither Alternative would add any stream crossings. Alternative 2 could contribute 1.9 tons of sediment annually over the life of the project, while Alternative 3 could contribute 0.2 tons. Both alternatives would reduce sedimentation in the long-term by 45.9 tons annually. Temporary road construction with Alternative 2 would affect approximately 0.4 acres of wildlife habitat (which is smaller in size than a 1.3 acre football field).
2	1	900 – Process	Doing an EIS for this project is appropriate.	Not a cause/effect of this proposal.	An EIS will be prepared.
2	4	900 – Process	Request our November 8, 2006 comments be incorporated into the record.	Not a cause/effect of this proposal.	The comments are included in the project file and were consideration for identification of issues.
2 7	17 32	900 – Process	Please state clearly in the DEIS which NFMA regulations are being used in the development of the Salt Project. We repeatedly ask this question for all projects and the FS continues to refuse to respond, which is a NEPA violation. The FS has no excuse for withholding this information. The only way the public can ascertain if the regulations are being complied with is if the FS identifies them. This is not an unreasonable request. NEPA requires that the Forest Service provide accurate and timely information to the commenting public and the decision maker. "NEPA procedures must insure that environmental information is available to public officials and citizens before decisions are made and before actions are taken." 40 CFR §1500.1(b). " ... NEPA requires consideration of the potential impact of an action before the action takes place." Tenakee	Not a cause/effect of this proposal.	Within each resource specialist report in the project file the regulatory framework, including NFMA, for that resource is identified. An assessment of the consistency with the NFMA regulations is included as appropriate for the resources as well in the specialist reports and in the DEIS. The National Forest Management Act (NFMA) requires that projects implemented by the Forest Service be consistent with the relevant forest plan. The Salt project is consistent with the Shasta-Trinity Land and Resource Management Plan, as described in the EIS and supporting analyses."

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ID #	**Com-ment #**	**Subject Code**	**Comment (not necessarily verbatim)**	**Issue Statement**	**Comment Disposition**
			Springs v. Clough, 915 F.2d 1308, 1313. NEPA is primarily a procedural statute: It mandates a particular process but not necessarily a particular result. Inland Empire Public Lands Council v. USFS, 88 F.3d 754, 758 (9th Cir. 1996). This process must proceed without undue bias from the action agency and ultimate decision maker. The CEQ regulations warn that a NEPA document may not be used to justify a decision already made. 40 CFR §1502.2(g). NEPA §1506.6(a) requires that the Forest Service: "Make diligent efforts to involve the public in preparing and implementing their NEPA procedures" and the procedural requirements of NEPA must be strictly interpreted. California v. Block, 609 F.2d 753, 760 (9th Cir. 1982).		
2	18	900 – Process	In our comments on the Jones Thin project we stated some of the units in that proposal were originally in the Upper Dubakella project that we stopped on appeal. To date that project has not yet come back out. We have similar concerns about the Salt Project having some units that may have been originally proposed in the Upper Dubakella project. NEPA forbids breaking up larger projects into smaller components in order to evade NEPA analysis or dilute environmental impacts.	Not a cause/effect of this proposal.	There are no units within the Salt project that were in the original Upper Dubakella project. A map in the project files shows that these project areas are adjacent to each other but do not overlap.
2	20*	900 – Process	Is the Forest Service considering fuel hazard reduction, road restoration, timber commodity outputs and plantation thinning as components of the watershed level restoration strategy? Has or will the watershed level restoration strategy be revised to reflect these proposed changes?	Not a cause/effect of this proposal.	The watershed restoration strategy is conceptual; it is an evolving strategy that is not fixed but has been and will continue to be modified collaboratively with stakeholders over time. The Forest is considering these project actions because as is explained in Chapter 1 of the EIS these actions are needed to move the existing condition toward the desired future condition as described in the Forest Plan and the Middle Hayfork Creek and Salt Creek Watershed Analysis.
2	24*	900 – Process	Will the same analysis area be used for all resource values? We encourage the Forest Service to choose one analysis	Not a cause/effect of	Each of the resource analyses will describe the geographic and temporal scope that is

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ID #	**Com-ment #**	**Subject Code**	**Comment (not necessarily verbatim)**	**Issue Statement**	**Comment Disposition**
			area for all resource values.	this proposal.	appropriate to describe current resource conditions and potential direct, indirect and cumulative effects to that particular resource. The effects area for a particular resource is strongly related to the science (biology, geology, ecology) of that resource and therefore may appropriately vary from resource to resource. The effects area for direct and indirect effects may be different than the cumulative effects analysis area for a single resource as well. We have considered the commenter's suggestion but for the reasons described here will not use one analysis area for all resources.
2	29*	900 – Process	For clarification, we point out that footnote 7 in the scoping document refers to a paper and not the Shasta-Trinity LRMP for Prescription VIII.	Not a cause/effect of this proposal.	Correction noted.
2	40	900 – Process	Please keep the Conservation Congress and CBF on the mailing list for this project and forward a copy of the DEIS to our office upon its release. We also request that copies of the BE/BA, MIS Report, Hydrology Report, Fisheries Report, and other analyses be included in the DEIS for public review.	Not a cause/effect of this proposal.	The appropriate portions of the mentioned reports will be incorporated into the EA which will be mailed to the commenter and available on the Shasta Trinity public web site. All of the reports mentioned will be part of the project file.
4	11	900 – Process	Carefully assess and review proposed restrictions and mitigation items. It must be clearly documented they are needed.	Not a cause/effect of this proposal.	All design criteria and mitigation measures will be carefully reviewed for need, implementability and effectiveness.
4	12	900 – Process	We ask you not consider an alternative in detail that deals with diameter limits. This would be counterproductive to your employee's time during the NEPA analysis. Diameter limits are arbitrary designations that do not have any silvicultural merit. They are counterproductive to meeting your identified purpose and need statements. AFRC does not and will not support diameter limits as they are not compatible with your current land management goals for this project area.	Not a cause/effect of this proposal.	None of the alternatives have diameter limits.
4	21*	900 – Process	The primary purpose of this project is to reduce the high fuel hazards present within the project area. The intent is to improve the fire condition class within the project area. Other objectives include restoring forest health to some of the stands and providing connectivity to previously treated	Not a cause/effect of this proposal	The Forest did carefully consider using the HFRA authorization for this project and that assessment is in the project file. For a number of reasons, including the multiple objectives for this project and the fact the project is not a

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ID #	**Com-ment #**	**Subject Code**	**Comment (not necessarily verbatim)**	**Issue Statement**	**Comment Disposition**
			watersheds. All of these objectives fit nicely with the Healthy Forest Restoration Act (HFRA). We ask that you seriously consider using the HFRA NEPA process for this project. This would save time by limiting the number of alternatives and reduce the potential for appeals.		wildland urban interface the Forest decided not to use the HFRA authority.
Post- scoping comment period – Conversation & email comment – in project file 2		600 - Wildlife	Concerns about the effects of mastication in pre-commercial thin units to neotropical migrant birds. Stephens etal (date unknown) in "Fire Hazard Reduction in Chaparral Using Diverse Treatments"looks at mastication vs. burning in relation to migratory birds and demonstrates the birds do better in burned areas. Denise Boggs (06/09/2008)	Concerns about the effects of mastication in pre-commercial thin units to neotropical migrant birds.	The Stephens paper is relative to effects of mastication on birds in chaparral habitat. The bird study component was added to the two primary objectives of this study which were to compare prescribed burning and mechanical mastication and the seasonal timing of these two treatments. The additional study was to investigate bird community recovery following mastication and prescribed fire fuel reduction treatments in chaparral. While there is chaparral habitat within the Salt project area, no chaparral is proposed for treatment. No mastication is proposed in chaparral habitat. Some mastication (similar to chipping) of woody materials such as small trees and limbs left-over after thinning, may occur beneath the canopy of mixed conifer stands following thinning. The effects of thinning on birds are evaluated in Oechsner (2009). The type of mastication proposed in the Salt project would not remove existing "vital habitat attributes" for birds. Perching, nesting sites, cover, foraging substrate and food sources for shrub and ground nesting species of forest birds would not be impacted from mastication. See sample photo in project file of mastication that has recently taken place on the South Fork Management Unit of the Shasta-Trinity National Forest near the Salt project area (Post Mountain thinning).

* Mail #2 comments 20 – 39 are from the commenters' 11/8/2006 scoping letter; Mail # 4 comments 21 – 26 are from the commenters' 11/3/2006 scoping letter; Mail #8 comments are all from his 10/26/06 letter.

Subject Codes*							
100	**Forest Vegetation**	501	Project objectives	902	Public Involvement	**1300**	**Special Uses**
101		502	Project Design	**1000**	**Information to Note**	**1400**	**Fire/Fuels**
102	Regeneration	**600**	**Wildlife**	1001	General project support	**1500**	**Fisheries**
103	Insects & Disease (Bark beetles/Pine beetles)	601	Snag habitat	**1100**	**Cumulative Effects**	**1600**	**Transportation**
200	**Botany**	602	T/E/S	1101	Neighboring and Past Activities		
201	Weeds	**700**	**Watershed**	**1200**	**Rec/Scenery**		
202	T/E/S	701	Streams protection	1201	OHV Use		
300	**Soils**	702	Water quality	1202	Scenery		
301	Soils damage/erosion	**800**	**Air Quality**				
400	**Economics**	**900**	**Process**				
500	**Proposed Action**	901	NEPA				

Appendix B

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Information Considered in Cumulative Effects Analysis

Past, Present, Ongoing and Reasonable

Foreseeable Future Actions
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Information Considered in Cumulative Effects Analysis Past, Present, Ongoing and Reasonable Foreseeable Future Actions

Cumulative effects result from incremental effects of actions, when added to other past, present, and reasonably foreseeable future actions. Cumulative effects can result from individually minor, but collectively significant, actions taking place over a period of time.

The environmental analysis required under NEPA is forward-looking, in that it focuses on the potential impacts of the proposed action. The past and present activities and natural events have contributed to creating the existing condition, as described in the affected environment sections of this environmental impact statement. These activities, as well as reasonably foreseeable activities, may produce environmental effects on resources relevant to the proposal.

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, the environmental impact analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

The cumulative effects analysis in each resource section does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one can not reasonably identify each and every action over the last century that has contributed to current conditions. Additionally, focusing on the impacts of past human actions alone could risk ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed to those effects. Finally, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, “agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions.”

The cumulative effects analysis in this EIS is also consistent with Forest Service National Environmental Policy Act (NEPA) Regulations (36 CFR 220.4(f)) (July 24, 2008), which state, in part:

> *"CEQ regulations do not require the consideration of the individual effects of all past actions to determine the present effects of past actions. Once the agency has identified those present effects of past actions that warrant consideration, the agency assesses the extent that the effects of the proposal for agency action or its alternatives will add to, modify, or mitigate those effects. The final analysis documents an agency assessment of the cumulative effects of the actions considered (including past, present, and reasonable foreseeable future actions) on the affected environment. With respect to past actions, during the scoping process and subsequent preparation of the analysis, the agency must determine what information regarding past actions is useful and relevant to the required analysis of cumulative effects. Cataloging past actions and specific information about the direct and indirect effects of their design and implementation could in some contexts be useful to predict the cumulative effects of the proposal. The CEQ regulations, however, do not require agencies to catalogue or exhaustively list and analyze all individual past actions. Simply because information about past actions may be available or obtained with reasonable effort does not mean that it is relevant and necessary to inform decisionmaking. (40 CFR 1508.7)"*

For these reasons, much of the "analysis" of past actions for each resource is largely based on current environmental conditions. This appendix provides information on past, present and reasonably foreseeable future actions that, in conjunction with the current resource conditions, were considered in the analysis of effects in the EIS. The table represents past, present and reasonably foreseeable future activities and natural events known to have already occurred, are currently occurring, or are likely to occur in the vicinity of the proposed Salt project and may contribute cumulative effects. These tables, though comprehensive, may have some unintended omissions due to lack of records or knowledge. The listing is intended to demonstrate that relevant past, present, and reasonably foreseeable future activities are identified and are considered in the analysis of cumulative effects. However, these listings do not stand alone, and are supported with cumulative effects analysis by each resource area.

Because the proposal's direct and indirect effects vary in time and space depending on the resource or issue being considered, specific cumulative effects analysis area and timeframe may be different for each resource, and some resources may have considered activities within an effects area larger than presented here.

Information is presented here for the two, 7th order HUCs that encompass or are adjacent to proposed treatment units. Listed events that are not specifically analyzed or mentioned in the resource effects analyses were considered to have no potential effect on the individual resource. The projects and activities listed as reasonably foreseeable future activities were gleaned from the Forest's quarterly Schedule of Proposed Actions (SOPA) published April 1, 2008, and from interviewing Forest program managers.

Table B-1: Past, Present and Reasonable Foreseeable Actions Table

Watershed Name	Past Projects (completed prior to December 2008) Note that different activities may occur on the same acreages; therefore, the total acres affected is not a total of the activities listed.	Present Projects	Foreseeable Projects (January 2009 to December 2013 -- other than the Salt project)
Headwaters of Salt Creek (9,760 acres) 7th field HUC	Pre-commercial thinning, individual or selected trees harvested: 187 ac. 1977-2008	none	14 ac FY Planned 2008. Westside Plantation thinning project proposes to thin plantations across the Forest, including Headwaters of Salt Creek watershed. Scoping started in September 2008.[346] The scoping map for this project included the 481 acres of plantation thinning that is being proposed and analyzed for the Salt project. Those acres will be removed from the Westside project.
	Roadside Fuels/ Fuelbreaks: Phone FMZ 44 acres in 1994	none	The Trinity Roadside Hazard Project is in the early planning stages.[347] The estimated mileage for hazard abatement and roadside fuel break is 10.3 miles for the entire project, a small portion of which is in the Upper Salt Creek-Hayfork Creek watershed. No activity is planned within the Salt project area. Activity is planned for late 2009.
	Mechanical site preparation and piling of activity fuels: 303 acres 1977-1986; 22 acres 1987-1996	none	none
	FS Timber Harvest: patch clearcut 37 acres from 1957-1966; patch clearcut 372 acres from 1967-1986; patch clearcut 113 acres from 1987 – 2008; Salvage cut 36 acres in 3/2005; sanitation 75 acres in 6/1988	none	none
	Private Timber Harvest past harvest has occurred, though it is not quantified.	No Timber Harvest Plans on file with CDF3	No Timber Harvest Plans on file with CDF3
	Road Construction (3.9 mi./sq. mile existing), and designation.	none	The Westside Watershed Restoration Project scoping document was made available in December 2008.[348] It proposes to decommission 3.9

[346] USDA 2008. Westside Plantation Thinning Scoping Document
[347] USDA 2009. Trinity Roadside Hazard Scoping Document
[348] USDA 2008. Westside Watershed Restoration Project Scoping Document

Watershed Name	Past Projects (completed prior to December 2008) Note that different activities may occur on the same acreages; therefore, the total acres affected is not a total of the activities listed.	Present Projects	Foreseeable Projects (January 2009 to December 2013 -- other than the Salt project)
			miles of road and upgrade three crossings in the Lower Hayfork 5th field HUC, which Salt Creek 7th field HUC is within. Travel Management Route Designation is planned for 2009.[349] It will eliminate cross country motorized access, accept on designated routes.
	Wildland Fire by decade: TOTAL = 284 acres as follows: pre-1920 = 2; 1920s = 100; 1930s = 42; 1940s = 1; 1950s = 1; 1960s = 1; 1970s = 5; 1980s = 127; 1990s = 5; plus 40 fires less than 1 acre each from 1920-2000. Summer 2008: Telephone Fire burned a total of 5,727 acres (124 acres high severity; 3,150 acres low severity; 1,423 acres moderate; 1,029 acres unburned). No acres burned within the Salt project area.	none	Potential for future wildfire.
	Burning Activity Fuels - 224 acres from 1977-2008	none	none as planned in FACTS
	Chipping Activity Fuels - 36 acres in 2005	none	none as planned in FACTS
	Domestic Water Use	Domestic Water Use	Domestic Water Use
	Grazing (3200 acres with 270 AUMs) majority of use in Dobbins Gulch area. When permitted, area meets standards. (Salt Creek Allotment)	presently a vacant allotment	Grazing (3200 acres with 45 AUMs) [1]
	Utilities: 2.6 miles of underground gas pipeline; 3.4 miles of 115K powerline @ 75 feet width; 4.8 miles of Distribution powerline	none	none

[349] USDA 2008. Travel Management Route Designation Scoping Document

Watershed Name	Past Projects (completed prior to December 2008) Note that different activities may occur on the same acreages; therefore, the total acres affected is not a total of the activities listed.	Present Projects	Foreseeable Projects (January 2009 to December 2013 -- other than the Salt project)
	Historic placer and hydraulic mining	none	none
Ditch Gulch (5,077 acres) 7th field HUC	Pre-commercial thinning, individual or selected trees harvested: 135 acres 1987-2008	none	Westside Plantation thinning project proposes to thin plantations across the Forest, including Ditch Gulch watershed. Scoping started in September 2008. The scoping map for this project included the 481 acres of plantation thinning that is being proposed and analyzed for the Salt project. Those acres will be removed from the Westside project.
	Roadside Fuels/ Fuelbreaks: Post Mountain 78 acres in 2006	Post Mountain Stewardship fuel reduction is ongoing	none
	Mechanical site preparation and piling of activity fuels: 646 acres 1977-1986; 6 acres 1987-1996	none	none as planned in FACTS
	FS Timber Harvest: patch clearcut 420 acres 1977-1986, 10 acres 1987-2008 Salvage cut 57 acres in 2005	none	none as planned in FACTS for timeframe specified
	Private Timber Harvest past harvest has occurred, though it is not quantified.	No Timber Harvest Plans on file with CDF3	No Timber Harvest Plans on file with CDF3
	Road Construction (6.6 miles/sq. mile existing) and designation.	none	The Westside Watershed Restoration Project scoping document was made available in December 2008. It proposes to decommission 3.9 miles of road and upgrade three crossings in the Lower Hayfork 5th field HUC, which Ditch Gulch 7th field HUC is within. Travel Management Route Designation is planned for 2009. It will eliminate cross country motorized access, accept on designated routes.
	Wildland Fire: TOTAL = 62 Acres as follows: 1918 = 60 acres; 1990s = 2 acres; 15 other fires < 1 acre each. 2008 Telephone fire = 0 acres high or moderate severity.		Potential for future wildfire.

Watershed Name	Past Projects (completed prior to December 2008) Note that different activities may occur on the same acreages; therefore, the total acres affected is not a total of the activities listed.	Present Projects	Foreseeable Projects (January 2009 to December 2013 -- other than the Salt project)
	Burning Activity fuels: 369 acres from 1977-2008	none	none
	Chipping Activity Fuels - 57 acres in 2005	none	none
	Domestic Water Use	Domestic Water Use	Domestic Water Use
	Grazing (500 acres with 100 AUMs) Post Creek Allotment.	Grazing - 500 acres with 20 AUMs	Grazing (500 acres with 20 AUMs)
	Utilities: 2.5 miles of 115K powerline; 2.3 miles of underground gas line	continue	continue
	Historic placer and hydraulic mining.	none	none

Appendix C

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Best Management Practices
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Best Management Practices

Practice 1.4 – Use of Sale Area Map for Designating Water Quality Protection Needs

The Contract would delineate the location of protection areas and insure their recognition and proper protection. Protection areas include, but are not limited to; stream courses, meadows, harvest unit boundaries, available water sources, and roads where hauling is restricted (Timber Sale Contract Provisions (TSCP) B1.1, B5.12, B6.5, C5.12 and C6.5).

Practice 1.5/5.6 – Limiting the Operating Period of Timber Sale Activities

The "Normal Operating Season" for planned commercial thinning activities would be between April 15 and October 15 (TSCP A16). Operations may occur outside of this period if conducted in accordance with the Shasta Trinity NF Wet Weather Operation Specifications (TSCP B6.66, C6.6). All landing, temporary road, and skid trail construction, and road reconditioning would be conducted during appropriate periods of weather and soil moisture (TSCP B6.6).

Practice 1.8 – Streamside Management Zone Designation

This practice would be best described as a tool with which to evaluate riparian reserve designations associated with the project. The ID team would designate the appropriate protection areas within the riparian reserves where project activities could occur, to be included on the TSC Sale Area Map (TSCP B6.5, C5.421, and C6.5).

Criteria to evaluate BMP implementation and effectiveness would include: ground cover disturbance, canopy closure, disturbance to channel banks and sediment delivery as required in BMPEP T01 – Evaluation of Streamside Management Zones.

Practice 1.10 – Tractor Skidding Design

Skid trail layout patterns are designed minimize erosion and sedimentation as appropriate for specific terrain. The Forest Service would approve all skid trails prior to use by the Purchaser (TSCP B6.422 and C6.42).

On-site monitoring of this BMP occurs during administration evaluations conducted during implementation (BMPEP AE-1) during BMPEP T02- Skid Trails Evaluations).

Practice 1.11 – Suspended Log Yarding in Timber Harvesting

Skyline yarding systems would require at least one end of logs to be suspended during yarding operations. Areas requiring suspended yarding would be identified prior to implementation and included in the Contract and the Sale Area Map (TSCP B6.42 and C6.427).
Onsite evaluations for BMP implementation and effectiveness would be conducted using BMPEP T03: Suspended Yarding, the following winter after the completion of the project.

Practice 1.12 – Log Landing Location

The Purchaser and the Sale Administer must mutually agree upon landing locations. Designated locations must comply with the requirements for location as stated in the BMP. Monitoring would include an on-site evaluation (BMPEP AE-1) of Project area, which includes any temp roads and landings. BMPEP T04- Landings would be evaluated the following winter to assess effectiveness of BMP 1.12 and 1.16 (TSCP B6.422, B6.6, B6.63, C6.428, C6.6, C6.602, C6.603).

Practice 1.13 – Erosion Prevention and Control Measures During Timber Sale Operations

Equipment will not be operated when ground conditions are such that excessive damage will result. Erosion control work will be kept current. If a purchaser fails to perform seasonal erosion control work,, that Forest Service may assume responsibility and utilize unencumbered deposits as payment for the work (TSCP B6.6 and C6.6).

Onsite evaluations during operations may be monitored for administration using BMEP AE-1: Timber Sales and Roads). Further implementation and effectiveness are evaluated the following winter after the completion of the project using forms and protocol for BMPEP T05-Timber Sale Administration.

Practice 1.14 – Special Erosion Prevention Measures on Disturbed Land

Sale administration personnel select areas for treatment based on criteria specified by the interdisciplinary team. If specific areas of concern exist for these types of treatments it would be identified on the sale area map. Special erosion prevention measures include the spreading of slash, straw, or, by agreement, some other treatment. Incorporation (TSCP C6.602).

Practice 1.16 – Log Landing Erosion Control

Contract specifications require the Purchaser to install erosion control measures on landings. Erosion prevention and control measures would be designed to insure that landings have proper drainage. This may include ditching, outsloping, water barring, and ripping (TSCP B6.6, B6.63, C6.6, and C6.602).

Practice 1.17 – Erosion Control on Skid Trails

Contract specifications require the timber sale operator to install erosion control measures on skid trails. Skid trails from both tractor yarding systems and skyline cable yarding systems, where only one end is suspended, would be treated to prevent surface erosion. Closure work may include mulching, outsloping, water barring, ripping, removal of berms and road barrier construction (TSCP B6.442, B6.6, B6.66, C6.442, C6.602, and C6.64).

Implementation and effectiveness monitoring of this BMP are conducted using BMPEP T02: Skid Trail Forms and Protocol.

Practice 1.18 – Meadow Protection during Timber Harvesting

As a minimum, meadow protection requirements specified in the Forest Plan would be implemented. The Timber Sale Contract prohibits unauthorized operation of vehicular or skidding equipment in

meadows or in protection zones designated on the sale area map and marked on the ground (TSCP B6.61.

Practice 1.19 – Streamcourse and Aquatic Protection

The interdisciplinary team doing the environmental analysis identifies the riparian reserves requiring protection and the protection requirements. These requirements are included in the timber sale contract and sale area map. The riparian reserves requiring protection would be marked on the ground prior to logging operations (TSCP B6.5 and C6.5).

Practice 1.20 – Erosion Control Structure Maintenance

During the period of the Timber Sale Contract, the Purchaser would provide maintenance of soil erosion control structures constructed by the Purchaser until they become stabilized, but not more than one year after their construction. (TSCP B6.6, B6.66, B6.67, and C6.6).

Practice 1.21 – Acceptance of Timber Sale Erosion Control Measures before Sale Closure

Onsite evaluations during operations would be monitored and documented (BMEP AE-1: Timber Sales and Roads) and the first winter after the completion of the project (BMPEP T05-Timber Sale Administration) (TSCP C6.6, B6.6, B6.63, B6.64, B6.65, and B6.66).

Practice 1.22 – Slash Treatment in Sensitive Areas

Special slash treatments may be prescribed in sensitive areas to facilitate slash disposal, without the use of mechanized equipment. Slash treatment methods would be designated on the sale area map. For this project, depending on the site-specific fuel hazards, slash in riparian reserves would either be: (1) hand piled and left uncovered and unburned; or (2) burned during the wet season; or (3) lopped and scattered to within 18” of the ground [C6.7]. Effectiveness monitoring would be included with BMPEP T01: Streamside Management Zones (TSCP C6.7).

Practice 1.24 – Non-recurring “C” Provisions That Can Be Used for Water Quality Protection

If needed, Special “C” provisions would be identified for water quality protection where the standard “B” or “C” provisions are inadequate to protect watershed values.

Practice 1.25 – Modification of the Timber Sale Contract

The Timber Sale Contract can be modified or terminated if new circumstances or conditions indicate that the timber sale would damage soil, water, or watershed values (TSCP B8.32, B8.33, and B8.34).

Practice 2.2 – Erosion Control Plan

The Timber Sale Contract requires that a general plan of operations, including planned periods and methods of erosion control be developed by the purchaser and presented to the Forest Service (TSCP B6.311). This plan would set forth erosion control measures and discuss mitigation required by the

Timber Sale Contract. Operations cannot begin until the Forest Service has given written approval of the plan.

Practice 2.3 – Timing of Construction Activities

The intent of this BMP is to minimize erosion by conducting road construction activities during minimal runoff periods. The purchaser would be required to schedule and conduct operations during the dry season or when rain and runoff are unlikely. Erosion control work would be kept as current as practicable on active road construction projects (TSCP B6.6, B6.61, and C6.6).

Practice 2.5 – Road Slope Stabilization Construction Practices

Stabilization methods would be designed to minimize erosion from road slopes and slope failure along roads. Methods would be identified during the environmental analysis and included in the project plan. The measures should be completed prior to the first winter rains (TSCP B6.6, B6.61, and C6.6).

Practice 2.6 – Dispersion of Subsurface Drainage from Cut and Fill Slopes

Subsurface drainage from cut and fill slopes would be provided where it is identified that subsurface moisture saturation is expected. Collected water would be dispersed in an area capable of withstanding increased flows.

Practice 2.7 – Control of Road Drainage

If there is a need identified in the project planning process, measures would be developed to minimize the erosive effects of water concentrated by road drainage features. Measures include such controls as construction of properly spaced cross drains, water bars or rolling dips, energy dissipaters, aprons, downspouts, debris racks, and armoring of ditches.

Practice 2.11 – Control of Sidecast Material during Construction and Maintenance

The Timber Sale Contract includes clause B6.62 that addresses temporary road maintenance specifications. This includes slide and slump repair, surface blading, and side casting during road maintenance. Generally, side casting of material would be avoided in areas where it can adversely impact water quality.

Practice 2.12 – Servicing and Refueling of Equipment

Purchasers are required to take all reasonable precautions to prevent pollution of air, soil, and water. Purchaser shall furnish oil absorbing mats for use under all stationary equipment or equipment being serviced. A Spill Prevention, Containment and Counter Measures Plan is required if the volume of oil or oil products fuel exceeds 1,320 gallons in containers of 55 gallons or greater (TSCP B6.34 and B6.341).

Practice 2.13 – Control of Construction and Maintenance Activities Adjacent to SMZs

This BMP is designed to protect water quality by controlling construction and maintenance actions within and adjacent to streamside management zone so that its functions are not impaired. Protected riparian reserves would be identified in the planning process (TSCP 6.312, B6.5 and C6.5).

Practice 2.21 – Water Source Development Consistent with Water Quality Protection

Water source development is normally needed to supply water for road construction and maintenance, dust control, and fire control. At no time would downstream water flow be reduced to a level that would be detrimental to aquatic resources, fish passage, or other established uses (TSCP C5.36).

Practice 2.22 – Maintenance of Roads

Roads would be maintained in a manner that provides for water quality protection by minimizing rutting, failures, side casting, and blockage of drainage facilities. The purchaser and the Forest Service would agree to an Annual Road Maintenance Plan that outlines responsibilities and timing of maintenance. This would be done before the beginning of the operating season (TSCP B5.12, B5.3, C5.31 and C5.12).

Practice 2.23 – Road Surface Treatment to Prevent Loss of Material

Measures would be taken to minimize loss of road material when the need for such action is identified (TSCP B5.3, C5.31#, and B6.22).

Practice 2.24 – Traffic Control During Wet Periods

Roads that must be used during wet periods should have a stable surface and sufficient drainage provided to allow such use while at the same time maintaining water quality. Where wet season field operations are planned, roads may need to be upgraded or use restricted (TSCP B6.6, B6.66, and C6.6).

Practice 2.25 – Snow Removal Controls to Avoid Resource Damage

When roads are used in the winter, snow removal would be done in a manner to protect roads and adjacent resources. Snow berms would be removed or breached to prevent concentration of snowmelt runoff on the road. The Purchaser and the Forest Service would agree to measures prior to snow removal activities (TSCP C5.34).

Practice 2.26 – Obliteration or Decommissioning of Temporary Roads

Contract specifications would include language that requires all temporary roads and landings to be decommissioned as soon as the purchaser has completed work and before the seasonal rain begins. Closure work may include mulching, outsloping, water barring, scarifying, removal of berms and road barrier construction (TSCP B6.63).

Monitoring and documentation would occur on-site during operations (BMPEP AE-1: Timber Sales and Roads) and the following winter (BMPEP E14- Temporary Roads) (TSCP C6.602 and C6.603).

Practice 5.2 – Slope Limits for Mechanical Equipment Operations

The project would be designed to allow tractors only where activities would not increase the probability of gully and sheet erosion and associated sediment production as a result of tractor use. Monitoring and documentation would occur on-site during operations (BMPEP AE-1: Timber Sales and Roads) and the following winter (BMPEP T02- Skid Roads).

Practice 5.6 – Soil Moisture Limitations for Mechanical Equipment Operations

The Contract shall require winter shutdown whenever the Forest Service determines that the soil moisture or physical conditions have become unsuitable for equipment operation on any area (TSCP B6.3, B6.31, B6.311, and B6.6).

Timber sale administration would document the physical conditions (BMPEP AE-1: Timber Sales and Roads.) BMPEP T05-Timber Sale Administration monitoring would occur the first winter following the completion of the project.

Practice 6.1 – Fire and Fuel Management Activities

Fuel management projects would have management requirements, mitigation measures, and multiple resource protection prescriptions documented in the project planning and decision documents.

Practice 6.3 – Protection of Water Quality from Prescribed Burning Effects

This BMP is designed to maintain soil productivity, minimize erosion, and minimize ash, sediment, nutrients, and debris from entering water bodies. Streamside management zones would be identified as part of the burn plan.

Appendix D

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Aquatic Conservation Strategy Objectives for Action Alternatives and Riparian Reserve Resource Protection Measures
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Objective 1

Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

Effect: The proposed action would open the overstocked stands and allow sunlight to reach the forest floor promoting understory species vigor and diversity in composition including that within riparian reserves of intermittent and ephemeral streams. In addition, intervals of openings within the riparian corridor are preferred over a continuous canopy of diseased and dying conifer to reduce the risk of stand replacing fire. Multi-story vegetation components should result from treating diseased and dying conifer and thinning. These treatments will have a neutral to beneficial effect on the distribution, diversity, and complexity of watershed and landscape-scale features.

Objective 2

Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

Effect: All confluences among tributaries will be maintained. The proposed action would allow the processes that support a proper functioning condition over their current status of decline (USDI 1994, Reid 1994). Sunlight is currently limited from reaching the forest floor by the dense conifer canopy. The shrub component of plant communities should improve on adjacent slopes as sunlight reaches the forest floor. Riparian vegetation is suppressed due to this lack of light as well as over-browsing by ungulates. Thinning activities adjacent to and within the riparian reserve of intermittent and ephemeral streams, which preserve mature healthy conifer and open the canopy, will favor regeneration and establishment of riparian plant communities including willow. During high flows the contribution of nutrients, woody debris and sediment are redistributed within the watershed and plant communities have an opportunity to expand in the downstream direction.

In addition, reduction of stand density may have some beneficial effects on connectivity by reducing the risk of fire within the riparian reserves. This alternative will have a neutral to beneficial effect on spatial connectivity within and between the watersheds.

Objective 3

Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.

Effect: The proposed action will have a neutral effect and no negative effects on the physical integrity of the aquatic system. No harvest would take place within riparian reserves of perennial streams, and no skidding equipment will be allowed within 50 feet of intermittent channels on slopes greater than 30% and 25 feet on slopes less than 30%, so banks and stream features will be avoided

and remain intact. With improved sunlight, through thinning, the riparian vegetation is expected to improve bank strength. With sufficient improved vegetation along the banks, the channel bottom should sustain attributes that reflect a higher proper functioning condition (USDI 1994).

Objective 4

Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

Effect: The proposed action will maintain water quality for biological, physical and chemical integrity. The greatest potential for erosion commonly occurs during and immediately after the disturbance activity. The implementations of BMPs are designed to protect water quality even if stream flow is present at the time of proposed activities. Roads typically carry most of the sediment from a hillslope disturbance to the stream. With very little slope, sediment transport is limited by slope in the project area.

Objective 5

Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

Effect: The proposed action will have a beneficial effect on improving the riparian vegetation vigor and composition and thus on the sediment regime. Bank strength will increase due to increased soil strength from additional root strength from more vigorous riparian vegetation (Rosgen 1996). Slopes adjacent to the channel are generally less than 3 percent. There will be little to no opportunity for activities to affect sediment movement in the project area because of low slopes.

Objective 6

Maintain and restore instream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high and low flows must be protected.

Effect: The proposed action will have a neutral to slightly beneficial effect of short duration on maintenance of instream flows. Surface flow in the project area is primarily intermittent. A reduction in evapotranspiration 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 retain snow longer compared to forested stands as sublimation occurs more rapidly on branch surfaces (Pomeroy et al. 1998). This would tend to have a beneficial effect on increasing the duration of snowmelt. Renewal of riparian vegetation will eventually lead to stream processes that reduce energy, detain sediment, build banks and discourage entrenchment. This is a beneficial effect for the surface and subsurface flow.

Objective 7

Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.

Effect: The proposed action will have a beneficial effect on stream and floodplain interaction by encouraging under-story vegetation to establish and improving conditions for riparian vegetation from increased sunlight. Under-story vegetation on the floodplain and within the riparian reserves will increase the channel roughness and detain sediment, flow and reduce energy. Water tables are influenced by topographic lows; detention of sediment will lead to bank building processes, improved floodplain function and water table elevation.

Objective 8

Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.

Effect: Thinning activities will reduce the risk of stand-replacing fires in the riparian reserves of intermittent and ephemeral streams and promote stand health. Conifer removal outside of the equipment exclusion zone, but near streams is likely to provide beneficial effects to willow regeneration by allowing full to partial sunlight conditions for willow while reducing conifer competition. This should incrementally improve habitat for the Willow Flycatcher. 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 (Rosgen 1996). Entrenchment of streams may result in draw-down of alluvial aquifers responsible for sustenance of deep-rooted riparian communities (Minshall et al. 1989). The proposed action will have a beneficial effect on Objective 8.

Objective 9

Maintain and restore habitat to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species.

Effect: The proposed action will be beneficial in directing the species composition and structural diversity of plant communities to a more desirable state within the project area and thus will have a beneficial effect on populations of native plants, invertebrates and vertebrate riparian-dependent species within the project area. The intermittent nature of the streams being treated creates dry to wet soil moisture conditions that limit the establishment of riparian species to those areas where conditions are favorable. The proposed action will have a neutral to beneficial effect for Objective 9.

References for ACS Objectives

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 and Wildlife Service Biological Report 85 (7.24) p. 44.

Pomeroy, J. W. and J. Parviainen, N. Hedstrom, D. M. Gray. 1998. Coupled modeling of forest snow interception and sublimation. Hydrological Processes Vol. 12, Issue 15, Date: December 1998, pps: 2317-2337; www.Interscience.Wiley.com.

Reid, L.M. and R.R. Ziemer. 1994. 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.

Rosgen, D. 1996. Applied River Morphology

USDI Bureau of Land Management. 1994. Process for Assessing Proper Functioning Condition for Lentic Riparian-Wetland Areas, Technical Reference 1737-11.

Project Specific Riparian Restrictions

Based on field reviews and past monitoring data of similar treatments members of the interdisciplinary team and Ranger Donna Harmon determined that with the following restrictions, thinning approximately 62 acres adjacent to intermittent and ephemeral streams in the Salt project would help to maintain or meet Aquatic Conservation Strategy Objectives. This Appendix to the Environmental Impact Statement discusses how these treatments, with the restrictions covered here, meet the nine Aquatic Conservation Strategy Objectives. Treatments in riparian reserves of intermittent and ephemeral streams will be restricted based upon the zone width guidelines in Table D-1 and Figure D-1, and the list of restrictions listed below. No thinning will occur within riparian reserves of perennial streams within the Salt project area.

Table D-1. Summary Table of Project Specific Riparian Restrictions

Stream Class	Stream Type	Hillside Slope (%)	Equipment Exclusion Zone (EEZ) Width (feet)	Riparian Reserve Overstory Canopy Closure (%)*	NWFP and STFP Standard Riparian Reserve Width (feet)**	Salt Project Minimum Riparian Reserve Width (feet)**	Rationale for increase in Riparian Reserve width**
I	Perennial stream with fish	Slope > 30%	No treatments in Perennial Streams in the Salt Project		300	300	NA
		Slope < 30%			300	300	NA
II	Perennial stream with no fish	Slope > 30%			150	225	Used 1 ½ site tree distance in order to protect the riparian microclimate for nonfish aquatic animals
		Slope < 30%			150	225	
III	Intermittent and ephemeral	Slope > 30%	50	60	100	150	Average site potential of 200 yr. old tree (150')
		Slope < 30%	25	60	100	150	Average site potential of 200 yr. old tree (150')

* The canopy closure guidelines were developed by Forest biologists to get the maximum thinning treatment within the outer portion of the riparian reserve while still protecting the riparian microclimate. These percentages represent the best balance for projects on the South Fork Management Unit (Personal communication, Ratcliff 3/19/2008 email.

** The NWFP standards and guidelines state that for seasonally flowing or intermittent streams, at a minimum, the riparian reserve must include "…extension from the edges of the stream channel to a distance equal to the height of one site-potential tree, or 100 feet slope distance, whichever is greatest." (Interagency SEIS Team 1994, p. C-31) A site potential tree height (average maximum height of the tallest dominant tree 200 years or older) in the Salt Creek area is 150 feet. (Petersen and Amell 2009). For perennial non-fish bearing streams the NWFP standards and guidelines state that riparian reserves consist of the stream and the area on each side of the stream extending from the edges of the active steam channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance (300 feet total, including both sides of the stream channel), whichever is greatest." (Interagency SEIS Team 1994, p. C-30)

Equipment Exclusion Zone: The equipment exclusion zone (EEZ) for this project extends 50 feet (slope distance) from the high watermark on slopes >30% and extends 25 feet (slope distance) on slopes <30% OR extends to the inner gorge ,[350] which ever is greater.

- No treatment allowed. No equipment and no thinning.

Riparian Reserves – Perennial Streams: Riparian reserves for perennial streams are 300 feet for fish bearing streams and 225 feet for non-fish bearing streams.

- No thinning and no equipment in perennial stream riparian reserves.

Riparian Reserves – Non-Perennial Streams: The non-perennial riparian reserve is defined for this project as a protection zone 150 feet wide measured along the slope from the high watermark up the hillslope.

- Designate/approve riparian reserve crossings in coordination with the fisheries biologist and/or hydrologist.
- Equipment will be excluded from operating on active or potentially active landslides and thinning will be prescribed by a geoscientist.
- Selective commercial thinning within riparian reserves, adjacent to EEZs, would be accomplished through a combination of mechanical operations and hand thinning.
- Hazard trees within riparian reserves must be dropped and retained on site if > 16” dbh. Handpiles of thinned fuels would be placed outside of EEZs and burned in the riparian reserve in a manner that leaves at least 50% of the localized area unburned at any given time. In addition, hand piles would be placed in a checkerboard pattern whenever possible (not one pile directly above another).
- When fuels treatments involve area ignition, use backing fire in riparian reserves. There would be no ignition within riparian reserves associated with understory burning; however, fire would be allowed to creep into riparian areas

[350] The inner gorge is defined as the area above the stream channel where the slope is 65% or greater.

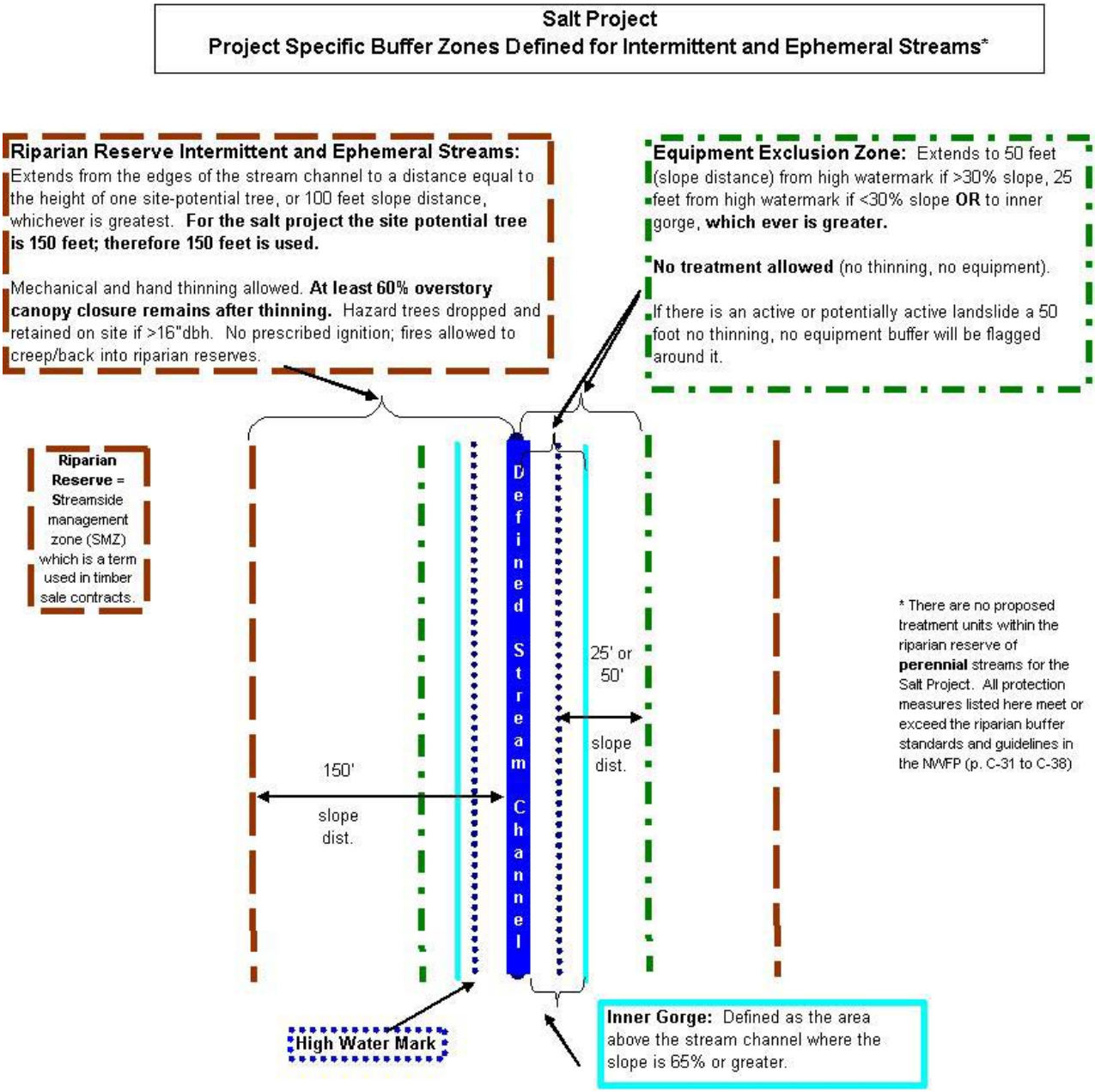

Figure D-1. Project specific buffer zones for intermittent and ephemeral streams

Appendix E

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Supplement to Wildlife Biological Assessment
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Supplement to the Biological Assessment for the Salt Timber Harvest and Fuels Reduction Project

Hayfork Ranger District
Shasta-Trinity National Forest
Trinity County, California

Prepared by:

Marynell Oechsner **February 2, 2009**

Marynell Oechsner Date
Wildlife Biologist
TEAMS Enterprise

Reviewed by:

Date

Background

A biological assessment was completed on May 25, 2007 for Alternative 2 of the Salt Project environmental assessment (Quinn 2007). Quinn (2007) determined that the Salt project **may affect and would likely to adversely affect the northern spotted owl**, but would have **no affect on designated spotted owl critical habitat**. Formal consultation with personnel at the US Fish and Wildlife Service Red Bluff Ecological Services Office followed and a biological opinion was rendered on August 6, 2007. The biological opinion concluded that Alternative 2 of the Salt Project **was not likely to jeopardize the continued existence of the northern spotted owl nor would it affect any northern spotted owl critical habitat**.

It was decided that an environmental impact statement would be developed in response to public and agency input following initial project scoping. A new interdisciplinary team was assigned to the project. Modifications were made to the original Alternative 2, and a third alternative was developed following a second scoping and public comment process.

A letter from US Fish and Wildlife Service Yreka Ecological Services Office dated March 26, 2008, requested that habitat assessments for a 0.5 mile and 1.3 mile radius circles around a northern spotted owl nest site or activity center be provided when Forest projects require Service review for impacts to northern spotted owl habitat.

In May 2008, US Fish and Wildlife Service released the *Recovery Plan for the Northern Spotted Owl*.

Purpose of this Document

The purpose of this document is to:

1. (1) Update the biological assessment by incorporating new information into the effects analysis.
2. (2) Disclose the differences in effects of modified Alternative 2 for the Salt Timber Harvest and Fuels Hazard Reduction Project Environmental Impact Statement to northern spotted owl.
3. (3) Ensure the project is consistent with management direction in the Recovery Plan for the Northern Spotted Owl

New Information

Two northern spotted owl surveys were conducted in 2008 within approximately a quarter mile radius of suitable nesting and roosting habitat. The third survey scheduled for June did not take place due to safety concerns resulting from wild fire activity in the area. The surveys completed in 2008 did not reveal new information on owl use in the area (Quinn, personal communication). Vegetation components were sampled in May, 2008 within the project area using standard R5 Stand Exam protocol. A total of 160 field plots representing 98 percent of the vegetation found in the project area were completed in the major vegetation types. Vegetation types sampled included M2G, M2P, M3G, M3P, XX1 and XX2 (Petersen and Amell 2009).

Stand exam data from 2008 shows that currently there is an average of 13 dead trees per acre across the project area. Six of the 13 dead trees per acre averaged 12.1 inches dbh or greater. (Petersen and Amell 2009).

Large woody debris ranges from 5 to 10 trees per acre for mixed conifer stands, from 3 to 8 trees per acre for tree/brush stands, and 1 to 5 logs per acre for brush areas (Foss 2009). Downed woody material ranges from less than 7 tons per acre to over 68 tons per acre, with an overall average of approximately 37 tons per acre on most of the project area (Lewis 2009).

Wildlife Resource Protection Measures Common to Both Alternatives

Northern Spotted Owls

- Limited Operating Periods (LOPs) would be implemented to avoid direct adverse impacts to the northern spotted owl. From February 1 through July 10, all noise- and smoke-generating activities will be prohibited within ¼ mile of suitable nesting or roosting habitat. In addition, all vegetation removal/cutting/burning will be prohibited through September 15 within suitable nesting or roosting habitat. These LOPs may be lifted if surveys using currently accepted protocols indicate specific areas are not occupied by breeding owls or with the mutual consent of the U.S. Fish and Wildlife Service and the U.S. Forest Service.

Snags and Downed Woody Debris

- Existing snags and down logs greater than 19 inches in diameter will be retained (unless there are safety concerns or the snag is within a skid trail, temporary road location, or landing site). An average of 1.5 snags per acre greater than 15 inches in diameter and 20 feet in height will be retained. Snags felled for safety reasons would be left on site.
- Maintain an average of 5 tons or 10 tons of logs per acre (depending upon land management allocation direction) with a preference to have 4 to 6 logs per acre of the largest available diameter.
- Retain hardwoods that have a reasonable chance of surviving and thriving after stand treatments.

Riparian Reserves

- **Perennial**: No thinning and no equipment in perennial stream riparian reserves. Riparian reserves for perennial streams for this project are 300 feet for fish bearing streams and 225 feet for non-fish bearing streams.
- **Non-Perennial Streams:** The non-perennial riparian reserve is defined for this project as a protection zone 150 feet wide measured along the slope from the high watermark up the hillslope.
- No new landings would be located inside of riparian reserves
- At least 60 percent of overstory canopy remains after thinning
- Designate and approve riparian Reserve crossings in coordination with the fisheries biologist or hydrologist
- Equipment will be excluded from operating on active or potentially active landslides and thinning will be prescribed by a geoscientist
- Selective commercial thinning within RR, adjacent to EEZs, would be accomplished through a combination of mechanical operations and hand thinning

- Hazard trees within RR must be dropped and retained on site if greater than 16 inches dbh.
- Handpiles of thinned fuels would be placed outside of EEZs and burned in the riparian reserve in a manner that leaves at least 50 percent of the localized area unburned at any given time. In addition, hand piles would be placed in a checkerboard pattern whenever possible (not one pile directly above another)
- When fuels treatments involve area ignition, use backing fire in RR. There would be no ignition within RR associated with understory burning; however, fire would be allowed to creep into riparian areas.
- **Equipment Exclusion Zone:** No equipment and no thinning allowed within the equipment exclusion zone (EEZ). The EEZ is a portion of the riparian reserve defined for this project as the area that extends 50 feet (slope distance) from the high watermark on slopes greater than 30 percent, and extends 25 feet (slope distance) on slopes greater than 30 percent or extends to the inner gorge, which ever is greater.

Habitat Conditions Modified by Wildfire

During preparation of this document in the summer of 2008, a wildfire occurred directly adjacent to the Salt project area. The Telephone wildfire was part of the Lime Complex of fires that occurred on the front country of Trinity County in the Lower Hayfork Creek 6th field watershed. The wildfire started on a ridgeline and slowly backed down the ridges over time, causing a mosaic burn. General trends are: forested areas that were north or east facing slopes were nice underburns; forested areas that were south or west facing slopes burned hotter and had tree mortality of 20-40 percent with ridges burning hot (USDA Forest Service 2008).

The Telephone wildfire affected existing northern spotted owl habitat conditions within the owl analysis area previously determined for this project, as well as a portion of owl territory TR-295 and the Salt Creek 5th field watershed. Approximately 6 percent of the 16,920 acre owl analysis area burned in the Telephone wildfire (Table 1).

Table 1-Acres of habitat in owl analysis area affected by wildfire

Habitat	Level of Fire Severity				Total Acres
	Unburned	Low	Moderate	High	
Capable	1,566	10	20	1	1,597
Connectivity	9,971	564	123	1	10,660
Foraging	2,412	135	9	0	2,556
High Nesting/Roosting	36	47	11	0	94
Moderate Nesting/Roosting	813	0	0	0	813
Not Capable	440	65	29	6	540
Private	636	20	4	0	660
Total Acres	**15,874**	**841**	**196**	**8**	**16,920**

Approximately 16 percent of northern spotted owl territory TR-295 burned in the Telephone wildfire. Table 2 displays the effects of wildfire to habitat within the territory TR-295.

Table 2-Acres of habitat in northern spotted owl territory TR-295 affected by wildfire

Habitat	Level of Fire Severity				Total Acres
	Unburned	Low	Moderate	High	
Capable	359	0	0	0	359
Connectivity	1,564	139	38	0	1,741
Foraging	199	13	1	0	213
High Nesting/Roosting	12	14	2	0	28
Moderate Nesting/Roosting	52	0	0	0	52
Not Capable	49	3	5	0	57
Territory Outside Analysis Area	646	220	79	2	947
Total Acres	**2,881**	**389**	**125**	**2**	**3,397**

Approximately 3,680 acres out of 26,469 acres of forested federal land in the Salt Creek 5th Field Watershed burned in the Telephone wildfire. Table 3 displays the acres of mature and old growth habitat by level of severity, burned by wildfire.

Table 3-Acres Mature and Old Growth Habitat Burned by Level of Severity in the Salt Creek 5th Field Watershed during the summer of 2008

Habitat	Level of Fire Severity			Total Acres
	Low	Moderate	High	
Mature Forest (3G and 3N)	2438	763	49	3250
Old Growth (4G and 4N)	159	42	6	206
Total	**2597**	**805**	**55**	**3456**

The term “fire severity” is used within the fire effects literature to describe ecological impacts of fires (Parsons, 2003). At all three scales displayed in Tables 1-3, a majority of the northern spotted owl habitat was unburned. Most of the landscape that burned did so at low levels of severity. Mild to moderate fires occur in the forest understory, removing small trees and herbaceous groundcover. Only high-intensity fires burn into the crowns of the tallest trees.

Effects to northern spotted owl habitat in the areas that burned were variable. Approximately 55 acres of mature forest and old growth habitat in the Salt Creek 5th field watershed was severely burned as a result of the wildfire. Some additional amount of mature and old growth forest was also reduced in the moderate severity burn areas. In these areas various important habitat components for owls were lost. Some existing snags burned up in the fire and down woody debris and ground cover for prey was reduced. Grasses, herbaceous vegetation and shrubs would be expected to begin recovering within a year following the fire.

Within the northern spotted owl habitat that burned, some trees likely were killed or scorched badly enough that they will eventually die and fall; thus, some snags and down woody material were created.

Habitat diversity (patchiness of the vegetation) across the landscape would have increased as a result of low severity burned areas. This will be beneficial to owls and their prey base over the

long term. Conditions for another wildfire event occurring within the area burned have been reduced, thus maintaining a majority of the remaining habitat values for owls over the long term.

Alternative 2 Modified

As a result of collecting stand exam data and modeling efforts, projected timelines for vegetation recovery from treatments has changed Timelines used in this updated analysis begins immediately following treatment and includes projections of stand changes and recovery in excess of 100 years.

Miles of temporary road construction and reconstruction, landings, and yarding systems were not changed. Differences in the acres and actions proposed in Alternative 2 and Alternative 2 Modified are displayed in Table 4.

Table 4-Acres of activities for Alternative 2 and Alternative 2 modified

Timber Stand Activity	Acres Alternative 2 Modified	Acres Alternative 2 Original
Intermediate Thinning (31 units)	963	991
Shelterwood Harvest – Green Tree Retention (2 units)	31	0
Shaded Fuel Break Thin	103	103
Regeneration Harvest - Green Tree Retention (2 units)	27	59
Hand Fuel Treatment (1 unit)	14	0
Precommercial Thin (59 units)	481	503
Total Proposed Treatments (acres)	**1,619**	**1,656**

Map 1 (appended) displays Alternative 2 modified treatment units in the project area and owl territories TR287 and TR295.

Direct and Indirect Effects- Differences between Alternative 2 and Alternative 2 Modified

Regeneration harvest with green tree retention (unit 37) in modified Alternative 2, would remove 4 acres of foraging habitat in the northern spotted owl analysis area and Salt project area (rather than 11 acres in Alternative 2). Less than two tenths of 1 percent of northern spotted owl foraging habitat would be removed from the analysis area. Approximately six tenths of 1 percent of northern spotted owl foraging habitat would be removed from the project area. None of the four acres of foraging habitat that is proposed to be removed occurs within northern spotted owl territory TR 287 or TR295.

Twenty-seven acres of regeneration harvest with green tree retention and 31 acres of shelterwood with green tree reserves are prescribed in Alternative 2. Regeneration harvest and shelterwood with green tree reserves would reduce connectivity habitat within the project area by 58 acres. Connectivity habitat would be maintained at well above the 50 percent threshold in the northern spotted owl analysis area.

The same amount (28 acres) of moderate quality nesting and roosting habitat is projected to be down-graded in Alternative 2 Modified as Alternative 2. Two hundred-thirty six acres (rather than 239 acres in Alt. 2) of foraging habitat would be degraded in Alternative 2 Modified.

Alternative 2 Modified would degrade 11 acres of foraging habitat in owl territory TR287 and degrade 2 acres of foraging habitat in owl territory TR295. Changing the analysis area size of the northern spotted owl core area from 0.7 miles to 0.5 miles resulted in no change of effects to habitat in owl territories TR287 or TR295 because no treatments are proposed in either size core areas. The existing condition of the habitat in the core areas of owl territories TR 287 and TR295 will be maintained.

Alternative 2 Modified would reduce the existing canopy closure from 60-78 percent to 50 percent in all thinned units except within intermittent or ephemeral stream riparian reserves. Across 41 acres of intermittent or ephemeral stream riparian reserves, commercial thinning would reduce canopy closure to 60 percent. Pre-commercial thinning of intermittent or ephemeral stream riparian reserves would reduce canopy closure to 60 percent across 60 acres. The canopy closure in shaded fuelbreaks would be 40 percent.

Effects of Modified Alternative 2 to spotted owl nesting, roosting and foraging habitat will last for a longer period of time than originally predicted (i.e.<35 years). The modeled projection of crown canopy 50 years following treatment would range from 54 to 75 percent (Petersen and Amell 2009). Thus, returning to the existing canopy closure condition in some stands will exceed 50 years rather than less than 35 years as predicted in Alternative 2. Likewise, growth and development of the larger remaining trees post treatment will not occur as rapidly. Fifty years after treatment the modeled quadratic mean diameter of trees is projected to be in the range of 22 - 29 inches, depending upon the existing vegetative stage of the stands (Petersen and Amell 2009). The projected number of years to achieve a 30-inch quadratic mean diameter for all trees ranges from 60 to more than 100 years (Petersen and Amell 2009). Thus, the predicted timeframe for the development of moderate and high quality nesting and roosting habitat for owls will exceed 60 years.

There would be fewer snags lost in Alternative 2 Modified. Snags less than 19 inches dbh (rather than less than 24 inches dbh) and down woody material in the 3-inch to 20-inch class would be reduced. Existing snags and down logs greater than 19 inches diameter will be retained, unless they are in a skid trail, landing site, or other exceptions. An average of 1.5 snags per acre greater than 15 inches in diameter and 20 feet in height will also be retained. Snags felled for safety reasons would be left on site. Additionally, an average of 5 tons of logs per acre (or 10 tons of logs per acre depending upon land management allocation direction) will be retained with a preference to have 4 to 6 logs per acre of the largest available diameter, providing habitat for prey species.

Cumulative Effects

The cumulative effects for Alternative 2 Modified would be the same as reported for Alternative 2.

Determination

Modified Alternative 2 of the Salt Timber Harvest and Fuels hazard Reduction Project **may affect and would likely adversely affect the northern spotted owl** based upon the following rationale: Direct harm or disturbance to breeding activities would be avoided with the use of the limited operating period. Existing nesting, roosting and foraging would be removed, downgraded or degraded. The quantity and relative quality of northern spotted owl nesting, roosting and foraging habitat would gradually increase after more than 50 years. The probability of loss of owl habitat due to fire would be reduced for about 20 years (Lewis 2009).

Modified Alternative 2 of the Salt Timber harvest and Fuels Hazard Reduction Project would have **no affect** on critical habitat of the northern spotted owl because there is no designated critical habitat of northern spotted owls in the project area or spotted owl analysis area.

Compliance with the Endangered Species Act and Resource Plans

Modified Alternative 2 of the Salt Timber Harvest and Fuels Hazard Reduction Project comply with the management direction and standards and guidelines set forth in the Northwest Forest Plan (1994) and the Shasta-Trinity Land and Resource Management Plan (1995).

Modified Alternative 2 and Alternative 3 of the Salt Timber Harvest and Fuels Hazard Reduction Project comply with the Endangered Species Act and the goals, objectives and strategy set forth in the Recovery Plan for the Northern Spotted Owl.

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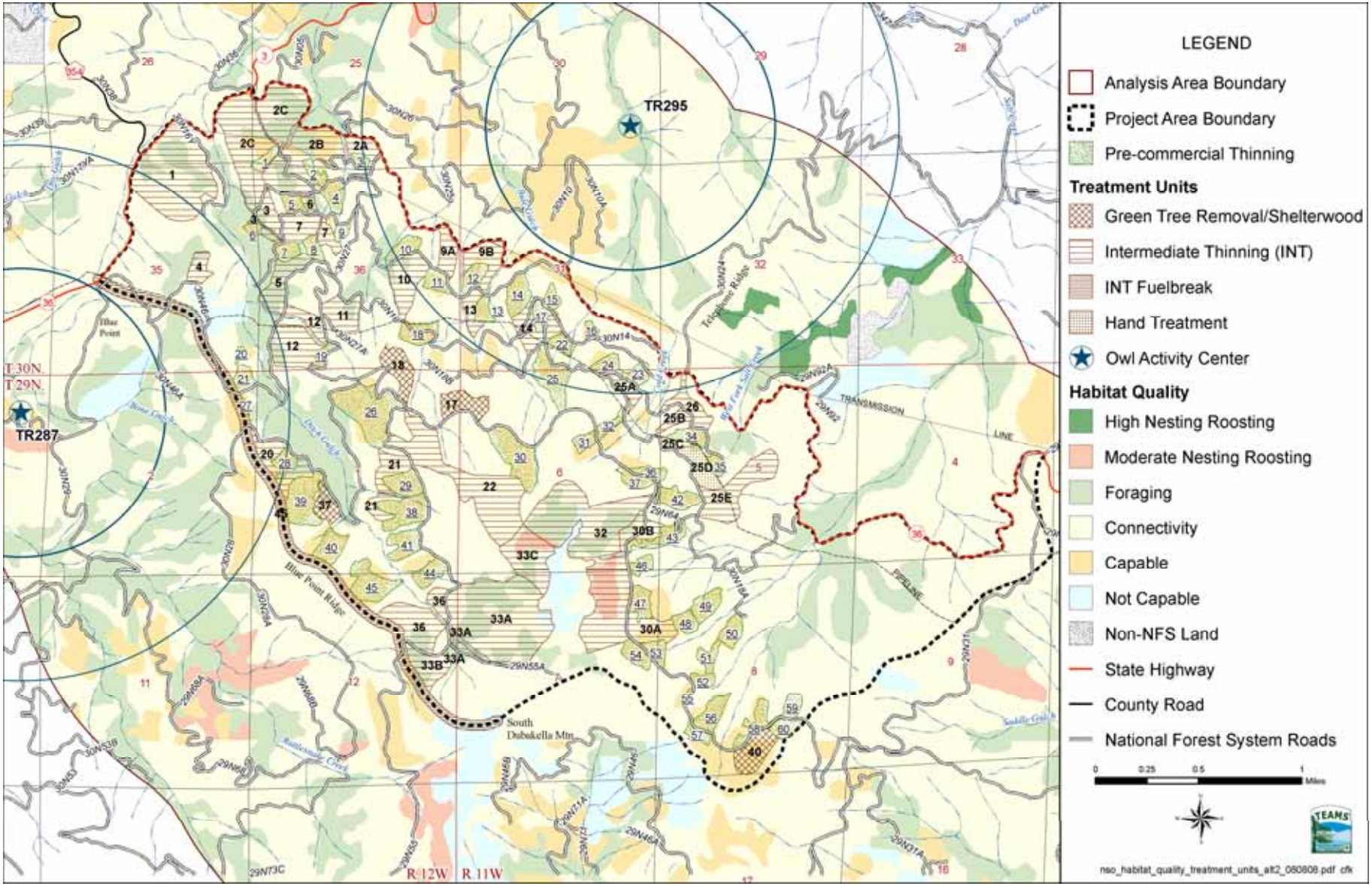

Figure E-1- Treatment units in northern spotted owl habitat for Alternative 2 Modified

Appendix F

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Wildlife Biological Assessment
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United States Department of Agriculture
Forest Service – Pacific Southwest Region

Wildlife Biological Assessment

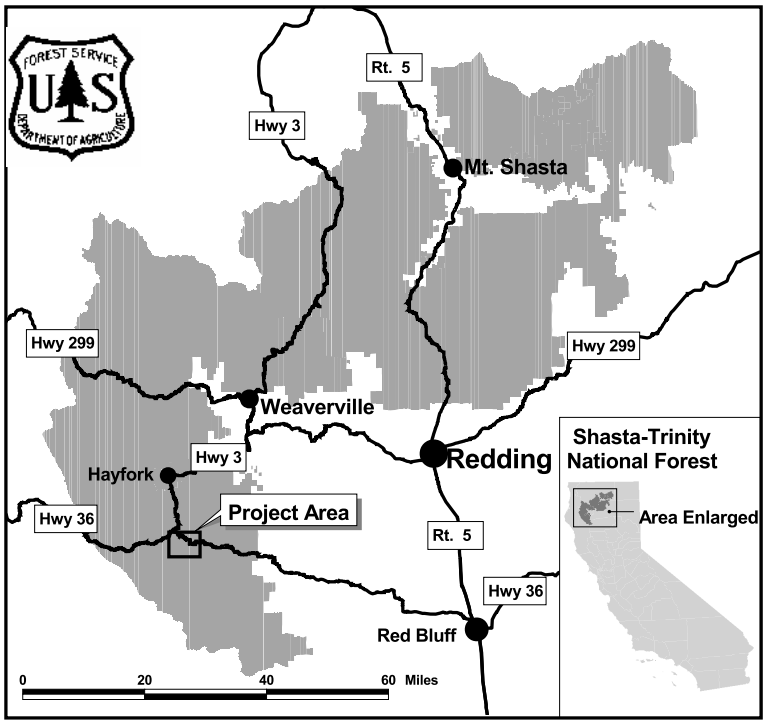
for the

Salt Project

ENVIRONMENTAL ASSESSMENT

(Alternative 2)

Trinity River Management Unit
Shasta-Trinity National Forest
Trinity County, California



Prepared By: _____ Date: _____

Thomas A. Quinn, Wildlife Biologist
Trinity River Management Unit
Shasta-Trinity National Forest
Contact person, phone (530) 623-1758

I. Introduction

The purpose of this biological assessment (BA) is to present the likely effects of the actions proposed in Alternative 2 of the Salt Project Environmental Assessment to Federally listed threatened, endangered or proposed species. This document is prepared in accordance with current policy and follows the standards established in Forest Service Manual direction (FSM 2670.32).

The Shasta-Trinity National Forest accessed the most recent a list of endangered, threatened, or proposed species that may occur in the project area vicinity (i.e., Trinity County) from the USFWS web site dated February 4, 2007 (http://www.fws.gov/arcata/specieslist). From this list, **the species considered in this document are:**

Endangered
- none

Threatened
- bald eagle (*Haliaeetus leucocephalus*)
- northern spotted owl (*Strix occidentalis caurina*)
- marbled murrelet (*Brachyramphus marmoratus*)
- California red-legged frog (*Rana aurora draytoni*)

Proposed
- none

Species Dropped from Further Analysis

The following species will not be further discussed except in the determinations section (VII) for the following reasons:

Long-term monitoring and survey efforts have revealed no **bald eagle** activity areas (i.e., nesting, roosting, or winter roosting/concentration areas) within or near the project area. The project area does not lie proximate to eagle foraging areas (e.g., lakes, rivers, larger creeks) and I do not expect eagles to occur in the vicinity.

The project area lies well outside the known or expected ranges of the **marbled murrelet** (Ralph et al. 1995) and the **California red-legged frog** (USDI 2002).

II. Consultation to date

On April 9, 2007, I provided this Draft BA to Keith Paul (Wildlife Biologist, U.S. Fish and Wildlife Service, USFWS, Red Bluff Field Office) for review and comments. Mr. Paul and Doug Powers (Wildlife Biologist, U.S. Fish and Wildlife Service, USFWS, Red Bluff Field Office) visited the project area on April 14, 2007. On April 18, 2007 I received minor comments related to clarification that have been incorporated into this final BA (e.g., Table 1, page 5, was included to synopsize the major aspects of the proposed actions; and a brief discussion of the non-territorial single owl ID# TR304 was included on page 7). On May 10, 2007 Mr. Paul, Mr. Powers, Jeff Paulo (project silviculturist, Forest Service, Shasta-Trinity National Forest) and I visited the project area to review concerns specific to GTR units in Alternative 3. We agreed that this BA will address only Alternative 2 and that consultation would be reinitiated should Alternative 3 be chosen.

III. Current management direction

The Shasta-Trinity National Forest (STNF) is currently operating in full compliance with the *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (ROD; USDA Forest Service and USDI Bureau of Land Management, 1994). The Regional Forester approved the STNF Land and Resource Management Plan (Forest Plan or LRMP) on April 28, 1995 and it became effective as of June 5, 1995. The Northwest Forest Plan ROD was incorporated into the Forest Plan.

The Forest Plan adopts the recovery plan for the bald eagle (USDI 1986) and the ROD as the Federal contribution to the recovery of the northern spotted owl. The STNF expects the network of areas withdrawn from active timber management (e.g., wilderness, late-successional reserves, riparian reserves, and administratively withdrawn areas) along with standards and guidelines related to snag, log, and hardwood retention to provide habitat adequate to maintain viable well-distributed populations of Federally listed or proposed species.

IV. Description of proposed action(s)

Location of Proposed Actions
The Salt Project is located within the upper reach of the Salt Creek fifth field watershed. State Highway 36 defines the northern boundary of the project area (see cover page map). The proposed project includes treatment areas in T29N, R11W sections 4-9, T29N, R12W sections 1, 2 and 12, T30N, R11W sections 31 and 32, and T30N, R12W sections 25, 26, 35, and 36 Mt. Diablo Meridian (Map 1). The project area is within the Hayfork Adaptive Management Area (AMA), and Management Area 19, Indian Valley/Rattlesnake, of the Shasta-Trinity Land and Resource Management Plan.

Purpose and Need for Action
The restoration strategy of the South Fork Management Unit is designed to implement a series of projects from south to north. The Salt project continues this strategy in the central northern area by addressing the need to reduce high fuel hazard, restore timber stands to a healthier condition and connecting to previously treated watersheds. The proposed action also includes activities that will improve watershed conditions through decommissioning of un-needed roads and restoration of anadromous fish habitat.

The high fuel hazard occurring in this project area needs to be lowered by removing the number of trees growing in young dense stands. Thinning stands would provide more space between trees increasing tree growth and vigor, reduce the future rate of tree mortality, and reduce the potential effects of wildfire.

Cut-over older stands need to be “restarted” with regeneration treatments using Green Tree Retention guidelines. These stands are under stocked and not growing well. Mortality and increasing decadence is occurring throughout these stands, increasing fuels hazard. Young stands would be created by removing areas of unhealthy trees and planting new, healthy seedlings in their place.

In Riparian Reserves there is a need to reduce the number of trees in young dense stands to improve connecting travel corridors for wildlife species, particularly late-successional dependent species; reduce the fire hazard of crown fires by removing some of the understory trees density; and maintain stand growth toward late-successional conditions by giving individual trees more site resources (space to grow and especially water).

Summary of Proposed Actions

- Regeneration Harvest (GTR) – 59 acres

Regeneration harvest with green tree retention (GTR) is proposed in multi-aged, multi-storied understocked or over-mature mixed conifer stands which have had previous harvest entries. These stands are understocked , not growing well and would not generally respond well to a thinning prescription. Mortality and increasing decadence is occurring throughout these stands, increasing the fuel hazard. Hardwood species, including canyon live-oak, California black oak, and Pacific madrone, are common but are generally understory components. This green tree retention (GTR) prescription is a regeneration harvest (i.e., most trees would be removed and the area replanted with seedlings) where biological legacies such as large/old green trees and other structural components (snags, logs, hardwoods, etc.) are retained within each harvest unit to provide old-growth habitat components into the future. The retention would include patches and individual large/old trees totaling at least 15 percent of each harvest unit area.

- Commercial Thinning (from below) – 991 acres

Thinning is proposed within overcrowded young-growth mixed conifer stands which have had previous harvest entries. Trees marked for removal with this 'thinning from below' would start with the smallest least healthy conifers and progressively involve larger trees until the exisitng 70 to 90 percent canopy cover is reduced to approximately 50 to 60 percent to make more water, nutrients, sunlight and growing space available to the remaining trees (conifers as well as hardwoods). The 60 percent canopy threshold would be meet in select Riparian Reserve portions within the thinning units. The remaining trees would experience accelerated growth and health. In addition, the smaller trees that would be removed act as fuel ladders because their crowns are closer to the ground and allow flames to move into the canopy that could lead to a large-scale loss of conifer forest habitat. Biological legacies such as large/old green trees and other structural components (large snags, logs, viable hardwoods, etc.) would be retained within each harvest unit to provide important old-growth habitat components as the stand developes.

- Plantation Precommercial Thinning - 503 acres

Conifer plantations establised in the 1970s and 1980s would be thinned from an existing 400-700 trees per acre to approximatley 150 trees per acre. The decreased competition for sunlight, nutrients, and soil moisture would improve stand vigor, reduce stand mortality, and reduce susceptibility to primary and secondary insect and disease effects. Stand vertical structural diversity would be maintained or improved by retaining intermediate, codominant, and dominant crown class hardwoods.

- Fuel Break Maintenance/Reconstruction - 103 acres

Fuel breaks that were created about 20 years ago would be maintained through thinning with a prescription that would remove smaller diameter trees, brush and snags and reduce the existing 50-70 percent overstory canopy closure down to 40 percent. Viable hardwoods would be cut back to the one-or-two most vigorous stems and maintained in the areas. In general, these are multi-aged, multi-storied mixed conifer stands which have been partially cut or sanitized in the past. Large snags and and most large logs have been removed for fuels and fire fighter safety concerns. Mortality is still occurring throughout these stands. Hardwood species, including canyon live-oak, California black oak, and Pacific madrone, are common but are generally understory components. The forest-floor component of these stands is generally well-developed and comprised of a variety of species, though

typically dominated by either deerbrush, wedgeleaf ceanothus, or whitethorn. Various grasses, forbs, and thistles are also commonly found.

Table 1. Major actions proposed in the Salt Project Alternative 2.

Regeneration (GTR)	Thinning From Below	Plantation Thinning	Fuel Break Maintenance/Reconstruction
59	991	503	103

- **Yarding Systems:** Trees, and some activity fuels, from the harvest units would be removed with a combination of tractor/mechanical yarding, skyline/cable yarding and helicopter yarding.

- **Landings:** An estimated 54 (0.25 to 0.5-acre) landings would be constructed or reconstructed in previously disturbed areas to aid in timber harvest, and ripped (i.e., "decompacted") and closed after completion of harvest activities.

- **Roads:** Approximately 18 miles of existing roads would be reconstructed (brushed, smoothed, graveled, etc.) and 0.33 miles of temporary roads would be constructed. Temporary roads would be ripped (i.e., "decompacted") and closed after completion of harvest activities.

- **Rock Pits:** An estimated one existing rock pit would be expanded to provide source material for road reconstruction activities.

- **Activity Fuels Treatments:** Fuels created as a relsult of the proposed silvicultural prescriptions would be treated with a combination of mastication (plantations), mechanical removal, chipping, handpiling/burning, tractorpiling/burning or burning areas of concentrated fuels.

Additional Design Criteria (Mitigation Measures)

The team developed numerous design criteria to reduce or avoid impacts to forest resources. Below are those that closely relate to wildlife issues:

- Limited Operating Periods (LOPs) would be implemented to avoid direct adverse impacts to the northern spotted owl. From February 1 through July 10, all noise- and smoke-generating activities will be prohibited <u>within ¼ mile</u> of suitable nesting/roosting habitat. In addition, all vegetation removal/cutting/burning will be prohibited through September 15 <u>within</u> suitable nesting/roosting habitat. These LOPs may be lifted if surveys using currently accepted protocols indicate specific areas are not occupied by breeding owls or with the mutual consent of the U.S. Fish and Wildlife Service and the U.S. Forest Service.
- Retain existing large (>19 inches diameter at breast height) snags and down logs within thinning units. Snags felled for safety reasons would be left on site as logs.
- Maintain an average of 5 tons of logs per acre with a preference to have 4 to 6 logs per acre at the largest available diameter.

- Retain all hardwoods that have a reasonable chance of surviving and thriving after stand treatments.
- Riparian Reserves of intermittent and ephemeral streams that display annual scour will have a minimum 150 foot Riparian Reserve based upon the average maximum height of 200-year-old trees for the site. There is one inner gorge greater than 150 feet from the defined channel of intermittent or ephemeral streams in unit 13 that will require a Riparian Reserve greater than 150 feet in width.
- Riparian Reserves of fish bearing streams that display annual scour will have a 300 foot Riparian Reserve based upon twice the average maximum height of 200-year-old trees for the site. There are no inner gorges or flood plains in the project area greater than 300 feet from the defined channel of fish bearing streams.
- Thinning may occur in the Riparian Reserves up to the inner gorge, or to 50 feet from the defined channel if no inner gorge exists, for the purpose of enhancing Riparian Reserve timber stand health and treating hazardous fuels. Thinning and fuels treatment will not reduce crown cover to less than 60% within Riparian Reserves.

v. existing environment

Spatial Scales

- The 36,881-acre **Salt Creek 5th Field Watershed** encompasses the project area and 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 ROD) establishes the 5th field watershed as the landscape to analyze the Standard & Guideline (S&G) "*Provide for Retention of Old-Growth Fragments Where Little Remains*" (ROD page C-44). Attachment 1 of this document presents an analysis of the Salt Creek 5th Field Watershed related to 15% S&G.

- The 16,920-acre **spotted owl Action Area** is the primary area analyzed for this project. It was established by a 1.3 mile buffer around all proposed harvest units. This area was deemed appropriate for the following reason: Based on available radio-telemetry data (Thomas et al. 1990), the U.S. Fish and Wildlife Service (FWS) estimated the median annual home range size for the northern spotted owl in California. Because the actual configuration of a home range is rarely known, the estimated home range of a northern spotted owl pair in California is represented by a 1.3-mile circle (3,340 acres) centered upon an owl activity center (e.g., nest site). Suitable habitat within a home range would likely be utilized to some extent within any given year by territorial owls. Therefore, any effects to habitat, both positive and negative, due to the Salt Project would likely affect any current or potential future owl activity centers in the area. That is to say, habitat affected by the Salt Project would fall with the home ranges of any owls nesting in the owl Action Area. The plantations proposed for thinning were not used to establish the action area because they contain no attributes of owl habitat (large snags, logs or older "legacy" conifers) and will require roughly 100-plus years to develop to owl habitat conditions. This 100-year timeframe seemed an unreasonable temporal scale to use in this analysis (see below).

- **Two** individual **owl home ranges** are analyzed for two historic owl activity centers included in our records (State ID#s TR287 and TR295; Maps 2 and 3) Note: The FWS uses a 0.7-mile radius circle around an owl activity center to delineate the area most heavily used (territory or "core area") by owls during the nesting season. These areas

assist the FWS during project level consultation related to possible impacts to individual owl pairs. No actions are proposed within 0.7 miles of a known activity center.

- The **project area** includes only the areas that would be directly impacted by the proposed actions (e.g., thinning units, regeneration units). Thus, Alternative 1 (no action) has no "project area".

LAND ALLOCATIONS AND CRITICAL HABITAT:

All actions proposed in the Salt project lie within the Hayfork Adaptive Management Area. As such, the area's main assigned biological role in the overall strategy for maintaining viable populations of species associated with late-successional and old-growth (LSOG) forest ecosystems (as described in the FSEIS, the subsequent ROD, and the Forest Plan) is to provide connectivity between large areas set aside for these species (late-successional reserves, LSRs) while maintaining at least 15 percent of federal forest land in LSOG conditions. Connectivity does not necessarily mean that set-aside late-successional and old-growth areas have to be physically joined in space. However, conditions between these areas must be compatible with the movement of LSOG associated species, such that they are both capable of moving through these habitats and inclined to do so.

SPECIES ACCOUNT:

- Northern spotted owl

No owl surveys have been conducted for this project. Our records include two historic owl pair activity centers in the action area (state ID numbers TR287 and TR295; last confirmed in 1992 and 1996 respectively)(Maps 2 and 3). Our records also include detections of a non-territorial male owl just within the southern boundary of the action area in the vicinity of Mud Springs (state ID TR304); pair or territorial single status was not established for this area and thus it is not included as an activity center.

- Spotted Owl Population Trend

Courtney et al. (2004, Table 2) report the most current estimated rate of population change (PC) for the northern spotted owl where a stable population is indicated by PC = 1, a declining population by PC < 1, and an increasing population by PC > 1. PC ranged from 0.896 to 1.005 and was <1.0 on 12 of 13 range-wide study areas. However, in only four of these 12 were 95% confidence intervals for PC < 1. Evidence for owl population decline was weak on the three study areas closest to the Salt Project Area (i.e., Klamath, NW California and Hoopa study areas).

The wealth of information on the demography of the northern spotted owl is unique. For no other threatened or endangered species do we have such extensive information on population trends and the factors affecting them. The demographic studies reported here are among the most significant achievements in conservation biology. Yet, the information is still far from complete, and inadequate to make critical assessments. While northern spotted owl populations appear to be in decline, it is not possible to determine whether this decline is greater than that predicted at the time of the NWFP (Courtney et al. 2004).

Table 2. Estimated rate of population change (PC) for Northern Spotted Owls, with standard error and 95% confidence interval (as reported in Courtney et al. 2004, Table 8.5). Shaded areas in this table identify the study areas closest to the Salt Project

	PC[1]	Standard Error	95% Confidence Interval Lower	Upper
California				
NW California	0.985	0.013	0.959	1.011
Hoopa	0.980	0.019	0.943	1.017
Simpson	0.970	0.012	0.947	0.993
Oregon				
Coast Ranges	0.968	0.018	0.932	1.004
H.J. Andrews	0.978	0.014	0.950	1.005
Warm Springs	0.908	0.022	0.866	0.951
Tyee	1.005	0.019	0.967	1.043
Klamath	0.997	0.034	0.930	1.063
S. Cascades	0.974	0.035	0.906	1.042
Washington				
Wenatchee	0.917	0.018	0.882	0.952
Cle Elum	0.938	0.019	0.910	0.976
Rainer	0.896	0.055	0.788	1.003
Olympic	0.956	0.032	0.839	1.018

[1]A stable population is indicated by PC = 1, a declining population by PC < 1, and an increasing population by PC > 1.

- Competitors & Predators

No known northern goshawk, barred owl or great horned owls sightings occur in the action area.

- West Nile Virus

West Nile virus occurs in the project area general vicinity based upon positive lab test results of roughly 18 dead birds found throughout Trinity County (personal communication with Peter Hedtke; Trinity County Environmental Health Division of the Building and Development Services Department). None of the birds analyzed were spotted owls.

HABITAT ACCOUNT:

The northern spotted owl is strongly associated with conifer stands that include the following characteristics: a multi-layered, multi-species (including hardwoods) canopy dominated by large overstory trees; moderate to high canopy closure; a high incidence of trees with large cavities and other types of deformities; numerous large snags; an abundance of large dead wood on the ground (logs); and open space within and below the upper canopy for spotted owls to fly (Thomas et al. 1990, USDI Fish and Wildlife Service 1990a). Nest sites are usually located within stands of old-growth and late-successional (late seral) forest dominated by Douglas-fir containing structures such as cavities, broken tree tops, or mistletoe (*Arceuthobium* spp.) brooms (Forsman et al. 1984, Blakesley et al. 1992, LaHaye and Gutierrez 1999). In redwood forests along the coast range of California, spotted owls may be found in younger forest stands with structural characteristics of older forests (Thomas et al. 1990). In the vicinity of the Salt Project these habitat characteristics are essentially restricted to old-growth, and to a lesser extent other late seral (mature late-successional) conifer stands. Recent

landscape-level analyses suggest that a mosaic of late-successional habitat interspersed with other vegetation types may benefit spotted owls more than large homogeneous expanses of older forests (Zable et al. 2003, Franklin et al. 2000, Meyer et al. 1998) presumably by providing more foraging opportunities. Foraging habitat is the most variable of all habitats used by territorial spotted owls (Thomas et al. 1990). Descriptions of foraging habitat have ranged from complex structure (Solis and Gutierrez 1990) to forests with lower canopy closure and smaller trees than nesting/roosting habitat (Gutierrez 1996).

Attachment 1 of this document provides habitat definitions and the assumptions used to analyze late-successional and old-growth habitat. Table 3 displays the crosswalk between the two main stand attributes used (size class and canopy closure) and habitat specific to the spotted owl. Figure 1 displays a visual generalization of relative owl habitat quality related to “crown diameter” and “canopy closure” attributes in our Forest GIS database.

Crown Diameter (Size) Classes:

- 0 = shrub, forb, grass, noncommercial conifer, hardwood, and nonvegetated (no old-growth potential; not federal forest land).
- 1 = 0-5 foot crown diameter, seedling sapling; stand establishment stage; includes most contemporary plantations (future old-growth potential; federal forest land).
- 2 = 6-12 foot crown diameter, poles; growth and maturation with little or no natural thinning; includes minor acreages of contemporary plantations (future old-growth potential; federal forest land)..
- **3** = 13-24 foot crown diameter, small to medium timber; continued growth and maturation and beginning natural thinning (current mature forest).
- **4 or greater** = >24 foot crown diameter, large sawtimber; transition stage (current old-growth forest).

Canopy Closure Classes:

- S = <20%
- P = 20-39%
- **N** = 40-69%
- **G** = ≥70%

Connectivity (Dispersal) Habitat

Connectivity habitat comprises more than 83 percent (14,186 acres) of the 16,920-acre spotted owl action area and is relatively contiguous except for areas leading to the southeast where harsh growing conditions limit conifer growth (Map 2). Thomas et al. (1990) established the level of adequate connectivity habitat at 50 percent of a given landscape (e.g., quarter-township). Connectivity habitat is defined as conifer stands meeting at least "11-40" conditions (i.e., an average conifer of at least 11 inches diameter at breast height and at least 40 percent canopy closure) (Thomas et al. 1990). See Table 3.

Spotted Owl Nesting, Roosting and Foraging (NRF) Habitat

Old-growth (4N/G) provides “high quality” owl nesting/roosting habitat. Younger densely to moderately canopied mature stands provide “moderate” quality owl nesting/roosting habitat (3G) and foraging habitat (3N) respectively. There is a clear distinction between old-growth and late-successional habitat. Late-successional (late seral) is defined simply as conifer stands at least 80 years old regardless of other stand attributes such as level of decadence or canopy closure. Old-growth is a subset of late-successional and is defined as a forest stand usually at least 180-220 years old with moderate to high canopy closure; a multilayered, multispecies canopy dominated by large overstory trees; a high incidence of large trees, some with broken tops and other indications of old and decaying wood (decadence); numerous large snags; and heavy accumulations of wood, including large logs on the ground (NWFP ROD page F-4).

Table 3. Spotted owl nesting/roosting (NR), foraging (F) and connectivity habitat related to late-successional (late seral) and old-growth habitat analysis and crown diameter & canopy closure (see Appendix 1).

Nesting/Roosting (NR)	4G & 4N (high quality NR; old-growth), and 3G (moderate quality NR)
Foraging (F)	3N
Connectivity (dispersal habitat)	(the above plus) 4P, 4S, 3P, 3S, 2G and 2N
Capable (potential future NRF)	all remaining Federal Forest Land (capable of growing to NRF habitat conditions)

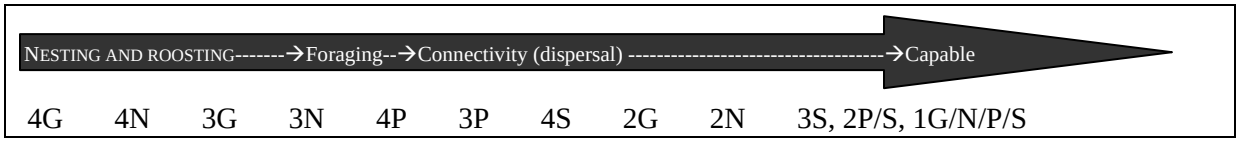


Figure 2. **The general relationship between late-successional (late seral) MIS spotted owl habitat quality and size class & canopy closure to** (from left to right, higher to lower quality).

VI. Effects of the proposed action

The current amount of NRF habitat within the three spatial scales analyzed is included in Table 4 and is displayed on Maps 2 and 3. Note that the Salt Creek 5th Field Watershed was used only for analyzing the "*Provide for Retention of Old-Growth Fragments Where Little Remains*" S&G (see Attachment 1).

Actions Not Further Analyzed:
The interrelated and interdependent actions listed below will not be further analyzed for the following reasons:

- **Road reconstruction and rock pit expansion** would occur within existing Forest Service system roadbeds or already heavily disturbed sites and would have no effect on existing owl habitat.
- **Temporary road construction** would occur only within proposed thinning units and their widths (12-15 feet) would be comparable to the leave tree spacing (i.e., comparable effects to canopy closure). Additionally, they would be ripped or subsoiled after use (i.e., the soil would be "decompacted") to allow water infiltration and revegetation. That is to say, the recovery of the stands as related to owl habitat would be similar with or without the temporary road construction. Therefore, the effects are lumped in with the effects of thinning.
- **Dozer and handlines** would occur within proposed harvest units and would have little effect on retained vegetation or habitat components. Therefore, the effects are lumped in with thinning/regeneration effects.
- **Activity fuels treatments** (including burning), **decompacting temporary roads or landings**, and **road decommissioning** would not affect owl habitat.
- For all these actions the LOP (page 6) avoids direct impacts to owls due to noise or smoke related to the proposed actions.

DIRECT EFFECTS (Mortality, Harm, Failed Breeding Attempts, Displacement)

The limited operating periods included in the design criteria for this project minimize direct effects to the spotted owl by avoiding disturbances during critical periods of the breeding season or when young owls are not mobile enough to readily move from a disturbance.

Two potential owl pairs may be temporarily displaced (≤35 years based upon estimated regrowth of these stands). However, the response of individual owls or pairs to the proposed habitat alteration is speculative without intrusive radio or color-coded tagging and monitoring. The majority of the stands proposed for thinning are very dense, to the point of likely limiting effective foraging by spotted owls. Resident owls may remain in the area or return shortly after the disturbance and then benefit from having these thinned stands available for more effective foraging habitat given that high quality NR habitat will remain intact. Owls are capable and willing to (re)occupy suitable habitat in areas affected by timber harvest activities and many successful owl nest sites occur in landscapes where adjacent timber harvesting has occurred (personal observation). Conversely, resident owls acclimated to current conditions may relocate to other areas permanently or until stands recover to predisturbance canopy cover levels. If resident owls relocate, other dispersing or nonterritorial (floater) owls may opportunistically move in and occupy NR habitat in the project area or vicinity.

INDIRECT EFFECTS (i.e., HABITAT)

Connectivity
The Salt Project would maintain connectivity habitat at well above 50 percent threshold (Thomas et al. 1990) in the action area (84%). Only regeneration units (GTR) would reduce the existing 14,186 acres (including NRF habitat) of connectivity habitat in the action area (55 acres). The size and location of the GTR units would not isolate existing NRF habitat and multiple connectors through the action area would be maintained (see Maps 2 and 3). Additionally, the proposed plantation thinning would accelerate the development of approximately 503 acres of connectivity habitat conditions in approximately 15 years. Without thinning, these plantations would likely reach 11-40 conditions but would remain so dense that owls would not be able to freely fly through them for 35+ years.

Effects to Spotted Owl Nesting/Roosting (NR) and Foraging (F) Habitat

Short-Term (<35 years)

The Salt Project would affect owl habitat in the short-term in four general ways:

- **REDUCTION IN OVERALL CANOPY CLOSURE:** A moderate to dense canopy closure is important to owls because it moderates environmental extremes (e.g., temperature, rain/snow fall, etc.).

- **SIMPLIFICATION IN VERTICAL STRUCTURE:** Multiple canopy levels provided by understory conifers and hardwoods provide lower (cooler) roost sites in the hot summer months and provide perch sites for foraging and eating.

- **REDUCTION IN SMALLER DIAMETER (<24" DBH) SNAGS AND LOGS:** Snags can provide owl nest sites and both snags and logs provide habitat for owl prey species. Few large (>24"dbh) would be removed by the proposed thinning treatments and virtually no large snags occur in the fuel break area. My experience suggests that spotted owls would not likely use snags less than 24"dbh for nest sites.

- **REDUCTION IN POTENTIAL NESTING OPPORTUNITIES:** Larger decadent (broken-topped) conifers and snags provide typical nest sites for spotted owls. This effect is related to GTR prescriptions; the largest/oldest conifers and snags would be retained in the thinning units.

The Salt Project would affect approximately 279 acres of existing NRF habitat. Effects to existing NRF habitat are analyzed at four spatial scales described above (the owl action area, two owl home ranges, and the project area or the actual areas that would be affected) and three categories of intensity (described below). Table 4 presents the amount (acres) of each habitat type that would be affected segregated by the intensity and spatial scales. Map 2 displays the proposed actions related to NRF habitat at the action area and owl home range scales.

Effects Intensity

- **Removed** indicates the habitat would no longer function as owl habitat resulting from GTR prescriptions. Long-term experience with similar treatments indicates that regenerated areas should recover to connectivity habitat conditions in roughly 35 to 40 years after the first commercial thinning. Foraging habitat and nesting/roosting habitat conditions should develop in roughly 80 years and 100+ years respectively.

    - 0 acres of high quality NR habitat (4G)
    - 0 acres of moderate quality NR habitat (3G)
    - 11 acres of foraging habitat (3N)

- **Downgraded** indicates a temporary reduction (about 35 years or less) of owl nesting/roosting habitat down to foraging habitat resulting from thinning prescriptions within existing moderate quality nesting/roosting habitat. There would be a reduction in overall canopy closure from and existing 70-90% down to approximately 50-60% and a reduction in smaller diameter (≤19" diameter at breast height) recruitment snags and logs (live trees that will provide for snags and logs into the future). The retention of large predominant (legacy) conifers, larger snags (>19") and viable hardwoods would maintain snags and decadent conifers large enough to provide owl nest sites and contribute to vertical structure. Visual estimates based upon field reviews indicate that the LRMP S&G of 1.5 snags and 5 tons of course woody material (i.e., logs) would be met at a 40-acre average. Thinning within existing owl foraging habitat would maintain foraging habitat conditions.

    - 0 acres of high quality NR habitat (4G)
    - 28 acres of moderate quality NR habitat (3G down to 3N)
    - 0 acres of foraging habitat (3N)

- **Degraded** indicates some habitat components (e.g., smaller snags, canopy closure, and vertical structural complexity) may be somewhat reduced but the habitat would continue to function at the current level resulting from thinning and fuel break treatments within foraging habitat (3N). The retention of large predominant (legacy) conifers, larger snags (>19") and viable hardwoods would maintain snags and decadent conifers large enough to provide owl nest sites and contribute to vertical structure.

  - 0 acres of high quality NR habitat (4G)
  - 0 acres of moderate quality NR habitat (3G)
  - 239 acres of Foraging habitat (3N)

Long-Term (≥35 years) Effects to NRF Habitat

The thinning prescriptions within existing NRF habitat and other conifer stands not currently NRF (Map 3) would result in a net increase of forest stands with old-growth (NR) characteristics after about 35 years (Figure 2). Thirty-five years is used as a temporal timeframe because we expect the original canopy closure to be regained or exceeded by then within thinned areas. Other important owl habitat components such as large/old conifers, large snags & log, and viable hardwoods would be retained in the thinning units.

The proposed thinning and fuel break treatments within the overcrowded conifer stands would improve the health of these forest areas by making more water, nutrients, and sunlight and growing space available to the remaining trees (conifers as well as hardwoods). In addition, the smaller trees that would be removed act as fuel ladders because their crowns are closer to the ground and allow flames to move into the canopy that could lead to loss of NRF habitat. Long-term experience with thinning conifer stands indicates that within about 35 years the thinned late-successional stands (including stands that are currently below owl foraging habitat conditions) would have redeveloped a moderate to dense canopy closure. The conifers would have developed larger, fuller crowns with larger lateral branches. These trees would ultimately provide recruitment for larger snags and logs. Small diameter (<19" dbh) snags and logs would be rare because of the past removal of smaller diameter recruitment trees. Understory hardwoods would have persisted in the stands adding to vertical structural complexity. Most of the preexisting large snags and logs would still be present.

The fuel break treatments are proposed within existing fuel breaks created about 20 years ago. As such, most large decadent conifers, large snags and logs have been removed for fuels and fire fighter safety concerns. Thus, these areas are anticipated to develop to foraging habitat rather than NR habitat conditions because the areas would largely lack suitable nest sites.

NOTE: The decisions made in the Salt Project EA would improve future options of managing for old-growth habitat into the future but would not dictate ultimate stand development. We anticipate reevaluating the thinned stands in about 35.

Table 4. Salt Project effects (acres) to spotted owl nesting/roosting (NR) and foraging habitat within the spotted owl 'Action Area' and within the Home Ranges of two owl activity centers TR287 and TR295. Note that there are no affects to existing high quality NR habitat (old-growth) and that no NR habitat is affected in the owl home ranges. No actions are proposed in the owls' territories (i.e., within 0.7 miles of the activity centers).

		High Quality NR (Old-Growth Forest; 4G)		Moderate Quality NR (dense mature forest; 3G)		Foraging (mod. dense mature forest; 3N)	
Analysis Area	**Effects to Habitat**	**Existing Available Habitat**	**Acres Affected**	**Existing Available Habitat**	**Acres Affected**	**Existing Available Habitat**	**Acres Affected**
Owl Action Area	Removed	**94**	0	**813**	0	**2,556**	11
	Downgraded		0		28		0
	Degraded		0		0		239
	TOTAL		0		28		250
TR287 Owl Home Range	Removed	**17**	0	**105**	0	**746**	7
	Downgraded		0		0		0
	Degraded		0		0		11
	TOTAL		0		0		18
TR295 Owl Home Range	Removed	**26**	0	**64**	0	**483**	0
	Downgraded		0		0		0
	Degraded		0		0		2
	TOTAL		0		0		2

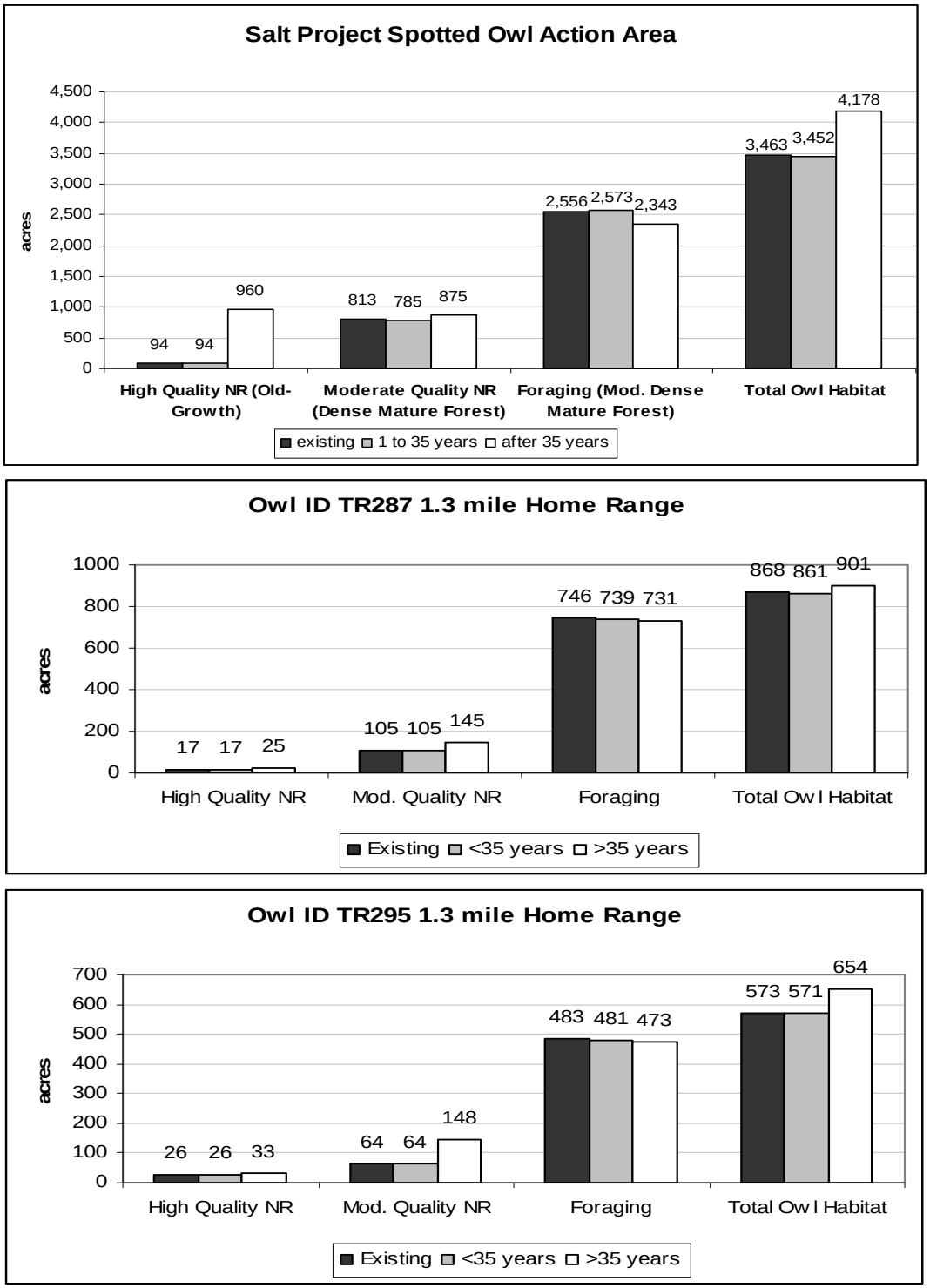


Figure 2. Existing spotted owl habitat conditions and the short-term (<35 years) and long-term effects (≥35 years) to habitat within the Spotted Owl Action Area and spotted owl home ranges ID TR287 and TR295. Existing conditions also reflect the long-term effects of Alternative 1 (no action) because we expect no significant changes to habitat conditions in 35+ years with this alternative.

- Competitors & Predators

  The probability of predation by great horned owls on spotted owls may be temporarily increased because thinning would provide more open stands that the larger, less maneuverable great horned owl prefers (USDI 1992a).

- West Nile Virus

  There is no known connection between WNV and forest management practices and there are no known cases of spotted owl mortality due to this disease at this time. Should WNV begin to impact owls in the area, the short-term negative effects related to this project may be compounded.

Cumulative effects

Attachment 1 of this document presents an analysis of current forest conditions within the Salt Creek Watershed (that encompasses the action area) and incorporates past actions that led to those conditions. Mid-mature conifer forest dominates Federal land within the roughly 16,920-acre action area because of historic timber harvest activities and fire. Over time, older conifer forest habitat within the action area will likely be restricted to 15,784 acres of federal forest land. Existing non-conifer areas such as hardwood and shrub dominated habitats and riparian vegetation would remain largely intact on both federal and private lands. The action area includes approximately 660 acres of private property that is either residential, including the community of Trinity Pines or areas that were harvested in the 1960's. As a result, this land is dominated by very dense pine forest. While these areas meet the 11-40 condition of owl connectivity habitat, they are currently so dense as to prohibit the free movement owls. The California Department of Forestry and Fire Protection (CDF) web site* lists no private timber harvest plans in this area. No Forest Service projects are planned in the action area in the foreseeable future

*(http://www.fire.ca.gov/ResourceManagement/THPStatusUpload/THPStatusTable.html)

VII. Determinations

- bald eagle

It is my determination that the Salt Project would have **no effect on the bald eagle** because eagles are not known nor expected to occur within or near the project area. Potential effects to eagle prey (i.e., fish) downstream from the project area would be immeasurable (see the Salt Project Fishery BA).

- Northern spotted owl

It is my determination that the Salt Project **may affect and would likely adversely affect the northern spotted owl** based upon the following rationale: Existing NRF habitat would be reduced, downgraded or degraded in the short-term (<35 years) and the quantity and relative quality of NRF habitat would be increased in the long-term (after roughly 35 years). Two potential owl pairs may be temporarily (≤35 years) displaced. The probability of large-scale catastrophic loss of owl habitat due to fire would be reduced. Direct harm or disturbance to breeding activities would be avoided with the LOP.

- **NORTHERN SPOTTED OWL CRITICAL HABITAT**
  It is my determination that the Salt Project **would have no affect on designated spotted owl critical habitat** because no designated critical habitat lies within areas proposed for treatment.

It is my determination that the Salt Project would have **no effect on the marbled murrelet** or **California red-legged frog** because the project area lies outside the known or expected ranges of these species.

- **MARBLED MURRELET CRITICAL HABITAT**
  It is my determination that the Salt Project would have **no effect on designated marbled murrelet critical habitat** because no designated critical habitat lies within areas proposed for treatment.

VIII. Management recommendations

Given the design criteria included in the Salt Project specific to the spotted owl and its habitat, there are no management recommendations.

IX. Contributors

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- Kelly Wolcott, Forest Wildlife Biologist, Shasta-Trinity National Forest.
- Keith Paul, Wildlife Biologist, U.S. Fish and Wildlife Service, Red Bluff Field Office.

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ATTACHMENT 1 for the Biological Assessment

Salt Creek 5th Field Watershed

Analysis and Recommendations

for the

PROVIDE FOR RETENTION OF OLD-GROWTH FRAGMENTS IN WATERSHEDS WHERE LITTLE REMAINS

standard and guideline

SUMMARY
Total late-successional conditions in the Salt Creek Watershed are currently well above the 15% S&G threshold of concern. Total existing late-successional forest (dominated by mature forest) comprises about 78 percent of federal forest land in the watershed. *However, old-growth--that provides high quality habitat for species associated with old-growth forests such as the northern spotted owl--comprises only 408 acres or less than 2 percent of the 26,491 acres of federal forest land. Therefore, harvesting existing old-growth is not recommended at this time.*

INTRODUCTION

This document presents an analysis of the current condition of late-successional and old-growth conifer habitat within the Salt Creek 5th field watershed and recommendations for meeting and maintaining future options to meet the intent of the ***provide for retention of old-growth fragments in watersheds where little remains*** standard and guideline (15% S&G, ROD page C-44).

The threshold of concern with the 15% S&G is the retention of at least 15 percent of federal forest land within a 5th field watershed in late-successional habitat. The first paragraph of the S&G describes the importance of old-growth habitat in providing for biological and structural diversity across the landscape and goes on to state that it is **prudent** to retain what little remains of this age class within landscapes where it is currently very limited. However, the second paragraph of the S&G makes it clear that late-sucessional (including both mature and old-growth; see below) constitute the numerator in calculating the percentage of federal forest land (i.e., the denominator) meeting this S&G.

DEFINITIONS & ASSUMPTIONS

The *Shasta-Trinity Land and Resource Management Plan (Forest Plan) database* (**LMP-90 database**) was used to assess Forest Service land within the watershed.

- ***Federal Forest Land*** – Federal land that is now, or is capable of becoming, at least 10 percent stocked with forest trees (i.e., conifers) and that has not been developed for nontimber use. This acreage is the base (denominator) used to calculate the 15 percent retention S&G. Within the watershed Forest Service land of the forest types (LMP-90 database *"Vegtype1"*) Douglas-fir, mixed conifer, ponderosa pine, plantation, and white fir qualify as Federal Forest Land.

- ***Late-Successional Forest*** - Forest seral stages that include old-growth and mature age classes.

- ***Old-Growth*** – A forest stand usually at least 180-220 years old with moderate to high canopy closure; a multilayered, multispecies canopy dominated by large overstory trees; high incidence of large trees, some with broken tops and other indications of old and decaying wood; numerous snags; and heavy accumulations of wood, including large logs on the ground. **Within the watershed all size class 4 (or greater) stands with a canopy closure of G or N are assumed to be old-growth** (LMP-90 database *"Vegsize"* and *"Vegden"*).

- ***Mature Stand*** – A mappable (>10 acres) stand of trees for which the annual rate of growth has peaked; generally greater than 80 years old but not yet old-growth. Mature stands generally contain trees with a smaller average diameter, less age class variation, and less structural complexity than old-growth stands of the same forest type. **Within the watershed all size class 3 or greater stands are assumed to be mature stands. Because the definition of "mature" does not include a canopy closure criterion.** Older mature stands with relatively high canopy closure (e.g., *"Vegden"* G and N) typically provide suitable habitat for species associated with old-growth forests such as the northern spotted owl.

LMP-90 Database Assumptions

The Shasta-Trinity Land and Resource Management Plan (Forest Plan) database (LMP-90 database) is the best existing and available tool for vegetative analysis of Forest Service land within an area as large as the Salt Creek Watershed. Using this database to analyze existing vegetative conditions as

they relate to old-growth habitat requires a number of basic assumptions that long-term local experience suggests are valid for analyses at this scale. The information available in the LMP-90 database represents aerial photo interpretation from 1975 photos. The interpretation was conducted with primarily timber production interests in mind. In 1990 and 1992 the database was updated to include recent harvest units (i.e., plantations) and stand replacing fires. Stand attributes in the database (the codes included in the LMP-90 database are included in parentheses) used to infer potential and existing late-successional forest conditions were: **vegetation type** (LMP-90 database *Vegtype1*), **crown size** (LMP-90 database *Vegsize*), **canopy closure** (*Vegden*).

- ***Vegtype1*** (vegetation type): Within the Salt Creek Watershed only "commercial conifer" types typically have the potential to qualify as Federal Forest Land and provide habitat for species associated with old-growth conifer forests. That is to say, only these types move through the successional stages resembling those described on pages B-2 through B-4 in the ROD and develop old-growth stand structure and composition as described on page B-2 (and the Glossary) of the ROD. Within the watershed Federal Forest includes ponderosa pine, Douglas-fir, mixed conifer, white fir and plantation vegetation types. Nonconifer and noncommercial conifer types almost never achieve the size, canopy closure, or generally complex vertical structure associated with old-growth habitat.

- ***Vegsize*** (overstory conifer crown diameter): Overstory conifer crown diameter classes included in the LMP-90 database are a reasonable indicator of general stand age and their use is the only currently available tool for estimating seral stage development over large areas. Size classes are the major indicator of the level of decadence within stands (e.g., snags, logs, broken-top trees, etc.) since decadence is largely a function of stand age. That is to say, stands with larger trees are typically older than stands with smaller trees. Size class 4 (or greater) are typically old enough to have developed these attributes of old-growth conifer forests. Stands in size class 3 on sites highly capable of growing trees often are at least 21 inches dbh (diameter breast height) considering growth since 1975. Generally, if these stands are a result of natural regeneration (e.g., having developed after a stand replacing fire as opposed to past clearcutting) they include legacies from the previous stands (e.g., large trees, snags, logs, etc.) and likely provide at least some of the ecological roles of old-growth. Size classes 3 and 4 provide late-successional forest (i.e., Federal Forest Land) that contribute to meeting the 15% S&G although these stands with lower canopy cover may not provide suitable habitat for species associated with old-growth forests such as the northern spotted owl (see Figures 1 and 2).

  Crown Diameter Classes:
  - 0 = shrub, forb, grass, noncommercial conifer, hardwood, and nonvegetated (no old-growth potential; not federal forest land).
  - 1 = 0-5 foot crown diameter, seedling sapling; stand establishment stage; includes most contemporary plantations (future old-growth potential; federal forest land).
  - 2 = 6-12 foot crown diameter, poles; growth and maturation with little or no natural thinning; includes minor acreages of contemporary plantations (future old-growth potential; federal forest land)..
  - **3** = 13-24 foot crown diameter, small to medium timber; continued growth and maturation and beginning natural thinning (current mature forest).
  - **4 or greater** = >24 foot crown diameter, large sawtimber; transition stage (current old-growth forest).

- ***Vegden*** (overstory conifer canopy cover) **(**: Moderate to dense canopy closure is typical of old-growth habitat in the Salt Creek Watershed. Local experience strongly suggests that canopy closure classes N & G typify current old-growth habitat. These classes were originally assigned based on predominant crown cover of only commercial conifer overstory species. When the understory component is included along with 20+ years of growth these two classes commonly have a total canopy closure above 60 percent. In addition, the understory increases the complexity of vertical structure (an important attribute of old-growth habitat). Class P and S stands typically do not provide suitable habitat for species associated with old-growth forests such as the northern spotted owl (see Figures 1 and 2).

Canopy Closure Classes:

- S = <20%
- P = 20-39%
- **N** = 40-69%
- **G** = ≥70%

Size & Canopy Closure Classes Related to Old-Growth Habitat

Older denser conifer stands typically provide better habitat conditions for species associated with old-growth forests such as the northern spotted owl.

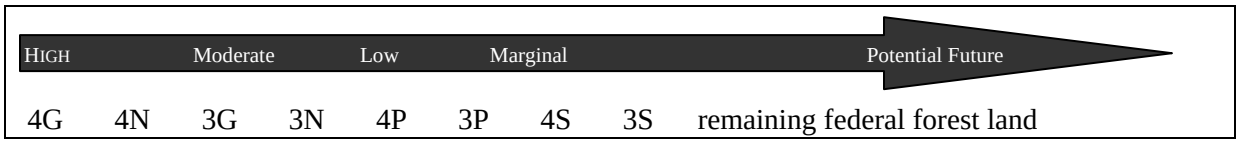

Figure 1. **The general relationship between old-growth habitat quality and size class & canopy closure** (from left to right, higher to lower quality).

Size & Canopy Closure Classes Related to Northern Spotted Owl Late-Seral Management Indicator Species (MIS) Habitat Quality

In general, spotted owl habitat quality improves with age and canopy closure. **NOTE:** The terms "late seral" or "late seral stage" used in the LRMP are synonymous with the term **late-successional** in the context of this document. Late-successional is the term used in the Northwest Forest Plan and most other supporting documents.

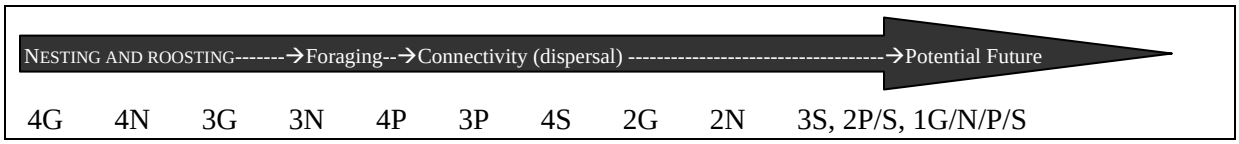

Figure 2. **The general relationship between late-successional (late seral) MIS spotted owl habitat quality and size class & canopy closure to** (from left to right, higher to lower quality).

CURRENT CONDITIONS

Current conditions in the Salt Creek Watershed are well above the 15% S&G threshold of concern. The 36,881-acre Salt Creek Watershed includes about 5,748 acres of private property and 31,133 acres of Forest Service land of which about 26,491 acres are vegetation types that are 'federal forest

land' (Figure 3). This federal forest land is the denominator in calculating the S&G. Total existing late-successional forest (dominated by mature forest, size class 3, Table 1 and Figure 4) that contributes to meeting the 15% S&G comprises about 78 percent of federal forest land in the watershed. The percentage drops to about 23 percent if only moderately dense or dense late-successional forest (that typically provide suitable habitat for species associated with old-growth forests such as the northern spotted owl) are included. High quality old-growth habitat (4N/G) comprises only 408 acres or less than 2 percent of the federal forest land.

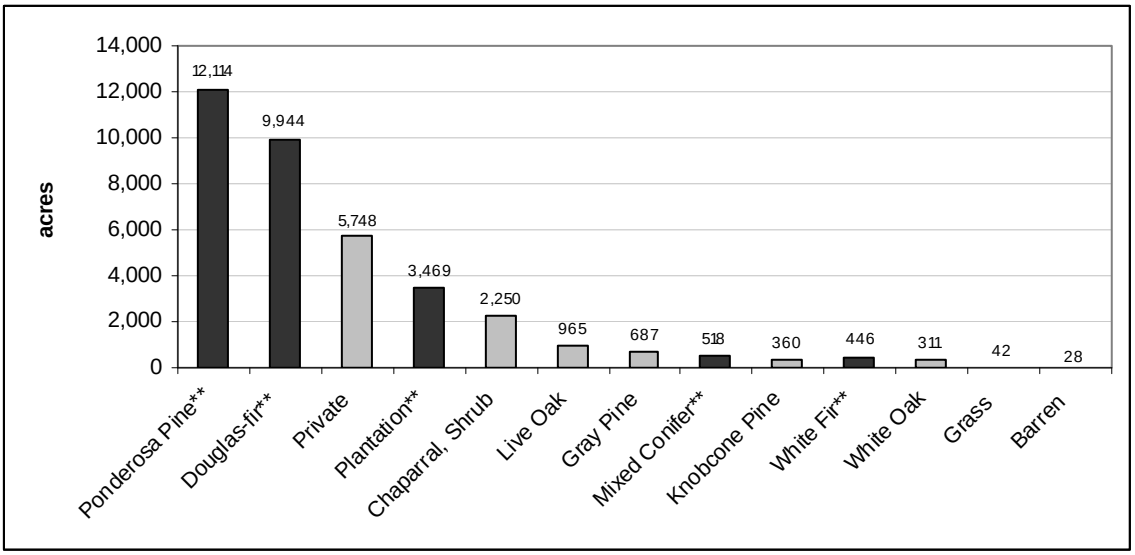

Figure 3. Major Vegetation Types in the Salt Creek Watershed. **Vegetation types that qualify as Federal Forest Land and supply the denominator in calculating the 15% S&G.

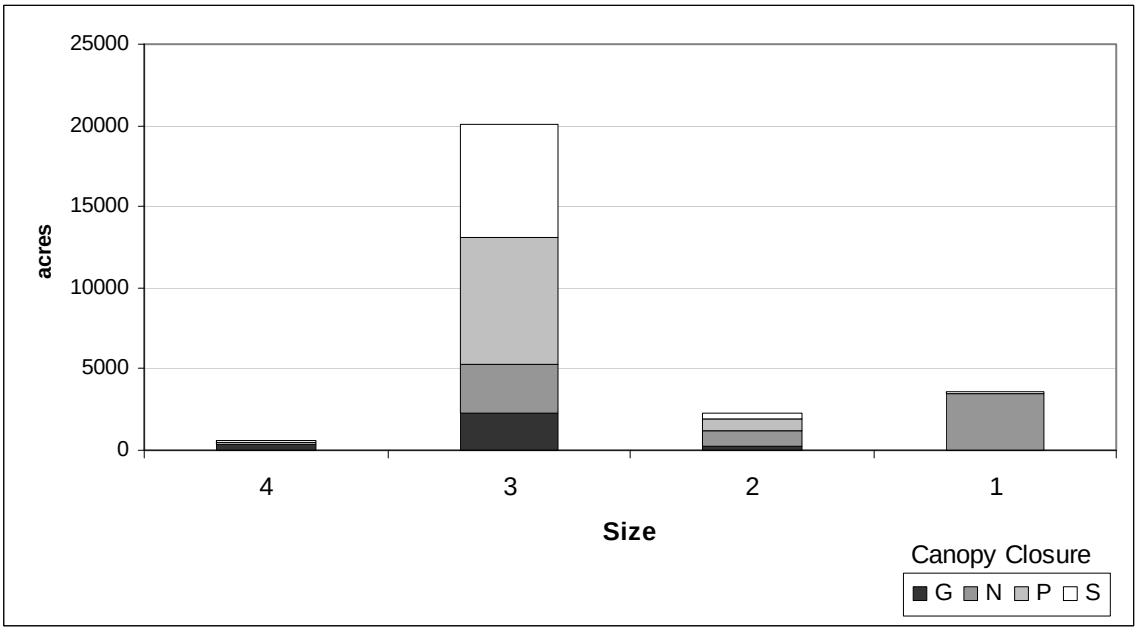

Figure 4. Size Class and Canopy Closure of the Federal Forest Land in the Salt Creek Watershed. Size Classes 3 & 4 are currently late-successional habitat that contribute to meeting the 15% S&G.

Table 1. Size Class and Canopy Closure Distribution within the Salt Creek Watershed. Includes only federal land that is now, or is capable of becoming, at least 10 percent stocked with forest trees and that has not been developed for nontimber use (i.e., 'Federal Forest Land'). Size classes 3 & 4 are currently late-successional and contribute to meeting the 15% S&G.

Size Class	Canopy Closure				
	G	**N**	P	S	Total
≥4	**342**	**66**	**58**	**81**	**547**
3	**2,260**	**3,083**	**7,783**	**6,992**	**20,118**
2	279	952	721	313	2,265
1	0	3,500	0	61	3,561
TOTAL FEDERAL FOREST LAND					**26,491**

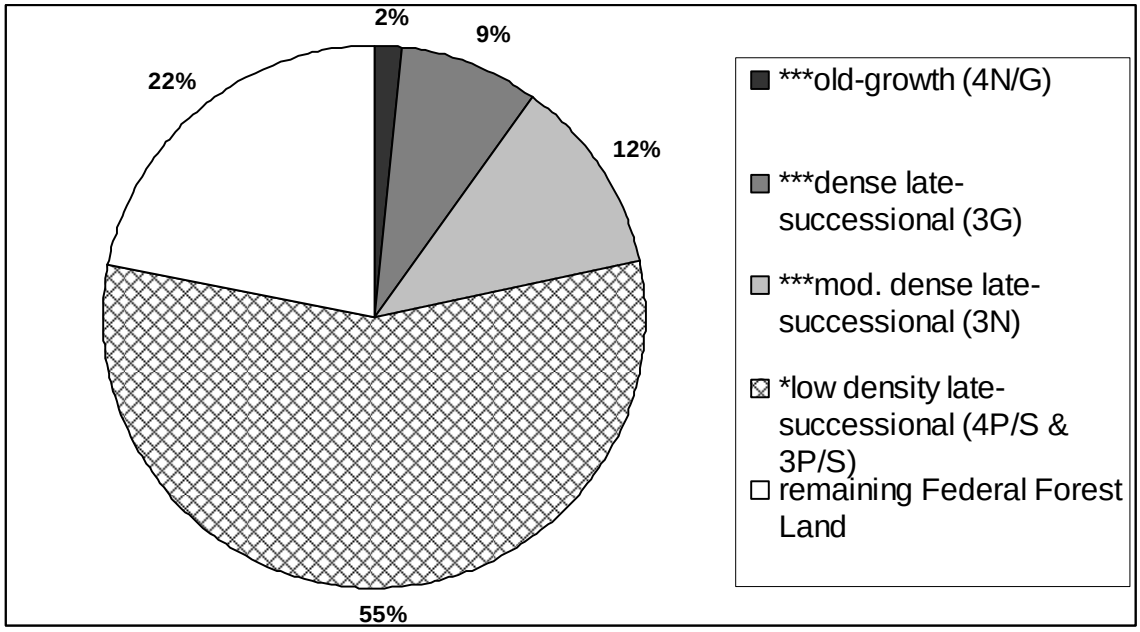

Figure 5. The percentages of late-successional forest in the Salt Creek Watershed segregated by relative habitat quality (from best to worst: old-growth, dense mature, moderately dense mature, sparse late-successional forest). ***These acres currently contribute to meeting the 15% S&G and provide suitable habitat for species associated with old-growth forests such as the northern spotted owl. *These acres currently contribute to meeting the 15% S&G but do not provide suitable owl habitat. The remaining Federal Forest Land habitat includes younger stands that do not yet count as late-successional. Percentages are based upon 26,491 acres of Federal Forest Land in the watershed.

RECOMMENDATIONS

At this time I recommend the following to meet the intent of the 15 percent retention standard and guideline and to maintain our options for meeting this S&G into the future within the Salt Creek Watershed:

- The GIS database used for this analysis is an appropriate 'coarse grain' tool for landscape level (i.e., 5th field watershed) analyses. At the project level, individual stands proposed for treatment should be examined to determine what ecological role they are filling related to old-growth habitat.

- Consider silvicultural treatments designed to accelerate the development of old-growth habitat conditions in younger stands.

- Defer timber harvesting in 4G and 4N stands. These stands are likely the highest quality old-growth habitat and currently comprise only about two percent of the watershed. Timber harvesting may become appropriate within these stands when we can demonstrate that other younger stands are meeting the ecological roles of old-growth habitat.

- **Prescriptions designed to reduce fuel ladders within 4G and 4N stands may be appropriate in strategically located areas where fire protection is a concern. Prescriptions should be designed to maintain old-growth conditions to the extent practicable.**

Appendix G

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USFWS Biological Opinion
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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Red Bluff Fish & Wildlife Office
10950 Tyler Road, Red Bluff, California 96080
(530) 527-3043, FAX (530) 529-0292

AUG - 6 2007

In Reply Refer To: 1-12-2007-F-11

Ms. Donna F. Harmon
District Ranger
Hayfork Ranger District
Shasta-Trinity National Forest
P.O. Box 159
Hayfork, CA 96041

Subject: Formal Endangered Species Consultation on the Salt Project, Hayfork Ranger District, Shasta-Trinity National Forest

Dear Ms. Harmon:

This correspondence is in reply to your letter, dated June 11, 2007, and received by this office on June 13, 2007, requesting formal consultation on the Salt Project (proposed action), Hayfork Ranger District, Shasta-Trinity National Forest (Forest). The attached document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion based on our review of the proposed action and its effects on the Federally threatened northern spotted owl (*Strix occidentalis caurina*) in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). The biological opinion outlines effects of the proposed action, including our determination that *the proposed action is not likely to jeopardize the continued existence of the northern spotted owl.*

The Service has reviewed the information provided in your biological assessment, and acknowledges the Forest's determination that the proposed action would have *no effect* on the following federally threatened species: bald eagle (*Haliaeetus leucocephalus*), marbled murrelet (*Brachyramphus marmoratus*), and California red-legged frog (*Rana aurora draytoni*). Additionally, the Forest determined the proposed action would have no effect on designated northern spotted owl critical habitat and designated marbled murrelet critical habitat. Therefore, no further action pursuant to the Act is necessary regarding these federally listed entities ***unless new information reveals effects of the proposed action that may affect these species in a manner or to an extent not considered***, or a new species or critical habitat is designated that may be affected by the proposed action.

If you have any questions regarding this letter or the attached biological opinion which addresses effects of the proposed action on the northern spotted owl, please contact Keith Paul of my staff at 530-527-3043.

Sincerely,

Tom T. Kisanuki

James G. Smith,
(acting) Project Leader

cc: Thomas Quinn, Wildlife Biologist
Trinity River Management Unit, Shasta-Trinity National Forest
P.O. Box 1190
Weaverville Ranger District
Weaverville, CA 96093-1190

Kelly Wolcott, Forest Wildlife Biologist
Supervisors Office, Shasta-Trinity National Forest
3644 Avtech Parkway, Redding, CA 96002

TAKE PRIDE IN AMERICA

BIOLOGICAL OPINION

Introduction

This document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion (BO) based on our review of the proposed action and its effects on the northern spotted owl (*Strix occidentalis caurina*) in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

This BO is based on information provided by the following: the Salt Project Biological Assessment (BA) (USDA Forest Service 2007); other documents as referenced; telephone and email correspondence and site visits to the project area. Additionally, this BO references information contained in the Record of Decision (ROD) for Amendments to Forest Service and Bureau of Land Management Planning documents within the Range of the Northern Spotted Owl (USDA Forest Service and USDI Bureau of Land Management 1994a), A Range-wide Baseline Summary and Evaluation of Data Collected Through Section 7 Consultation for the northern spotted owl and its Critical Habitat: 1994-2001 (USDI Fish and Wildlife Service 2001), and updates to this report conducted as needed by the Service (most recently completed on July 19, 2007).

Consultation History

Northwest Forest Plan

On October 8, 1993, the Secretaries of Agriculture and Interior (Secretaries) initiated formal consultation on the preferred alternative (Alternative 9) in the Final Supplemental Environmental Impact Statement on Management for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl (FSEIS) (USDA Forest Service and USDI Bureau of Land Management 1994b). On February 10, 1994, the Service issued a BO determining that implementation of the preferred alternative was not likely to jeopardize the continued existence or adversely modify critical habitat of any listed species. The Service rendered the BO on Alternative 9 based on the assumption that all proposed projects would be consistent with the ROD, and noted that all proposed projects conducted pursuant to the FSEIS, that may affect listed species, would be submitted to the Service for section 7 consultation (USDI Fish and Wildlife Service 1994). On April 14, 1994, the Secretaries signed the ROD adopting an amended Alternative 9. The Service subsequently determined that because changes in the amended version of Alternative 9 - herein referred to as the Northwest Forest Plan (NWFP) - were relatively minor, re-initiation of consultation on the ROD was not required. However, the NWFP is programmatic in nature and did not address site-specific activities and their effects on listed species or their designated critical habitats. These specific assessments were deferred to future consultations in which more specific information on baseline conditions and proposed project actions could be incorporated.

Shasta-Trinity National Forest Land and Resource Management Plan

The Service followed up the NWFP range-wide consultation with a consultation addressing the Shasta-Trinity National Forest (STNF) Land and Resource Management Plan (LRMP) (USDA

Forest Service 1995). The LRMP was prepared to guide natural resource management activities and establish management standards and guidelines for the STNF. On April 26, 1995, the Service issued a BO determining that implementation of the LRMP was not likely to jeopardize the continued existence of the northern spotted owl (USDI Fish and Wildlife Service 1995).

Level-One Coordination on the Salt Project

Interagency coordination on the Salt Project began with a telephone conversation on January 30, 2007, between Thomas Quinn (Wildlife Biologist, Hayfork Ranger District, STNF) and Keith Paul (Fish and Wildlife Biologist, Red Bluff Fish and Wildlife Office) regarding the purpose and need of the proposed action and potential effects to federally listed species. On April 10, 2007 Thomas Quinn provided a draft BA to Keith Paul via e-mail, followed by project maps on April 11, 2007 that arrived by mail. A site visit was made by Service personnel, Keith Paul and Doug Powers (Fish and Wildlife Biologist, Red Bluff Fish and Wildlife Office) on April 13, 2007. Minor comments on the draft BA were submitted to Thomas Quinn via e-mail on April 18, 2007. A follow up site visit by Service personnel, Keith Paul and Doug Powers and Forest personnel, Thomas Quinn and Jeff Paulo (Silviculturist, Yolla Bolla Ranger Station, STNF) was made on May 10, 2007 to discuss concerns specific to green tree retention (GTR) units in Alternative 3 of the Salt Environmental Assessment (EA). At that time it was agreed that only Alternative 2 of the EA would be included in the final BA. If Alternative 3 was chosen by the District Ranger, than reinitiation of consultation would pursue. The Service received the final BA on June 13, 2007.

The STNF is using a species list obtained from the Fish and Wildlife Service website (http://arcata.fws.gov/specieslist/speciesreport.asp) on February 4, 2007. The STNF has followed processes outlined in the Streamlined Consultation Process and the Service has provided technical expertise where appropriate.

A complete administrative record of this consultation is available and on file at the Service's Red Bluff Fish and Wildlife Office in Red Bluff, California.

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1 Description of the Proposed Action

1.1 Project Description

The Salt Project is located within the upper reach of the Salt Creek fifth field watershed. State Highway 36 defines the northern boundary of the project area. The legal locations fall in the Mt. Diablo Meridian within two townships: T29N, R11W, Sections 4, 5, 6, 7, 8 and 9; T29N, R12W, Sections 1, 2 and 12; T30N, R11W, Sections 31 and 32; and T30N, R12W, Sections 25, 26, 35 and 36. The Salt Project area lies within the Hayfork Adaptive Management Area (AMA) and Management Area 19, Indian Valley/Rattlesnake, of the Shasta-Trinity Land and Resource Management Plan.

The restoration strategy of the South Fork Management Unit is designed to implement a series of projects from south to north. The Salt Project continues this strategy in the central northern area by addressing the need to reduce high fuel hazard, restore timber stands to a healthier condition and connecting to previously treated watersheds. The proposed action also includes activities that will improve watershed conditions through decommissioning of unneeded roads and restoration of anadromous fish habitat.

The high fuel hazard occurring in this project area needs to be lowered by removing the number of trees growing in young dense stands. Thinning stands would provide more space between trees increasing tree growth and vigor, reduce the future rate of tree mortality and reduce the potential effects of wildfire.

Cut-over older stands need to be "restarted" with regeneration treatments using GTR guidelines. These stands are understocked and not growing well. Mortality and increasing decadence is occurring throughout these stands, increasing fuels hazard. Young stands would be created by removing areas of unhealthy trees and planting new, healthy seedlings in their place.

In Riparian Reserves there is a need to reduce the number of trees in young dense stands to improve connecting travel corridors for wildlife species, particularly late-successional dependent species; reduce the fire hazard of crown fires by removing some of the understory trees density; and maintain stand growth toward late-successional conditions by giving individual trees more site resources (space to grow and especially water).

Proposed treatments include the following:

1.1.1 Regeneration Harvest (GTR) – 59 Acres

Regeneration harvest with GTR is proposed in multi-aged, multi-storied understocked or over-mature mixed conifer stands which have had previous harvest entries. These stands are understocked, not growing well and would not generally respond well to a thinning prescription. Mortality and increasing decadence is occurring throughout these stands, increasing the fuel hazard. Hardwood species, including canyon live-oak (*Quercus chrysolepis*), California black oak (*Quercus kelloggii*) and Pacific madrone (*Arbutus menziessii*) are common but generally understory components. This GTR prescription is a regeneration harvest (i.e., most trees would

be removed and the area replanted with seedlings) where biological legacies such as large/old green trees and other structural components (snags, logs, hardwoods, etc.) are retained within each harvest unit to provide old-growth habitat components into the future. The retention would include patches and individual large/old trees totaling at least 15 percent of each harvest unit area.

1.1.2 Commercial Thinning (from below) – 991 Acres

Thinning is proposed within overcrowded young-growth mixed conifer stands which have had previous harvest entries. Trees marked for removal with this "thinning from below" would start with the smallest least healthy conifers and progressively involve larger trees until the existing 70 to 90 percent canopy cover is reduced to approximately 50 to 60 percent to make more water, nutrients, sunlight and growing space available to the remaining trees (conifers as well as hardwoods). The 60 percent canopy threshold would be met in select Riparian Reserve portions within the thinning units. The remaining trees would experience accelerated growth and increased health. In addition, the smaller trees that would be removed act as fuel ladders because their crowns are closer to the ground and allow flames to move into the canopy that could lead to a large-scale loss of conifer forest habitat. Biological legacies such as large/old green trees and other structural components (large snags, logs, viable hardwoods, etc.) would be retained within each harvest unit to provide important old-growth habitat components as the stand develops.

1.1.3. Plantation Precommercial Thinning – 503 Acres

Confer plantations established in the 1970s and 1980s would be thinned from an existing 400 to 700 trees per acre to approximately 150 trees per acre. The decreased competition for sunlight, nutrients and soil moisture would improve stand vigor, reduce stand mortality and reduce susceptibility to primary and secondary insect and disease effects. Stand vertical structural diversity would be maintained or improved by retaining intermediate, codominant and dominant crown class hardwoods.

1.1.4. Fuel Break Maintenance/Reconstruction – 103 Acres

Fuel breaks that were created about 20 years ago would be maintained through thinning with a prescription that would remove smaller diameter trees, brush and snags and reduce the existing 50 to 70 percent overstory canopy closure down to 40 percent. Viable hardwoods would be cut back to the one-or-two most vigorous stems and maintained in the areas. In general, these are multi-aged, multi-storied mixed conifer stands which have been partially cut or sanitized in the past. Large snags and most large logs have been removed for fuels and fire fighter safety concerns. Mortality is still occurring throughout these stands. Hardwood species, including canyon live-oak, California black oak and Pacific madrone are common but are generally well-developed and comprised of a variety of species, though typically dominated by either deerbrush (*Ceanothus integerrimus*), wedgeleaf ceanothus (*Ceanothus cuneatus*) or whitethorn (*Ceanothus cordulatus*). Various grasses, forbs and thistles are also commonly found.

1.1.5 Yarding Systems

Trees and some activity fuels from the harvest units would be removed with a combination of tractor/mechanical yarding, skyline/cable yarding and helicopter yarding.

1.1.6 Landings

An estimated 54 (0.25 to 0.5-acre) landings would be constructed or reconstructed in previously disturbed areas to aid in timber harvest and ripped (i.e., "decompacted") and closed after completion of harvest activities.

1.1.7 Roads

Approximately 18 miles of existing roads would be reconstructed (brushed, smoothed, graveled, etc.) and 0.33 miles of temporary roads would be constructed. Temporary roads would be ripped and closed after completion of harvest activities.

1.1.8 Rock Pits

An estimated one existing rock pit would be expanded to provide source material for road reconstruction activities.

1.1.9 Activity Fuels Treatments

Fuels created as a result of the proposed silvicultural prescriptions would be treated with a combination of mastication (plantations), mechanical removal, chipping, handpiling/burning, tractorpiling/burning or burning areas of concentrated fuels.

1.1.10 Conservation Measures

The following interdependent actions will be included in the project design to reduce or avoid impacts to forest resources and wildlife issues:

- Limited Operating Periods (LOPs) would be implemented to avoid direct adverse impacts to the northern spotted owl. From February 1 through July 10, all noise- and smoke-generating activities will be prohibited within one-quarter mile of suitable nesting/roosting habitat. These LOPs may be lifted if surveys using currently accepted protocols indicate specific areas are not occupied by breeding owls or with the mutual consent of the Service and Forest.
- Retain existing large (>19 inches diameter at breast height) snags and down logs within thinning units. Snags felled for safety reasons would be left on site as logs.
- Maintain an average of five tons of logs per acre with a preference to have four to six logs per acre at the largest available diameter.
- Retain all hardwoods that have a reasonable chance of surviving and thriving after stand treatments.
- Riparian Reserves of intermittent and ephemeral streams that display annual scour will have a minimum 150 foot Riparian Reserve based upon the average maximum height of

200-year-old trees for the site. There is one inner gorge greater than 150 feet from the defined channel of intermittent or ephemeral streams in unit 13 that will require a Riparian Reserve greater than 150 feet in width.

- Riparian Reserves of fish bearing streams that display annual scour will have a 300 foot Riparian Reserve based upon twice the average maximum height of 200-year-old trees for the site. There are no inner gorges of flood plains in the project area greater than 300 feet from the defined channel of fish bearing streams.
- Thinning may occur in the Riparian Reserves up to the inner gorge, or up to 50 feet from the defined channel if no inner gorge exists, for the purpose of enhancing Riparian Reserve timber stand health and treating hazardous fuels. Thinning and fuels treatment will not reduce crown cover to less than 60 percent within Riparian Reserves.

1.2. Definition of the Action Area

The 16,920-acre northern spotted owl action area is the primary area analyzed for this project. It was established by using a 1.3 mile buffer around all proposed harvest units. This area was deemed appropriate for the following reason: based on available radio-telemetry data (Thomas et al. 1990), the Service estimated the median annual home range size for the northern spotted owl in California. Because the actual configuration of a home range is rarely known, the estimated home range of a northern spotted owl pair in California is represented by a 1.3 mile circle (3,340 acres) centered upon an owl activity center (e.g., nest site). Suitable habitat within a home range would likely be utilized to some extent within any given year by territorial owls. Therefore, any effects to habitat, both positive and negative, due to the Salt Project would likely affect any current or potential future owl activity centers in the area. That is to say, habitat affected by the Salt Project would fall within the home ranges of any owls nesting in the owl action area. The plantations proposed for thinning were not used to establish the action area because they contain no attributes of owl habitat (large snags, logs or older "legacy" conifers) and will require roughly 100-plus years to develop to owl habitat conditions. This 100-year timeframe seemed an unreasonable temporal scale to use in this analysis.

2 Status of the Species – Northern Spotted Owl

2.1 Legal Status

The spotted owl was listed as threatened on June 26, 1990 due to widespread loss and adverse modification of suitable habitat across the owl's entire range and the inadequacy of existing regulatory mechanisms to conserve the owl (USDI FWS 1990a). The U.S. Fish and Wildlife Service recovery priority number for the spotted owl is 6C, on a scale of 1C (highest) to 18 (lowest) (USDI FWS 1983a, 1983b, 2004a). This number reflects a high degree of threat, a low potential for recovery, and the owl's taxonomic status as a subspecies. The "C" reflects conflict with development, construction, or other economic activity. The spotted owl was originally listed with a recovery priority number of 3C, but that number was changed to 6C in 2004 during the 5-year review of the species (USDI FWS 2004a).

2.2 Life History

2.2.1 Taxonomy

The northern spotted owl is one of three subspecies of spotted owls currently recognized by the American Ornithologists' Union (1957). The taxonomic separation of these three subspecies is supported by genetic (Barrowclough and Gutiérrez 1990, Barrowclough et al. 1999, Haig et al. 2004), morphological (Gutiérrez et al. 1995), and biogeographic information (Barrowclough and Gutiérrez 1990). The distribution of the Mexican subspecies (*S. o. lucida*) is separate from those of the northern and California (*S. o. occidentalis*) subspecies (Gutiérrez et al. 1995). Recent studies analyzing mitochondrial DNA sequences (Haig et al. 2004, Chi et al. 2005, Barrowclough et al. 2005) and microsatellites (Henke et al., unpubl. data) confirmed the validity of the current subspecies designations for northern and California spotted owls. The narrow hybrid zone between these two subspecies, which is located in the southern Cascades and northern Sierra Nevada's, appears to be stable (Barrowclough et al. 2005).

2.2.2 Physical Description

The northern spotted owl is a medium-sized owl and is the largest of the three subspecies of spotted owls (Gutiérrez et al. 1995). It is approximately 46 to 48 centimeters (18 inches to 19 inches) long and the sexes are dimorphic, with males averaging about 13 percent smaller than females. The mean mass of 971 males taken during 1,108 captures was 580.4 grams (1.28 pounds) (out of a range 430.0 to 690.0 grams) (0.95 pound to 1.52 pounds), and the mean mass of 874 females taken during 1,016 captures was 664.5 grams (1.46 pounds) (out of a range 490.0 to 885.0 grams) (1.1 pounds to 1.95 pounds) (P. Loschl and E. Forsman, pers. comm. cited in USDI FWS 2007). The northern spotted owl is dark brown with a barred tail and white spots on its head and breast, and it has dark brown eyes surrounded by prominent facial disks. Four age classes can be distinguished on the basis of plumage characteristics (Forsman 1981, Moen et al. 1991). The northern spotted owl superficially resembles the barred owl, a species with which it occasionally hybridizes (Kelly and Forsman 2004). Hybrids exhibit physical and vocal characteristics of both species (Hamer et al. 1994).

2.2.3 *Current and Historical Range*

The current range of the spotted owl extends from southwest British Columbia through the Cascade Mountains, coastal ranges, and intervening forested lands in Washington, Oregon, and California, as far south as Marin County (USDI FWS 1990a). The range of the spotted owl is partitioned into 12 physiographic provinces (see Figure 1) based on recognized landscape subdivisions exhibiting different physical and environmental features (Thomas et al. 1993). These provinces are distributed across the species' range as follows:

- Four provinces in Washington: Eastern Washington Cascades, Olympic Peninsula, Western Washington Cascades, Western Washington Lowlands

- Five provinces in Oregon: Oregon Coast Range, Willamette Valley, Western Oregon Cascades, Eastern Oregon Cascades, Oregon Klamath

- Three provinces in California: California Coast, California Klamath, California Cascades

The spotted owl is extirpated or uncommon in certain areas such as southwestern Washington and British Columbia. Timber harvest activities have eliminated, reduced or fragmented spotted owl habitat sufficiently to decrease overall population densities across its range, particularly within the coastal provinces where habitat reduction has been concentrated (Thomas and Raphael 1993).

2.2.4 Behavior

Spotted owls are territorial. However, home ranges of adjacent pairs overlap (Forsman et al. 1984, Solis and Gutiérrez 1990) suggesting that the area defended is smaller than the area used for foraging. Territorial defense is primarily effected by hooting, barking and whistle type calls. Some spotted owls are not territorial but either remain as residents within the territory of a pair or move among territories (Gutiérrez 1996). These birds are referred to as "floaters." Floaters have special significance in spotted owl populations because they may buffer the territorial population from decline (Franklin 1992). Little is known about floaters other than that they exist and typically do not respond to calls as vigorously as territorial birds (Gutiérrez 1996).

Spotted owls are monogamous and usually form long-term pair bonds. "Divorces" occur but are relatively uncommon. There are no known examples of polygyny in this owl, although associations of three or more birds have been reported (Gutiérrez et al. 1995).

2.2.5 *Habitat Relationships*

2.2.5.1 Home Range.

Home-range sizes vary geographically, generally increasing from south to north, which is likely a response to differences in habitat quality (USDI FWS 1990a). Estimates of median size of their annual home range (the area traversed by an individual or pair during their normal activities (Thomas and Raphael 1993)) vary by province and range from 2,955 acres in the Oregon Cascades (Thomas et al. 1990) to 14,211 acres on the Olympic Peninsula (USDI FWS 1994a). Zabel et al. (1995) showed that these provincial home ranges are larger where flying squirrels are the predominant prey and smaller where wood rats are the predominant prey. Home ranges of adjacent pairs overlap (Forsman et al. 1984, Solis and Gutiérrez 1990), suggesting that the defended area is smaller than the area used for foraging. The U.S. Fish and Wildlife Service uses a 0.7-mile-radius circle (984 acres) from the activity center to delineate the most heavily used area during the nesting season. Spotted owls use smaller home ranges during the breeding season and often dramatically increase their home range size during fall and winter (Forsman et al. 1984, Sisco 1990).

Although differences exist in natural stand characteristics that influence home range size, habitat loss and forest fragmentation effectively reduce habitat quality in the home range. A reduction in the amount of suitable habitat reduces spotted owl abundance and nesting success (Bart and Forsman 1992, Bart 1995).

2.2.5.2 Habitat Use.

Forsman et al. (1984) reported that spotted owls have been observed in the following forest types: Douglas-fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), grand fir (*Abies grandis*), white fir (*Abies concolor*), ponderosa pine (*Pinus ponderosa*), Shasta red fir (*Abies magnifica shastensis*), mixed evergreen, mixed conifer hardwood (Klamath montane), and redwood (*Sequoia sempervirens*). The upper elevation limit at which spotted owls occur corresponds to the transition to subalpine forest, which is characterized by relatively simple structure and severe winter weather (Forsman 1975, Forsman et al. 1984).

Roost sites selected by spotted owls have more complex vegetation structure than forests generally available to them (Barrows and Barrows 1978, Forsman et al. 1984, Solis and Gutiérrez 1990). These habitats are usually multi-layered forests having high canopy closure and large diameter trees in the overstory.

Spotted owls nest almost exclusively in trees. Like roosts, nest sites are found in forests having complex structure dominated by large diameter trees (Forsman et al. 1984, Hershey et al. 1998). Even in forests that have been previously logged, spotted owls select forests having a structure (i.e., larger trees, greater canopy closure) different than forests generally available to them (Folliard 1993, Buchanan et al. 1995, Hershey et al. 1998).

Foraging habitat is the most variable of all habitats used by territorial spotted owls (Thomas et al. 1990). Descriptions of foraging habitat have ranged from complex structure (Solis and Gutiérrez 1990) to forests with lower canopy closure and smaller trees than forests containing nests or roosts (Gutiérrez 1996).

2.2.5.3 Habitat Selection

Spotted owls generally rely on older forested habitats because such forests contain the structures and characteristics required for nesting, roosting, and foraging. Features that support nesting and roosting typically include a moderate to high canopy closure (60 to 90 percent); a multi-layered, multi-species canopy with large overstory trees (with diameter at breast height [dbh] of greater than 30 inches); a high incidence of large trees with various deformities (large cavities, broken tops, mistletoe infections, and other evidence of decadence); large snags; large accumulations of fallen trees and other woody debris on the ground; and sufficient open space below the canopy for spotted owls to fly (Thomas et al. 1990). Forested stands with high canopy closure also provide thermal cover (Weathers et al. 2001) and protection from predators.

While spotted owls nest almost exclusively in trees, foraging habitat generally has attributes similar to those of nesting and roosting habitat, but such habitat may not always support successfully nesting pairs (USDI FWS 1992a). Dispersal habitat, at a minimum, consists of stands with adequate tree size and canopy closure to provide protection from avian predators and at least minimal foraging opportunities (USDI FWS 1992a). Although Forsman et al. (2002) found that spotted owls could disperse through highly fragmented forest landscapes, the stand-level and landscape-level attributes of forests needed to facilitate successful dispersal have not been thoroughly evaluated (Buchanan 2004).

Spotted owls may be found in younger forest stands that have the structural characteristics of older forests or retained structural elements from the previous forest. In redwood forests and mixed conifer-hardwood forests along the coast of northwestern California, considerable numbers of spotted owls also occur in younger forest stands, particularly in areas where hardwoods provide a multi-layered structure at an early age (Thomas et al. 1990, Diller and Thome 1999). In mixed conifer forests in the eastern Cascades in Washington, 27 percent of nest sites were in old-growth forests, 57 percent were in the understory reinitiation phase of stand development, and 17 percent were in the stem exclusion phase (Buchanan et al. 1995). In the western Cascades of Oregon, 50 percent of spotted owl nests were in late-seral/old-growth stands (greater than 80 years old), and none were found in stands of less than 40 years old (Irwin et al. 2000).

In the Western Washington Cascades, spotted owls roosted in mature forests dominated by trees greater than 50 centimeters (19.7 inches) dbh with greater than 60 percent canopy closure more often than expected for roosting during the non-breeding season. Spotted owls also used young forest (trees of 20 to 50 centimeters (7.9 inches to 19.7 inches) dbh with greater than 60 percent canopy closure) less often than expected based on this habitat's availability (Herter et al. 2002).

In the Coast Ranges, Western Oregon Cascades and the Olympic Peninsula, radio-marked spotted owls selected for old-growth and mature forests for foraging and roosting and used young forests less than predicted based on availability (Forsman et al. 1984, Carey et al. 1990, 1992, Thomas et al. 1990). Glenn et al. (2004) studied spotted owls in young forests in western Oregon and found little preference among age classes of young forest.

Habitat use is influenced by prey availability. Ward (1990) found that spotted owls foraged in areas with lower variance in prey densities (that is, where the occurrence of prey was more predictable) within older forests and near ecotones of old forest and brush seral stages. Zabel et al. (1995) showed that spotted owl home ranges are larger where flying squirrels (*Glaucomys sabrinus*) are the predominant prey and smaller where wood rats (*Neotoma* spp.) are the predominant prey.

Recent landscape-level analyses in portions of Oregon Coast and California Klamath provinces suggest that a mosaic of late-successional habitat interspersed with other seral conditions may benefit spotted owls more than large, homogeneous expanses of older forests (Zabel et al. 2003, Franklin et al. 2000, Meyer et al. 1998). In Oregon Klamath and Western Oregon Cascade provinces, Dugger et al. (2005) found that apparent survival and reproduction was positively associated with the proportion of older forest near the territory center (within 730 meters) (2,395 feet). Survival decreased dramatically when the amount of non-habitat (non-forest areas, sapling stands, etc.) exceeded approximately 50 percent of the home range (Dugger et al. 2005). The authors concluded that they found no support for either a positive or negative direct effect of intermediate-aged forest—that is, all forest stages between sapling and mature, with total canopy cover greater than 40 percent—on either the survival or reproduction of spotted owls. It is unknown how these results were affected by the low habitat fitness potential in their study area, which Dugger et al. (2005) stated was generally much lower than those in Franklin et al. (2000) and Olson et al. (2004), and the low reproductive rate and survival in their study area, which they reported were generally lower than those studied by Anthony et al. (2006). Olson et al. (2004)

found that reproductive rates fluctuated biennially and were positively related to the amount of edge between late-seral and mid-seral forests and other habitat classes in the central Oregon Coast Range. Olson et al. (2004) concluded that their results indicate that while mid-seral and late-seral forests are important to spotted owls, a mixture of these forest types with younger forest and non-forest may be best for spotted owl survival and reproduction in their study area.

2.2.6 Reproductive Biology

The spotted owl is relatively long-lived, has a long reproductive life span, invests significantly in parental care, and exhibits high adult survivorship relative to other North American owls (Forsman et al. 1984, Gutiérrez et al. 1995). Spotted owls are sexually mature at 1 year of age, but rarely breed until they are 2 to 5 years of age (Miller et al. 1985, Franklin 1992, Forsman et al. 2002). Breeding females lay one to four eggs per clutch, with the average clutch size being two eggs; however, most spotted owl pairs do not nest every year, nor are nesting pairs successful every year (USDI FWS 1990b, Forsman et al. 1984, Anthony et al. 2006), and re-nesting after a failed nesting attempt is rare (Gutiérrez 1996). The small clutch size, temporal variability in nesting success, and delayed onset of breeding all contribute to the relatively low fecundity of this species (Gutiérrez 1996).

Courtship behavior usually begins in February or March, and females typically lay eggs in late March or April. The timing of nesting and fledging varies with latitude and elevation (Forsman et al. 1984). After they leave the nest in late May or June, juvenile spotted owls depend on their parents until they are able to fly and hunt on their own. Parental care continues after fledging into September (USDI FWS 1990a, Forsman et al. 1984). During the first few weeks after the young leave the nest, the adults often roost with them during the day. By late summer, the adults are rarely found roosting with their young and usually only visit the juveniles to feed them at night (Forsman et al. 1984). Telemetry and genetic studies indicate that close inbreeding between siblings or parents and their offspring is rare (Haig et al. 2001, Forsman et al. 2002).

2.2.7 Dispersal Biology

Natal dispersal of spotted owls typically occurs in September and October with a few individuals dispersing in November and December (Miller et al. 1997, Forsman et al. 2002). Natal dispersal occurs in stages, with juveniles settling in temporary home ranges between bouts of dispersal (Forsman et al. 2002, Miller et al. 1997). The median natal dispersal distance is about 10 miles for males and 15.5 miles for females (Forsman et al. 2002). Dispersing juvenile spotted owls experience high mortality rates, exceeding 70 percent in some studies (USDI FWS 1990a, Miller 1989). Known or suspected causes of mortality during dispersal include starvation, predation, and accidents (Miller 1989, USDI FWS 1990a, Forsman et al. 2002). Parasitic infection may contribute to these causes of mortality, but the relationship between parasite loads and survival is poorly understood (Hoberg et al. 1989, Gutiérrez 1989, Forsman et al. 2002). Successful dispersal of juvenile spotted owls may depend on their ability to locate unoccupied suitable habitat in close proximity to other occupied sites (LaHaye et al. 2001).
There is little evidence that small openings in forest habitat influence the dispersal of spotted owls, but large, non-forested valleys such as the Willamette Valley apparently are barriers to both natal and breeding dispersal (Forsman et al. 2002). The degree to which water bodies, such

as the Columbia River and Puget Sound, function as barriers to dispersal is unclear, although radio telemetry data indicate that spotted owls move around large water bodies rather than cross them (Forsman et al. 2002). Analysis of the genetic structure of spotted owl populations suggests that gene flow may have been adequate between the Olympic Mountains and the Washington Cascades, and between the Olympic Mountains and the Oregon Coast Range (Haig et al. 2001).

Breeding dispersal occurs among a small proportion of adult spotted owls; these movements were more frequent among females and unmated individuals (Forsman et al. 2002). Breeding dispersal distances were shorter than natal dispersal distances and also are apparently random in direction (Forsman et al. 2002).

2.2.8 Food Habits

Spotted owls are mostly nocturnal, although they also forage opportunistically during the day (Forsman et al. 1984, Sovern et al. 1994). The composition of the spotted owl's diet varies geographically and by forest type. Generally, flying squirrels (*Glaucomys sabrinus*) are the most prominent prey for spotted owls in Douglas-fir and western hemlock (*Tsuga heterophylla*) forests (Forsman et al. 1984) in Washington and Oregon, while dusky-footed wood rats (*Neotoma fuscipes*) are a major part of the diet in the Oregon Klamath, California Klamath, and California Coastal provinces (Forsman et al. 1984, 2001, 2004, Ward et al. 1998, Hamer et al. 2001). Depending on location, other important prey include deer mice (*Peromyscus maniculatus*), tree voles (*Arborimus longicaudus, A. pomo*), red-backed voles (*Clethrionomys* spp.), gophers (*Thomomys* spp.), snowshoe hare (*Lepus americanus*), bushy-tailed wood rats (*Neotoma cinerea*), birds, and insects, although these species comprise a small portion of the spotted owl diet (Forsman et al. 1984, 2004, Ward et al. 1998, Hamer et al. 2001).

Other prey species such as the red tree vole (*Arborimus longicaudus),* red-backed voles (*Clethrionomys gapperi),* mice, rabbits and hares, birds, and insects) may be seasonally or locally important (reviewed by Courtney et al. 2004). For example, Rosenberg et al. (2003) showed a strong correlation between annual reproductive success of spotted owls (number of young per territory) and abundance of deer mice (*Peromyscus maniculatus*) (r2 = 0.68), despite the fact they only made up 1.6±0.5 percent of the biomass consumed. However, it is unclear if the causative factor behind this correlation was prey abundance or a synergistic response to weather (Rosenberg et al. 2003). Ward (1990) also noted that mice were more abundant in areas selected for foraging by owls. Nonetheless, spotted owls deliver larger prey to the nest and eat smaller food items to reduce foraging energy costs; therefore, the importance of smaller prey items, like *Peromyscus*, in the spotted owl diet should not be underestimated (Forsman et al. 1984, 2001, 2004).

2.2.9 Population Dynamics

The spotted owl is relatively long-lived, has a long reproductive life span, invests significantly in parental care, and exhibits high adult survivorship relative to other North American owls (Forsman et al. 1984, Gutiérrez et al. 1995). The spotted owl's long reproductive life span

allows for some eventual recruitment of offspring, even if recruitment does not occur each year (Franklin et al. 2000).

Annual variation in population parameters for spotted owls has been linked to environmental influences at various life history stages (Franklin et al. 2000). In coniferous forests, mean fledgling production of the California spotted owl (*Strix occidentalis occidentalis*), a closely related subspecies, was higher when minimum spring temperatures were higher (North et al. 2000), a relationship that may be a function of increased prey availability. Across their range, spotted owls have previously shown an unexplained pattern of alternating years of high and low reproduction, with highest reproduction occurring during even-numbered years (e.g., Franklin et al. 1999). Annual variation in breeding may be related to weather (i.e., temperature and precipitation) (Wagner et al. 1996 and Zabel et al. 1996 *In*: Forsman et al. 1996) and fluctuation in prey abundance (Zabel et al. 1996).

A variety of factors may regulate spotted owl population levels. These factors may be density-dependent (e.g., habitat quality, habitat abundance) or density-independent (e.g., climate). Interactions may occur among factors. For example, as habitat quality decreases, density-independent factors may have more influence on survival and reproduction, which tends to increase variation in the rate of growth (Franklin et al. 2000). Specifically, weather could have increased negative effects on spotted owl fitness for those owls occurring in relatively lower quality habitat (Franklin et al. 2000). A consequence of this pattern is that at some point, lower habitat quality may cause the population to be unregulated (have negative growth) and decline to extinction (Franklin et al. 2000).

Olson et al. (2005) used open population modeling of site occupancy that incorporated imperfect and variable detectability of spotted owls and allowed modeling of temporal variation in site occupancy, extinction, and colonization probabilities (at the site scale). The authors found that visit detection probabilities average less than 0.70 and were highly variable among study years and among their three study areas in Oregon. Pair site occupancy probabilities declined greatly on one study area and slightly on the other two areas. However, for all owls, including singles and pairs, site occupancy was mostly stable through time. Barred owl presence had a negative effect on these parameters (see barred owl discussion in the New Threats section below). However, there was enough temporal and spatial variability in detection rates to indicate that more visits would be needed in some years and in some areas, especially if establishing pair occupancy was the primary goal.

2.3 Threats

2.3.1 *Reasons for Listing*

The spotted owl was listed as threatened throughout its range "due to loss and adverse modification of suitable habitat as a result of timber harvesting and exacerbated by catastrophic events such as fire, volcanic eruption, and wind storms" (USDI FWS 1990a: 26114). More specifically, threats to the spotted owl included low populations, declining populations, limited habitat, declining habitat, inadequate distribution of habitat or populations, isolation of provinces, predation and competition, lack of coordinated conservation measures, and

vulnerability to natural disturbance (USDI FWS 1992a). These threats were characterized for each province as severe, moderate, low or unknown (USDI FWS 1992a) (The range of the spotted owl is divided into 12 provinces from Canada to northern California and from the Pacific Coast to the eastern Cascades; see Figure 1). Declining habitat was recognized as a severe or moderate threat to the spotted owl throughout its range, isolation of populations was identified as a severe or moderate threat in 11 provinces, and a decline in population was a severe or moderate threat in 10 provinces. Together, these three factors represented the greatest concerns about range-wide conservation of the spotted owl. Limited habitat was considered a severe or moderate threat in nine provinces, and low populations were a severe or moderate concern in eight provinces, suggesting that these factors were also a concern throughout the majority of the spotted owl's range. Vulnerability to natural disturbances was rated as low in five provinces. The degree to which predation and competition might pose a threat to the spotted owl was unknown in more provinces than any of the other threats, indicating a need for additional information. Few empirical studies exist to confirm that habitat fragmentation contributes to increased levels of predation on spotted owls (Courtney et al. 2004). However, great horned owls (*Bubo virginianus*), an effective predator on spotted owls, are closely associated with fragmented forests, openings, and clearcuts (Johnson 1992, Laidig and Dobkin 1995). As mature forests are harvested, great horned owls may colonize fragmented forests, thereby increasing spotted owl vulnerability to predation.

2.3.2 New Threats

The Service conducted a 5-year review of the spotted owl in 1994 (USDI FWS 2004), for which the Service prepared a scientific evaluation of the status of the spotted owl (Courtney et al. 2004). An analysis was conducted assessing how the threats described in 1990 might have changed by 2004. Some of the key threats identified in 2004 are:

- "Although we are certain that current harvest effects are reduced, and that past harvest is also probably having a reduced effect now as compared to 1990, we are still unable to fully evaluate the current levels of threat posed by harvest because of the potential for lag effects…In their questionnaire responses…6 of 8 panel member identified past habitat loss due to timber harvest as a current threat, but only 4 viewed current harvest as a present threat" (Courtney and Gutiérrez 2004:11-7)

- "Currently the primary source of habitat loss is catastrophic wildfire, although the total amount of habitat affected by wildfires has been small (a total of 2.3% of the range-wide habitat base over a 10-year period)." (Courtney and Gutiérrez 2004:11-8)

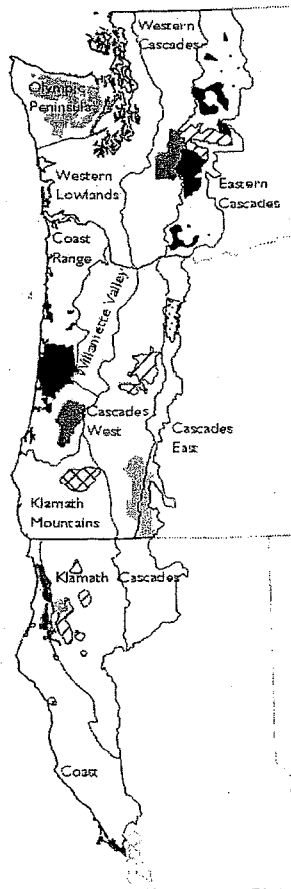
- "Although the panel had strong differences of opinion on the conclusiveness of some of the evidence suggesting [barred owl] displacement of [spotted owls], and the mechanisms by which this might be occurring, there was no disagreement that [barred owls] represented an operational threat. In the questionnaire, all 8 panel members identified [barred owls] as a current threat, and also expressed concern about future trends in [barred owl] populations." (Courtney and Gutiérrez 2004:11-8)

2.3.2.1 Barred Owls (*Strix varia*).

With its recent expansion to as far south as Marin County, California (Gutiérrez et al. 2004), the barred owl's range now completely overlaps that of the northern spotted owl. Barred owls may be competing with spotted owls for prey (Hamer et al. 2001) or habitat (Hamer et al. 1989, Dunbar et al. 1991, Herter and Hicks 2000, Pearson and Livezey 2003). In addition, barred owls physically attack spotted owls (Pearson and Livezey 2003), and circumstantial evidence strongly indicated that a barred owl killed a spotted owl (Leskiw and Gutiérrez 1998). Evidence that barred owls are causing negative effects on spotted owls is largely indirect, based primarily on retrospective examination of long-term data collected on spotted owls (Kelly et al. 2003, Pearson and Livezey 2003, Olson et al. 2005). It is widely believed, but not conclusively confirmed, that the two species of owls are competing for resources. However, given that the presence of barred owls has been identified as a negative effect while using methods designed to detect a different species (spotted owls), it seems safe to presume that the effects are stronger than estimated. Because there has been no research to quantitatively evaluate the strength of different types of competitive interactions, such as resource partitioning and competitive interference, the particular mechanism by which the two owl species may be competing is unknown.

Barred owls were initially thought to be more closely associated with early successional forests than spotted owls, based on studies conducted on the west slope of the Cascades in Washington (Hamer 1988, Iverson 1993). However, recent studies conducted in the Pacific Northwest show that barred owls frequently use mature and old-growth forests (Pearson and Livezey 2003, Gremel 2005, Schmidt 2006). In the fire prone forests of eastern Washington, a telemetry study conducted on barred owls showed that barred owl home ranges were located on lower slopes or valley bottoms, in closed canopy, mature, Douglas-fir forest, while spotted owl sites were located on mid-elevation areas with southern or western exposure, characterized by closed canopy, mature, ponderosa pine or Douglas-fir forest (Singleton et al. 2005).

The only study comparing spotted owl and barred owl food habits in the Pacific Northwest indicated that barred owl diets overlap strongly (76 percent) with spotted owl diets (Hamer et al. 2001). However, barred owl diets are more diverse than spotted owl diets and include species associated with riparian and other moist habitats, along with more terrestrial and diurnal species (Hamer et al. 2001).



Demographic Study Area	Land Ownership	# Owls Banded	Fecundity	Apparent Survival	λ_{RJS}	Population Trend Based on $\Delta\lambda$
Washington						
Wenatchee (WEN)	Private	1,200	Stable	Declining	0.917	Declining
Rainer (RAI)	USFS	217	Stable	Declining	0.896	Declining
Olympic (OLY)	NPS & USFS	985	Stable	Declining	0.956	Declining
Cle Elum (CLE)	USFS	724	Declining[1]	Declining?[2]	0.938	Declining
Oregon						
Oregon Coast Range (COA)	USFS & BLM	1,025	Declining?[1]	Stable	0.968	Declining
Tyee (TYE)	BLM & Private	1,032	Increasing	Stable	1.005	Stationary
South Oregon Cascades (CAS)	USFS & BLM	881	Declining	Stable	0.974	Stationary
H.J. Andrews (HJA)	USFS	1,095	Stable?[3]	Stable	0.978	Declining
Klamath (KLA)	BLM & Private	1,147	Stable	Stable	0.997	Stationary
Warm Springs (WSR)	Tribal	381	Stable	Stable	0.908	Declining
California						
Marin (MAR)	NPS	96	Stable	Stable	NA	NA
Simpson (SIM)	Private	1,344	Declining[1]	Stable	0.970	Declining
Hoopa (HUP)	Tribal	279	Increasing	Stable	0.980	Stationary
NW California (NWC)	USFS	1,026	Declining	Declining	0.985	Declining?[4]

[1] Best model included age and even-odd year effects, but a competing model had a negative time effect on productivity.
[2] Variable among years, but with a declining trend.
[3] Decreasing in early years, increase in last 5 years, stable overall.
[4] Gradual declines in fecundity and apparent survival, plus estimates of realized population change suggest a decline in last 8 years.

Figure 1. Physiographic provinces, northern spotted owl demographic study areas, and demographic trends (Anthony et al. 2006).

The presence of barred owls has been reported to reduce spotted owl detectability, site occupancy, reproduction, and survival. Olson et al. (2005) found that the presence of barred owls had a significant negative effect on the detectability of spotted owls, and that the magnitude of this effect did not vary among years. The occupancy of historical territories by spotted owls in Washington and Oregon was significantly lower ($p < 0.001$) after barred owls were detected within 0.8 kilometer (0.5 miles) of the territory center but was "only marginally lower" ($p = 0.06$) if barred owls were located more than 0.8 kilometer (0.5 miles) from the spotted owl territory center (Kelly et al. 2003:51). Pearson and Livezey (2003) found that there were significantly more barred owl site-centers in unoccupied spotted owl circles than occupied spotted owl circles (centered on historical spotted owl site-centers) with radii of 0.8 kilometer (0.5 miles) ($p = 0.001$), 1.6 kilometer (1 mile) ($p = 0.049$), and 2.9 kilometer (1.8 miles) ($p = 0.005$) in Gifford Pinchot National Forest. In Olympic National Park, Gremel (2005) found a significant decline ($p = 0.01$) in spotted owl pair occupancy at sites where barred owls had been detected, while pair occupancy remained stable at spotted owl sites without barred owls. Olson et al. (2005) found that the annual probability that a spotted owl territory would be occupied by a pair of spotted owls after barred owls were detected at the site declined by 5 percent in the HJ Andrews study area, 12 percent in the Coast Range study area, and 15 percent in the Tyee study area.

Olson et al. (2004) found that the presence of barred owls had a significant negative effect on the reproduction of spotted owls in the central Coast Range of Oregon (in the Roseburg study area). The conclusion that barred owls had no significant effect on the reproduction of spotted owls in one study (Iverson 2004) was unfounded because of small sample sizes (Livezey 2005). It is likely that all of the above analyses underestimated the effects of barred owls on the reproduction of spotted owls because spotted owls often cannot be relocated after they are displaced by barred owls (E. Forsman, pers. comm., cited in USDI FWS 2007). Anthony et al. (2006) found significant evidence for negative effects of barred owls on apparent survival of spotted owls in two of 14 study areas (Olympic and Wenatchee). They attributed the equivocal results for most of their study areas to the coarse nature of their barred owl covariate.

In a recent analysis of more than 9,000 banded spotted owls throughout their range, only 47 hybrids were detected (Kelly and Forsman 2004). Consequently, hybridization with the barred owl is considered to be "an interesting biological phenomenon that is probably inconsequential, compared with the real threat—direct competition between the two species for food and space" (Kelly and Forsman 2004:808).

The preponderance of evidence suggests that barred owls are exacerbating the spotted owl population decline, particularly in Washington, portions of Oregon, and the northern coast of California (Gutiérrez et al. 2004, Olson et al. 2005). There is no evidence that the increasing trend in barred owls has stabilized in any portion of the spotted owl's range in the western United States, and "there are no grounds for optimistic views suggesting that barred owl impacts on northern spotted owls have been already fully realized" (Gutiérrez et al. 2004:7-38).

2.3.2.2 Wildfire.

Studies indicate that the effects of wildfire on spotted owls and their habitat are variable, depending on fire intensity, severity and size. Within the fire-adapted forests of the spotted owl's range, spotted owls likely have adapted to withstand fires of variable sizes and severities. Bond et al. (2002) examined the demography of the three spotted owl subspecies after wildfires, in which wildfire burned through spotted owl nest and roost sites in varying degrees of severity. Post-fire demography parameters for the three subspecies were similar or better than long-term demographic parameters for each of the three subspecies in those same areas (Bond et al. 2002). In a preliminary study conducted by Anthony and Andrews (2004) in the Oregon Klamath Province, their sample of spotted owls appeared to be using a variety of habitats within the area of the Timbered Rock fire, including areas where burning had been moderate. In 1994, the Hatchery Complex fire burned 17,603 hectares in the Wenatchee National Forest in Washington's eastern Cascades, affecting six spotted owl activity centers (Gaines et al. 1997).

Spotted owl habitat within a 2.9-kilometer (1.8-mile) radius of the activity centers was reduced by 8 to 45 percent (mean = 31 percent) as a result of the direct effects of the fire and by 10 to 85 percent (mean = 55 percent) as a result of delayed mortality of fire-damaged trees and insects. Direct mortality of spotted owls was assumed to have occurred at one site, and spotted owls were present at only one of the six sites 1 year after the fire. In 1994, two wildfires burned in the Yakama Indian Reservation in Washington's eastern Cascades, affecting the home ranges of two radio-tagged spotted owls (King et al. 1998). Although the amount of home ranges burned was not quantified, spotted owls were observed using areas that burned at low and medium intensities. No direct mortality of spotted owls was observed, even though thick smoke covered several spotted owl site-centers for a week. It appears that, at least in the short term, spotted owls may be resilient to the effects of wildfire—a process with which they have evolved. More research is needed to further understand the relationship between fire and spotted owl habitat use.

At the time of listing there was recognition that large-scale wildfire posed a threat to the spotted owl and its habitat (USDI FWS 1990a). New information suggests fire may be more of a threat than previously thought. In particular, the rate of habitat loss in the relatively dry East Cascades and Klamath provinces has been greater than expected (see "Habitat Trends" below). Moeur et al. (2005) suggested that 12 percent of late-successional forest rangewide would likely be negatively impacted by wildfire during the first 5 decades of the Northwest Forest Plan. Currently, the overall total amount of habitat affected by wildfires has been relatively small (Lint 2005). It may be possible to influence through silvicultural management how fire prone forests will burn and the extent of the fire when it occurs. Silvicultural management of forest fuels are currently being implemented throughout the spotted owl's range, in an attempt to reduce the levels of fuels that have accumulated during nearly 100 years of effective fire suppression. However, our ability to protect spotted owl habitat and viable populations of spotted owls from large fires through risk-reduction endeavors is uncertain (Courtney et al. 2004). The NWFP recognized wildfire as an inherent part of managing spotted owl habitat in certain portions of the range. The distribution and size of reserve blocks as part of the NWFP design may help mitigate the risks associated with large-scale fire (Lint 2005).

2.3.2.3 West Nile Virus.

West Nile Virus (WNV) has killed millions of wild birds in North America since it arrived in 1999 (McLean et al. 2001, Caffrey 2003, Marra et al. 2004). Mosquitoes are the primary carriers (vectors) of the virus that causes encephalitis in humans, horses, and birds. Mammalian prey may also play a role in spreading WNV among predators, like spotted owls. Owls and other predators of mice can contract the disease by eating infected prey (Garmendia et al. 2000, Komar et al. 2001). Recent tests of tree squirrels from Los Angeles County, California, found over 70 percent were positive for WNV (R. Carney, pers. comm., cited in USDI FWS 2004). One captive spotted owl in Ontario, Canada, is known to have contracted WNV and died.

Health officials expect that WNV will eventually spread throughout the range of the spotted owl (Courtney et al. 2004), but it is unknown how WNV will ultimately affect spotted owl populations. Susceptibility to infection and mortality rates of infected individuals vary among bird species, even within groups (Courtney et al. 2004). Owls appear to be quite susceptible. For example, breeding Eastern screech owls (*Megascops asio*) in Ohio experienced 100 percent mortality (T. Grubb, pers. comm., cited in Courtney et al. 2004). Barred owls, in contrast, showed lower susceptibility (B. Hunter, pers. comm., cited in Courtney et al. 2004). Some level of innate resistance may occur (Fitzgerald et al. 2003), which could explain observations in several species of markedly lower mortality in the second year of exposure to WNV (Caffrey and Peterson 2003). Wild birds also develop resistance to WNV through immune responses (Deubel et al. 2001). The effects of WNV on bird populations at a regional scale have not been large, even for susceptible species (Caffrey and Peterson 2003), perhaps due to the short-term and patchy distribution of mortality (K. McGowan, pers. comm., cited in Courtney et al. 2004) or annual changes in vector abundance and distribution.

Courtney et al. (2004) offer competing propositions for the likely outcome of spotted owl populations being infected by WNV. One proposition is that spotted owls can tolerate severe, short-term population reductions due to WNV, because spotted owl populations are widely distributed and number in the several hundreds to thousands. An alternative proposition is that WNV will cause unsustainable mortality, due to the frequency and/or magnitude of infection, thereby resulting in long-term population declines and extirpation from parts of the spotted owl's current range. Thus far, no mortality in wild, northern spotted owls has been recorded, however, WNV is a potential threat of uncertain magnitude and effect (Courtney et al. 2004).

2.3.2.4 Sudden Oak Death.

Sudden oak death was recently identified as a potential threat to the spotted owl (Courtney et al. 2004). This disease is caused by the fungus-like pathogen, *Phytopthora ramorum* that was recently introduced from Europe and is rapidly spreading. At the present time, sudden oak death is found in natural stands from Monterey to Humboldt Counties, California, and has reached epidemic proportions in oak (*Quercus* spp.) and tanoak (*Lithocarpus densiflorus*) forests along approximately 300 km of the central and northern California coast (Rizzo et al. 2002). It has also been found near Brookings, Oregon, killing tanoak and causing dieback of closely associated wild rhododendron (*Rhododendron* spp.) and evergreen huckleberry (*Vaccinium ovatum*) (Goheen et al. 2002). It has been found in several different forest types and at

elevations from sea level to over 800 m. Sudden Oak death poses a threat of uncertain proportion because of its potential impact on forest dynamics and alteration of key prey and spotted owl habitat components (e.g., hardwood trees - canopy closure and nest tree mortality); especially in the southern portion of the spotted owl's range (Courtney et al. 2004).

2.3.2.5 Inbreeding Depression, Genetic Isolation, and Reduced Genetic Diversity.

Inbreeding and other genetic problems due to small population sizes were not considered an imminent threat to the spotted owl at the time of listing. Recent studies show no indication of reduced genetic variation and past bottlenecks in Washington, Oregon, or California (Barrowclough et al. 1999, Haig et al. 2004, Henke et al. unpublished). However, in Canada, the breeding population is estimated to be less than 33 pairs and annual population decline may be as high as 35 percent (Harestad et al. 2004). Canadian populations may be more adversely affected by issues related to small population size including inbreeding depression, genetic isolation, and reduced genetic diversity (Courtney et al. 2004). Low and persistently declining populations throughout the northern portion of the species range (see "Population Trends" below) may be at increased risk of losing genetic diversity.

2.3.2.6 Climate change.

Climate change, a potential additional threat to northern spotted owl populations, is not explicitly addressed in the NWFP. Climate change could have direct and indirect impacts on spotted owls and their prey. However, the emphasis on maintenance of seral stage complexity and related organismal diversity in the Matrix under the NWFP should contribute to the resiliency of the Federal forest landscape to the impacts of climate change (Courtney et al. 2004). There is no indication in the literature regarding the direction (positive or negative) of the threat.

Based upon a global meta-analysis, Parmesan and Yohe (2003) discussed several potential implications of global climate change to biological systems, including terrestrial flora and fauna. Results indicated that 62 percent of species exhibited trends indicative of advancement of spring conditions. In bird species, trends were manifested in earlier nesting activities. Because the spotted owl exhibits a limited tolerance to heat relative to other bird species (Weathers et al. 2001), subtle changes in climate have the potential to affect this. However, the specific impacts to the species are unknown.

2.3.2.7 Disturbance-Related Effects.

The effects of noise on northern spotted owls are largely unknown, and whether noise is a concern has been a controversial issue. The effect of noise on birds is extremely difficult to determine due to the inability of most studies to quantify one or more of the following variables: 1) timing of the disturbance in relation to nesting chronology; 2) type, frequency, and proximity of human disturbance; 3) clutch size; 4) health of individual birds; 5) food supply; and 6) outcome of previous interactions between birds and humans (Knight and Skagan 1988). Additional factors that confound the issue of disturbance include the individual bird's tolerance level, ambient sound levels, physical parameters of sound and how it reacts with topographic characteristics and vegetation, and differences in how species perceive noise.

Although information specific to behavioral responses of northern spotted owls to disturbance is limited, research indicates that recreational activity can cause Mexican spotted owls (*S. o. lucida*) to vacate otherwise suitable habitat (Swarthout & Steidl 2001) and helicopter overflights can reduce prey delivery rates to nests (Delaney et al. 1999b). Additional effects from disturbance, including altered foraging behavior and decreases in nest attendance and reproductive success, have been reported for other raptors (White & Thurow 1985, Andersen et al. 1989, McGarigal et al. 1991).

Northern spotted owls may also respond physiologically to a disturbance without exhibiting a significant behavioral response. In response to environmental stressors, vertebrates secrete stress hormones called corticosteroids (Campbell 1990). Although these hormones are essential for survival, extended periods with elevated stress hormone levels may have negative effects on reproductive function, disease resistance, or physical condition (Carsia & Harvey 2000, Saplosky et al. 2000). In avian species, the secretion of corticosterone is the primary non-specific stress response (Carsia & Harvey 2000). The quantity of this hormone in feces can be used as a measure of physiological stress (Wasser et al.1997). Recent studies of fecal corticosterone levels of spotted owls indicate that low intensity noise of short duration and minimal repetition does not elicit a physiological stress response (Tempel & Gutiérrez 2003, Tempel & Gutiérrez 2004). However, prolonged activities, such as those associated with timber harvest, may increase fecal corticosterone levels depending on their proximity to spotted owl core areas (see Wasser et al. 1997, Tempel & Gutiérrez 2004).

Post-harvest fuels treatments may also create above-ambient smoke or heat. Although it has not been conclusively demonstrated, it is anticipated that nesting northern spotted owls may be disturbed by heat and smoke intrusion into the nest grove.

2.4 Conservation Needs of the Spotted Owl

Based on the above assessment of threats, the spotted owl has the following habitat-specific and habitat-independent conservation (i.e., survival and recovery) needs:

2.4.1 Habitat-specific Needs

1. Large blocks of suitable habitat to support clusters or local population centers of spotted owls (e.g., 15 to 20 breeding pairs) throughout the owl's range;

2. Suitable habitat conditions and spacing between local spotted owl populations throughout its range to facilitate survival and movement;

3. Suitable habitat distributed across a variety of ecological conditions within the spotted owl's range to reduce risk of local or widespread extirpation;

4. A coordinated, adaptive management effort to reduce the loss of habitat due to catastrophic wildfire throughout the spotted owl's range, and a monitoring program to clarify whether these risk reduction methods are effective and to determine how owls use habitat treated to reduce fuels; and

5. In areas of significant population decline, sustain the full range of survival and recovery options for this species in light of significant uncertainty.

2.4.2 *Habitat-independent Needs*

1. A coordinated research and adaptive management effort to better understand and manage competitive interactions between spotted and barred owls; and

2. Monitoring to better understand the risk that WNV and sudden oak death pose to spotted owls and, for WNV, research into methods that may reduce the likelihood or severity of outbreaks in spotted owl populations.

2.4.3 Conservation Strategy

Since 1990, various efforts have addressed the conservation needs of the spotted owl and attempted to formulate conservation strategies based upon these needs. These efforts began with the ISC's Conservation Strategy (Thomas et al. 1990); they continued with the designation of critical habitat (USDI FWS 1992a), the Draft Recovery Plan (USDI FWS 1992b), and the Scientific Analysis Team report (Thomas et al. 1993), report of the Forest Ecosystem Management Assessment Team (Thomas and Raphael 1993); and they culminated with the NWFP (USDA FS and USDI BLM 1994a). Each conservation strategy was based upon the reserve design principles first articulated in the ISC's report, which are summarized as follows.

- Species that are well distributed across their range are less prone to extinction than species confined to small portions of their range.

- Large blocks of habitat, containing multiple pairs of the species, are superior to small blocks of habitat with only one to a few pairs.

- Blocks of habitat that are close together are better than blocks far apart.

- Habitat that occurs in contiguous blocks is better than habitat that is more fragmented.

- Habitat between blocks is more effective as dispersal habitat if it resembles suitable habitat.

2.4.4 Federal Contribution to Recovery

Since it was signed on April 13, 1994, the NWFP has guided the management of Federal forest lands within the range of the spotted owl (USDA FS and USDI BLM 1994a, 1994b). The NWFP was designed to protect large blocks of old growth forest and provide habitat for species that depend on those forests including the spotted owl, as well as to produce a predictable and sustainable level of timber sales. The NWFP included land use allocations which would provide for population clusters of spotted owls (*i.e.,* demographic support) and maintain connectivity between population clusters. Certain land use allocations in the plan contribute to supporting population clusters: LSRs, Managed Late-successional Areas, and Congressionally Reserved areas. Riparian Reserves, Adaptive Management Areas and Administratively Withdrawn areas

can provide both demographic support and connectivity/dispersal between the larger blocks, but were not necessarily designed for that purpose. Matrix areas were to support timber production while also retaining biological legacy components important to old-growth obligate species (in 100-acre owl cores, 15 percent late-successional provision, etc. (USDA FS and USDI BLM 1994a, USDI FWS 1994b)) which would persist into future managed timber stands.

The NWFP with its rangewide system of LSRs was based on work completed by three previous studies (Thomas et. al. 2006): the 1990 Interagency Scientific Committee (ISC) Report (Thomas et. al. 1990), the 1991 report for the Conservation of Late-successional Forests and Aquatic Ecosystems (Johnson et. al. 1991), and the 1993 report of the Scientific Assessment Team (Thomas et. al. 1993). In addition, the 1992 Draft Recovery Plan for the Northern Spotted Owl (USDI FWS 1992b) was based on the ISC report.

The Forest Ecosystem Management Assessment Team predicted, based on expert opinion, the spotted owl population would decline in the Matrix land use allocation over time, while the population would stabilize and eventually increase within LSRs as habitat conditions improved over the next 50 to 100 years (Thomas and Raphael 1993, USDA FS and USDI BLM 1994a, 1994b). Based on the results of the first decade of monitoring, Lint (2005) could not determine whether implementation of the NWFP would reverse the spotted owl's declining population trend because not enough time had passed to provide the necessary measure of certainty. However, the results from the first decade of monitoring do not provide any reason to depart from the objective of habitat maintenance and restoration as described in the NWFP (Lint 2005, Noon and Blakesley 2006). Bigley and Franklin (2004) suggested that more fuels treatments are needed in east-side forests to preclude large-scale losses of habitat to stand-replacing wildfires. Other stressors that occur in suitable habitat, such as the range expansion of the barred owl (already in action) and infection with WNV (which may or may not occur) may complicate the conservation of the spotted owl. Recent reports about the status of the spotted owl offer few management recommendations to deal with these emerging threats. The arrangement, distribution, and resilience of the NWFP land use allocation system may prove to be the most appropriate strategy in responding to these unexpected challenges (Bigley and Franklin 2004).

Under the NWFP, the agencies anticipated a decline of spotted owl populations during the first decade of implementation. Recent reports (Courtney et al. 2004, Anthony et al. 2006) identified greater than expected spotted owl declines in Washington and northern portions of Oregon, and more stationary populations in southern Oregon and northern California. The reports did not find a direct correlation between habitat conditions and changes in vital rates of spotted owls at the meta-population scale. However, at the territory scale, there is evidence of negative effects to spotted owl fitness due to reduced habitat quantity and quality. Also, there is no evidence to suggest that dispersal habitat is currently limiting (Courtney et al. 2004, Lint 2005). Even with the population decline, Courtney et al (2004) noted that there is little reason to doubt the effectiveness of the core principles underpinning the NWFP conservation strategy.

The current scientific information, including information showing northern spotted owl population declines, indicates that the spotted owl continues to meet the definition of a threatened species (USDI FWS 2004). That is, populations are still relatively numerous over most of its historic range, which suggests that the threat of extinction is not imminent, and that

the subspecies is not endangered; even though, in the northern part of its range population trend estimates are showing a decline.

In April 2007, the Service published the 2007 Draft Recovery Plan for the spotted owl (USDI FWS 2007). This draft plan outlines a three-part approach to recovering the spotted owl, including addressing the impacts of the barred owl on the spotted owl, establishing a network of habitat blocks to be managed for reproducing spotted owls, and monitoring the population trends and range of the spotted owl. The draft recovery plan recommends the experimental removal of barred owls to better understand the impact the species is having on spotted owls (USDI FWS 2007). The plan also includes two separate options for establishing the habitat network; one which is a mapped option within the plan, and one which is a rule set that outlines how the BLM and Forest Service would establish a network on their lands (USDI FWS 2007). The draft recovery plan estimates that recovery of the spotted owl could be achieved in approximately 30 years (USDI FWS 2007).

2.4.5 Conservation Efforts on Non-Federal Lands

In the report from the Interagency Scientific Committee (Thomas et al. 1990), the draft recovery plan (USDI FWS 1992b), and the report from the Forest Ecosystem Management Assessment Team (Thomas and Raphael 1993), it was noted that limited Federal ownership in some areas constrained the ability to form a network of old-forest reserves to meet the conservation needs of the spotted owl. In these areas in particular, non-Federal lands would be important to the range-wide goal of achieving conservation and recovery of the spotted owl. The U.S. Fish and Wildlife Service's primary expectations for private lands are for their contributions to demographic support (pair or cluster protection) to Federal lands, or their connectivity with Federal lands. In addition, timber harvest within each state is governed by rules that provide protection of spotted owls or their habitat to varying degrees.

There are 17 current or completed Habitat Conservation Plans (HCPs) that have incidental take permits issued for spotted owls—eight in Washington, three in Oregon, and four in California. The HCPs range in size from 40 acres to more than 1.6 million acres, although not all acres are included in the mitigation for spotted owls. In total, the HCPs cover approximately 2.9 million acres (9.1 percent) of the 32 million acres of non-Federal forest lands in the range of the spotted owl. The period of time that the HCPs will be in place ranges from 5 to 100 years; however, most of the HCPs are of fairly long duration. While each HCP is unique, there are several general approaches to mitigation of incidental take:

- Reserves of various sizes, some associated with adjacent Federal reserves
- Forest harvest that maintains or develops suitable habitat
- Forest management that maintains or develops dispersal habitat
- Deferral of harvest near specific sites

Washington. In 1996, the State Forest Practices Board adopted rules (Washington Forest Practices Board 1996) that would contribute to conserving the spotted owl and its habitat on non-Federal lands. Adoption of the rules was based in part on recommendations from a Science Advisory Group that identified important non-Federal lands and recommended roles for those lands in spotted owl conservation (Hanson et al. 1993, Buchanan et al. 1994). The 1996 rule package was developed by a stakeholder policy group and then reviewed and approved by the Forest Practices Board (Buchanan and Swedeen 2005). Spotted owl-related HCPs in Washington generally were intended to provide demographic or connectivity support (USDI FWS 1992b).

Oregon. The Oregon Forest Practices Act provides for protection of 70-acre core areas around sites occupied by an adult pair of spotted owls capable of breeding (as determined by recent protocol surveys), but it does not provide for protection of spotted owl habitat beyond these areas (Oregon Department of Forestry 2007). In general, no large-scale spotted owl habitat protection strategy or mechanism currently exists for non-Federal lands in Oregon. The three spotted owl-related HCPs currently in effect cover more than 300,000 acres of non-Federal lands. These HCPs are intended to provide some nesting habitat and connectivity over the next few decades.

California. The California State Forest Practice Rules, which govern timber harvest on private lands, require surveys for spotted owls in suitable habitat and to provide protection around activity centers (California Department of Forestry and Fire Protection 2007). Under the Forest Practice Rules, no timber harvest plan can be approved if it is likely to result in incidental take of federally listed species, unless the take is authorized by a Federal incidental take permit (California Department of Forestry and Fire Protection 2007). The California Department of Fish and Game initially reviewed all timber harvest plans to ensure that take was not likely to occur; the U.S. Fish and Wildlife Service took over that review function in 2000. Several large industrial owners operate under spotted owl management plans that have been reviewed by the U.S. Fish and Wildlife Service and that specify basic measures for spotted owl protection. Four HCPs authorizing take of spotted owls have been approved; these HCPs cover more than 669,000 acres of non-Federal lands. Implementation of these plans is intended to provide for spotted owl demographic and connectivity support to NWFP lands.

2.5 Current Condition of the Spotted Owl

The current condition of the species incorporates the effects of all past human activities and natural events that led to the present-day status of the species and its habitat (USDI FWS and USDC NMFS 1998).

2.5.1 Range-wide Habitat and Population Trends

2.5.1.1 Habitat Baseline.

The 1992 Draft Spotted Owl Recovery Plan estimated approximately 8.3 million acres of spotted owl habitat remained range-wide (USDI 1992b). However, reliable habitat baseline information for non-Federal lands is not available (Courtney et al. 2004). The Service has used information provided by the Forest Service, Bureau of Land Management, and National Park Service to

update the habitat baseline conditions on Federal lands for spotted owls on several occasions since the spotted owl was listed in 1990. The estimate of 7.4 million acres used for the NWFP in 1994 (USDA and USDI 1994a) was believed to be representative of the general amount of spotted owl habitat on these lands. This baseline has been used to track relative changes over time in subsequent analyses, including those presented here.

In 2005 a new map depicting suitable spotted owl habitat throughout the range of the spotted owl was produced as a result of the NWFP's effectiveness monitoring program (Lint 2005). However, the spatial resolution of this new habitat map currently makes it unsuitable for tracking habitat effects at the scale of individual projects. The Service is evaluating the map for future use in tracking habitat trends. Additionally, there continues to be no reliable estimates of spotted owl habitat on non-Federal lands; consequently, consulted-on acres can be tracked, but not evaluated in the context of change with respect to a reference condition on non-Federal lands. The production of the monitoring program habitat map does, however, provide an opportunity for future evaluations of trends in non-Federal habitat.

2.5.1.2 NWFP Lands Analysis 1994 – 2001.

In 2001, the Service conducted an assessment of habitat baseline conditions, the first since implementation of the NWFP (USDI FWS 2001). This range-wide evaluation of habitat, compared to the FSEIS, was necessary to determine if the rate of potential change to spotted owl habitat was consistent with the change anticipated in the NWFP. In particular, the Service considered habitat effects that were documented through the section 7 consultation process since 1994. In general, the analytical framework of these consultations focused on the reserve and connectivity goals established by the NWFP land-use allocations (USDA FS and USDI BLM 1994a), with effects expressed in terms of changes in suitable spotted owl habitat within those land-use allocations. The Service determined that actions and effects were consistent with the expectations for implementation of the NWFP from 1994 to June, 2001 (USDI FWS 2001).

2.5.1.3 Range-wide Analysis 1994 – July 19, 2007.

This section updates the information considered in USDI FWS (2001), relying particularly on information in documents the Service produced pursuant to section 7 of the Act and information provided by NWFP agencies on habitat loss resulting from natural events (e.g., fires, windthrow, insect and disease). To track impacts to spotted owl habitat, the Service designed the Consultation Effects Tracking System database which records impacts to spotted owls and their habitat at a variety of spatial and temporal scales. Data are entered into the database under various categories including, land management agency, land-use allocation, physiographic province, and type of habitat affected.

In 1994, about 7.4 million acres of suitable northern spotted owl habitat were estimated to exist on Federal lands managed under the NWFP. As of July 19, 2007, the Service had consulted on the proposed removal of approximately 202,368 acres (Table 1) or 2.73 percent of 7.4 million acres (Table 2) of northern spotted owl suitable habitat on Federal lands. Of the total Federal acres consulted on for removal, approximately 179,633 acres or 2.43 percent of 7.4 million acres of northern spotted owl habitat were removed as a result of timber harvest. These changes in

suitable spotted owl habitat are consistent with the expectations for implementation of the NWFP (USDA FS and USDI BLM 1994a).

April 13, 2004 marked the start of the second decade of the NWFP. Decade specific baselines and summaries of effects by State, physiographic province and land use function from proposed management activities and natural events are not provided here, but can be calculated using the Service's Consultation Effects Tracking system.

Due to ongoing technical difficulties with the Service's Consultation Effects Tracking system, the acres of habitat on federal NWFP lands that were consulted on and removed and downgraded in reserves and non-reserves in Table 2 do not match those acres of federal NWFP lands that were consulted on and removed and downgraded in Table 1. Until the technical difficulties are resolved, we continue to include Table 2 because it is useful for providing an approximate breakdown of habitat impacts by physiographic province and state.

Habitat loss from Federal lands due to management activities has varied among the individual provinces with most of the impacts concentrated within the Non-Reserve relative to the Reserve land-use allocations (Table 2). When habitat loss is evaluated as a proportion of the affected acres range-wide, the most pronounced losses have occurred within Oregon (84%), especially within its Klamath Mountains (49%) and Cascades (East and West) (33%) Provinces (Table 2), followed by much smaller habitat losses in Washington (8%) and California (9%)(Table 2). When habitat loss is evaluated as a proportion of provincial baselines, the Oregon Klamath Mountains (22%), Cascades East (7%), and the California Cascades (5%) all have proportional losses greater than the range-wide mean (4.9%) (Table 2).

From 1994 through July 19, 2007, habitat lost due to natural events was estimated at approximately 167,894 acres range-wide (Table 2). About two-thirds of this loss was attributed to the Biscuit Fire that burned over 500,000 acres in southwest Oregon (Rogue River basin) and northern California in 2002. This fire resulted in a loss of approximately 113,451 acres of spotted owl habitat, including habitat within five LSRs (Table 2[8]). Approximately 18,630 acres of spotted owl habitat were lost due to the B&B Complex and Davis Fires in the East Cascades Province of Oregon (Table 2[9]).

Because there is no comprehensive spotted owl habitat baseline for non-Federal lands, there is little available information regarding spotted owl habitat trends on non-Federal lands. Yet, we do know that internal Service consultations conducted since 1992, have documented the eventual loss of 419,412 (Table 1) acres of habitat on non-Federal lands. Most of these losses have yet to be realized because they are part of large-scale, long-term HCPs. Combining effects on Federal and non-Federal lands, the Service had consulted on the proposed removal of approximately 622,021, resulting from all management activities, as of July 19, 2007 (Table 1).

2.5.1.4 <u>Other Habitat Trend Assessments</u>

In 2005, the Washington Department of Wildlife released the report, "An Assessment of Spotted Owl Habitat on Non-Federal Lands in Washington between 1996 and 2004" (Pierce et al. 2005). This study estimates the amount of spotted owl habitat in 2004 on lands affected by state and

private forest practices. The study area is a subset of the total Washington forest practice lands, and statistically-based estimates of existing habitat and habitat loss due to fire and timber harvest are provided. In the 3.2-million acre study area, Pierce et al. (2005) estimated there was 816,000 acres of suitable spotted owl habitat in 2004, or about 25 percent of their study area. Based on their results, Pierce and others (2005) estimated there were less than 2.8 million acres of spotted owl habitat in Washington on all ownerships in 2004. Most of the suitable owl habitat in 2004 (56%) occurred on Federal lands, and lesser amounts were present on state-local lands (21%), private lands (22%) and tribal lands (1%). Most of the harvested spotted owl habitat was on private (77%) and state-local (15%) lands. A total of 172,000 acres of timber harvest occurred in the 3.2 million-acre study area, including harvest of 56,400 acres of suitable spotted owl habitat. This represented a loss of about 6 percent of the owl habitat in the study area distributed across all ownerships (Pierce et al. 2005). Approximately 77 percent of the harvested habitat occurred on private lands and about 15 percent occurred on State lands. Pierce and others (2005) also evaluated suitable habitat levels in 450 spotted owl management circles (based on the provincial annual median spotted owl home range). Across their study area, they found that owl circles averaged about 26 percent suitable habitat in the circle across all landscapes. Values in the study ranged from an average of 7 percent in southwest Washington to an average of 31 percent in the east Cascades, suggesting that many owl territories in Washington are significantly below the 40 percent suitable habitat threshold used by the State as a viability indicator for spotted owl territories (Pierce et al. 2005).

Moeur et al. 2005 estimated an increase of approximately 1.25 to 1.5 million acres of medium and large older forest (greater than 20 inches dbh, single and multi-storied canopies) on Federal lands in the Northwest Forest Plan area between 1994 and 2003. The increase occurred primarily in the lower end of the diameter range for older forest. The net area in the greater than 30 inch dbh size class increased by only an estimated 102,000 to 127,000 acres. The estimates were based on change-detection layers for losses due to harvest and fire and remeasured inventory plot data for increases due to ingrowth. Transition into and out of medium and large older forest over the 10-year period was extrapolated from inventory plot data on a subpopulation of Forest Service land types and applied to all Federal lands. Because size class and general canopy layer descriptions do not necessarily account for the complex forest structure often associated with northern spotted owl habitat, the significance of these acres to northern spotted owl conservation remains unknown.

2.5.1.5 Spotted Owl Numbers, Distribution, and Reproduction Trends.

There are no estimates of the size of the spotted owl population prior to settlement by Europeans. Spotted owls are believed to have inhabited most old-growth forests or stands throughout the Pacific Northwest, including northwestern California, prior to beginning of modern settlement in the mid-1800s (USDI FWS 1989). According to the final rule listing the spotted owl as threatened (USDI FWS 1990a), approximately 90 percent of the roughly 2,000 known spotted owl breeding pairs were located on Federally managed lands, 1.4 percent on State lands, and 6.2 percent on private lands; the percent of spotted owls on private lands in northern California was slightly higher (Forsman et al. 1984, USDI FWS 1989, Thomas et al. 1990).

The current range of the spotted owl extends from southwest British Columbia through the Cascade Mountains, coastal ranges, and intervening forested lands in Washington, Oregon, and California, as far south as Marin County (USDI FWS 1990a). The range of the spotted owl is partitioned into 12 physiographic provinces (Figure 1) based on recognized landscape subdivisions exhibiting different physical and environmental features (Thomas et al. 1993). The spotted owl has become rare in certain areas, such as British Columbia, southwestern Washington, and the northern coastal ranges of Oregon.

As of July 1, 1994, there were 5,431 known site-centers of spotted owl pairs or resident singles: 851 sites (16 percent) in Washington, 2,893 sites (53 percent) in Oregon, and 1,687 sites (31 percent) in California (USDI FWS 1995). The actual number of currently occupied spotted owl locations across the range is unknown because many areas remain unsurveyed (USDI FWS 1992a, Thomas et al. 1993). In addition, many historical sites are no longer occupied because spotted owls have been displaced by barred owls, timber harvest, or severe fires, and it is possible that some new sites have been established due to reduced timber harvest on Federal lands since 1994. The totals in USDI FWS (1995) represent the cumulative number of locations recorded in the three states, not population estimates.

Because the existing survey coverage and effort are insufficient to produce reliable range-wide estimates of population size, demographic data are used to evaluate trends in spotted owl populations. Analysis of demographic data can provide an estimate of the finite rate of population change (λ), which provides information on the direction and magnitude of population change. A λ of 1.0 indicates a stationary population, meaning the population is neither increasing nor decreasing. A λ of less than 1.0 indicates a decreasing population, and a λ of greater than 1.0 indicates a growing population. Demographic data, derived from studies initiated as early as 1985, have been analyzed periodically (Anderson and Burnham 1992, Burnham et al. 1994: Forsman et al. 1996, Anthony et al. 2006) to estimate trends in the populations of the spotted owl.

In January 2004, two meta-analyses modeled rates of population change for up to 18 years using the re-parameterized Jolly-Seber method (λ_{RJS}). One meta-analysis modeled all 13 long-term study areas excluding the Marin study area, while the other modeled the eight study areas that are part of the effectiveness monitoring program of the NWFP (Anthony et al. 2006). Data were analyzed separately for individual study areas, as well as across all study areas in a meta-analysis.

Point estimates of λ_{RJS} ranged from 0.896 to 1.005 for the 13 long-term study areas, and in all study areas but one—the Tyee study area—these estimates were less than 1.0 (Anthony et al. 2006). There was strong evidence that populations in the Wenatchee, Cle Elum, Warm Springs, and Simpson study areas decreased during the period of study. There also was evidence that populations in the Rainier, Olympic, Oregon Coast Range, and HJ Andrews study areas were decreasing. The precision of the λ_{RJS} estimates for Rainier and Olympic study areas was poor and not sufficient to detect a statistically significant difference from 1.00; however, the estimate of λ_{RJS} for the Rainier study area (0.896) was the lowest of all of the areas. Populations in the Tyee, Klamath, South Oregon Cascades, Northwest California, and Hoopa study areas appeared

to be stationary during the study, but there was some evidence that the spotted owl population in the Northwest California study area was decreasing (λ_{RJS} = 0.959 to 1.011).

The weighted mean λ_{RJS} for all of the study areas was 0.963 (standard error [SE] = 0.009, 95 percent confidence interval [CI] = 0.945 to 0.981), suggesting that populations over all of the study areas decreased by about 3.7 percent per year from 1985 to 2003. The mean λ_{RJS} for the eight demographic monitoring areas that are part of the effectiveness monitoring program of the NWFP was 0.976 (SE = 0.007, 95 percent CI = 0.962 to 0.990), and the mean λ_{RJS} for the other five study areas was 0.942 (SE = 0.016, 95 percent CI = 0.910 to 0.974), yielding average declines of 2.4 and 5.8 percent per year, respectively. These data suggest that demographic rates for spotted owl populations on Federal lands were better than elsewhere; however, both the interspersion of non-Federal land in study areas, and the likelihood that spotted owls use habitat on multiple ownerships in some demography study landscapes, confound this comparison.

The number of populations that declined and the rate at which they have declined are noteworthy, particularly the precipitous declines in the Wenatchee, Cle Elum, and Rainier study areas in Washington and the Warm Springs study area in Oregon. Estimates of population declines in these areas ranged from 40 to 60 percent during the study period of 1990 to 2003 (Anthony et al. 2006). Decreases in apparent adult survival rates were an important factor contributing to decreasing population trends. Survival rates decreased over time in five of the 14 study areas: four study areas in Washington, which showed the sharpest declines, and one study area in the California Klamath Province of northwest California (Anthony et al. 2006). In Oregon, there were no time trends in apparent survival for four of six study areas, and remaining areas had weak, non-linear trends. In California, three study areas showed no trend and one showed a significant linear decrease (Anthony et al. 2006). Like the trends in annual rate of population change, trends in the rate of adult survival showed clear decreases in some areas but not in others.

Loehle *et al.* (2005a) sampled a small portion of the range of the species and questioned the accuracy of lambda estimates computed in Anthony *et al.* (2005, subsequently published as Anthony *et al.* 2006), suggesting that the estimates were biased low by 3 to 4 percentage points. Loehle *et al.* (2005a) contended the lambda estimates in Anthony *et al.* (2005) did not accurately account for spotted owl emigration. Therefore, more of the spotted owl demography study areas would have a lambda closer to 1.0, a stationary population. Loehle *et al.* then published an erratum (2005b) acknowledging that the more recent analysis methods used in Anthony *et al.* (2006) did not cause them concern regarding potentially miscalculated permanent emigration rates. Subsequently, Franklin *et al.* (2006) published a comment indicating the Loehle *et al.* (2005a) survival estimates were inappropriate for comparison because they introduced a positive bias to the measure of population change, were not valid for evaluating bias, and their study areas were too different from the demography study areas to allow for comparison.

British Columbia has a small population of spotted owls. This population is relatively isolated from populations in Washington and appears to be declining sharply; spotted owls are absent from large areas of apparently suitable habitat (Chutter et al. 2004). Breeding populations have been estimated at fewer than 33 pairs and may be declining by as much as 35 percent per year (Chutter et al. 2004). The amount of interaction between spotted owls in Canada and the United

States is unknown (Chutter et al. 2004). The Canadian population has now reached the point at which it is vulnerable to random, naturally occurring demographic events that could cause further declines and perhaps extirpation. Chutter et al. (2004) suggest that immediate action is required to improve the likelihood of recovering that population in British Columbia.

Table 1. Changes to NRF[1] habitat acres from activities addressed in section 7 consultations (both formal and informal) and other causes range-wide from 1994 to July 19, 2007.

Northwest Forest Plan (NWFP) Group / Ownership		Consulted On Habitat Changes[2]		Other Habitat Changes[3]	
		Removed/ Downgraded	Degraded	Removed/ Downgraded	Degraded
Federal - Northwest Forest Plan	Bureau of Land Management	85452	29113	760	0
	Forest Service	97875	452977	29832	5481
	National Park Service	3866	3316	3	0
	Multi-agency[4]	15175	23314	137299	0
	NWFP Subtotal	202368	508720	167894	5481
Other Management and Conservation Plans (OMCP)	Bureau of Indian Affairs and Tribes	109370	28349	2398	0
	Habitat Conservation Plans	295889	14430	0	0
	OMCP Subtotal	405259	42779	2398	0
Other Federal Agencies & Lands[5]		241	466	28	70
Other Public & Private Lands[6]		14153	880	30240	20949
TOTAL Changes		622021	552845	200560	26500

[1] Nesting, roosting, foraging habitat. In California, suitable habitat is divided into two components; nesting – roosting (NR) habitat, and foraging (F) habitat. The NR component most closely resembles NRF habitat in Oregon and Washington. Due to differences in reporting methods, effects to suitable habitat compiled in this, and all subsequent tables include effects for nesting, roosting, and foraging (NRF) for 1994-6/26/2001. After 6/26/2001, suitable habitat includes NRF for Washington and Oregon but only nesting and roosting (NR) for California.
[2] Includes both effects reported by USDI FWS (2001) and subsequent effects compiled in the Spotted owl Consultation Effects Tracker (web application and database).
[3] Includes effects to NRF habitat (as documented through technical assistance) resulting from wildfires (not from suppression efforts), insect and disease outbreaks, and other natural causes, private timber harvest, and land exchanges not associated with consultation.
[4] The 'Multi-agency' grouping is used to lump a variety of NWFP mixed agency or admin unit consultations that were reported together prior to 6/26/2001, and the acres of habitat loss to natural events that can not be split out by administrative unit.
[5] Includes lands that are owned or managed by other Federal agencies not included in the NWFP.
[6] Includes lands not covered by Habitat Conservation Plans that are owned or managed by states, counties, municipalities, and private entities. Effects that occurred on private lands from right-of-way permits across Forest Service and FS lands are included here.

Table 2. Acres of suitable (NRF[1]) habitat loss on Federal lands from 1994 to July 19, 2007 from proposed management activities and natural events: baseline and summary of effects by State, physiographic province and land use function.

Physiographic Province[4]		Evaluation Baseline[2]			Habitat Removed/Downgraded[3]				% Provincial Baseline Affected	% of Range-wide Effects
		Reserves[5]	Non-reserves[6]	Total	Reserves[5]	Non-reserves[6]	Habitat loss to natural events[7]	Total		
WA	Olympic Peninsula	548483	11734	560217	867	24	299	1190	0.21	0.33
	Eastern Cascades	506340	200509	706849	3783	5014	5754	14551	2.06	4.06
	Western Cascades	864683	247797	1112480	1681	10804	0	12485	1.12	3.48
	Western Lowlands	0	0	0	0	0	0	0	0.00	0.00
OR	Coast Range	422387	94190	516577	479	3684	66	4229	0.82	1.18
	Klamath Mountains	448509	337789	785589	1998	71442	101676[8]	175116	22.29	48.82
	Cascades East	247624	196035	443659	1243	11152	19547[9]	31942	7.20	8.90
	Cascades West	1012426	1033337	2046472	3581	59208	24583	87372	4.27	24.35
	Willamette Valley	593	5065	5658	0	0	0	0	0.00	0.00
CA	Coast	47566	3928	51494	405	69	100	574	1.11	0.16
	Cascades	61852	26385	88237	0	4808	0	4808	5.46	1.34
	Klamath	734103	345763	1079866	1470	9159	15869	26498	2.45	7.39
Total		4894566	2502532	7397098	15507	175364	167894	358765	4.85	100.0

[1] Nesting, roosting, foraging habitat. In California, suitable habitat is divided into two components; nesting – roosting (NR) habitat, and foraging (F) habitat. The NR component most closely resembles NRF habitat in Oregon and Washington. Due to differences in reporting methods, effects to suitable habitat compiled in this, and all subsequent tables include effects for nesting, roosting, and foraging (NRF) for 1994-6/26/2001. After 6/26/2001, suitable habitat includes NRF for Washington and Oregon but only nesting and roosting (NR) for California.

[2] 1994 FSEIS baseline (USDA FS and USDI BLM 1994b).

[3] Includes consulted-on effects reported by USDI FWS (2001) and subsequent effects compiled in the Northern Spotted Owl Consultation Effects Tracking System database.

[4] Defined by the NWFP as the twelve physiographic provinces, as presented in Figure 3&4-1 on page 3&4-16 of the FSEIS.

[5] Land-use allocations intended to provide large blocks of habitat to support clusters of breeding pairs

[6] Land-use allocations intended to provide habitat to support movement of spotted owls among reserves.

[7] Acres for all physiographic provinces, except the Oregon Klamath Mountains and Oregon Cascades East, are from the Scientific Evaluation of the Status of the Northern Spotted Owl (Courtney et al. 2004).

[8] Acres are from the biological assessment entitled: Fiscal year 2006-2008 programmatic consultation: re-initiation on activities that may affect listed species in the Rogue-River/South Coast Basin, Medford BLM, and Rogue-Siskiyou National Forest.

[9] Acres are from the Scientific Evaluation of the Status of the Northern Spotted Owl (Courtney et al. 2004) and data in the Northern Spotted Owl Consultation Effects Tracking Database.

3 Environmental Baseline for the Salt Project

The environmental baseline is an account of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat, and ecosystem within the action area (USDI Fish and Wildlife Service and USDC National Marine Fisheries Service 1998). The environmental baseline represents a "snapshot" in time of the current condition, and provides the context for the analysis of potential effects of the proposed action on the species. As stated in Section 1.2, the action area for the Salt Project consists of approximately 16,920 acres.

3.1 Conservation Needs of the Spotted Owl in the Action Area

The Salt Project in its entirety lies within the Hayfork Adaptive Management Area (AMA). As such, its primary purpose with respect to conservation needs of the northern spotted owl is to maintain habitat connectivity, and thus owl dispersal opportunities, between Late-Successional Reserves (LSRs) set aside to protect numerous pairs of owls (USDA Forest Service and USDI Bureau of Land Management1994a). The Salt Project action area does not include any Critical Habitat or designated LSR.

3.2 Current condition – Habitat and Population Trends in the Action Area

3.2.1 Habitat Trends

For the purposes of this BO, the following habitat definitions apply (See Appendix A): high quality nesting/roosting (NR) habitat includes those stands that are classified as 4G and 4N; moderate quality NR refers to 3G stands; foraging (F) habitat refers to 3N stands; connectivity (dispersal only) habitat refers to 4P, 4S, 3P, 3S, 2G and 2N; and capable (potential future NRF) refers to all remaining Federal Forest Land that is capable of growing to NRF habitat conditions in the future.

The 16,920-acre action area includes approximately 907 acres of spotted owl NR habitat (94 acres high quality; 813 acres moderate quality), 2,556 acres of F habitat, with approximately 10,723 acres of Forest Service land capable of growing to at least foraging habitat conditions (see map, USDA Forest Service 2007). Additionally, approximately 660 acres of private land exists within the action area that is either residential, including the community of Trinity Pines or managed for timber production; the majority of areas of which were harvested in the 1960's. These harvested areas are currently dominated by very dense pine forest that meet the 11-40 condition (i.e., an average conifer of at least 11 inches diameter at breast height (dbh) and at least 40 percent canopy closure) of owl connectivity habitat, however, they are so dense as to prohibit the free movement of owls.

3.2.2 Spotted Owl Numbers, Distribution, and Reproduction Trends

Multiple observations or sightings of northern spotted owls have occurred in the action area according to historical records. Two historic owl activity centers are found within the action area. The first owl activity center (TR287; last confirmed presence reported in 1992) is located in the western portion of the action area. The owl's territory (0.7 mile buffer) and home range

(1.3 mile buffer) overlap with private land. Within Forest lands, approximately 868 acres of suitable spotted owl habitat (122 acres NR, 746 acres F) fall within the 1.3 mile home range of this activity center. The second owl activity center (TR295; last confirmed presence reported in 1996) is located in the northeast portion of the action area. This activity center also has private lands located within the 1.3 home range. Within Forest lands, approximately 573 (90 acres NR, 483 acres F) fall within the 1.3 mile home range of this activity center. As noted in the BA, no actions are proposed for high quality NR within the action area, no actions are proposed for NR habitat within the two owl pair home ranges, and no actions are proposed within the owl's territories. Additionally, historical records include detections of a non-territorial male owl (TR 304, detected in 1989) just within the southern boundary of the action area in the vicinity of Mud Springs. Pair or territorial single status was not established for this area and thus was not included in the BA as an activity center.

Since the action area has not been surveyed for at least the last 10 years, it is reasonable to expect that additional nest sites may occur in areas of suitable habitat; either from the historic owl pairs utilizing an alternative nest or new pairs that have taken up occupancy within the action area. Long-term spotted owl survey efforts throughout the Pacific Northwest have shown that spotted owl pairs exhibit high site fidelity but often utilize multiple activity centers or "alternate nest sites" over the course of several years (Anthony 2005). Survey results have shown that when a group of alternate sites is vacated or when one member of a spotted owl pair leaves or dies another individual usually fills the void and the new pair continues to use the cluster of alternate nest sites. These alternate sites can be as much as a mile apart but are usually closer to each other. These long-term survey efforts have also shown that non-resident or "floater" spotted owls often occupy habitat patches where occupancy has not previously been documented. These non-resident or "floater" owls could potentially attract a mate and occupy suitable habitat that was previously unoccupied. Therefore, it is reasonable to assume that at least the two historic activity centers are occupied.

In an effort to predict owl presence/absence within the action area, the Service utilized the work of Zabel et al. (2003). Zabel et al. (2003) developed, tested and compared the ability of vegetation models (292 total) at the 200-, 550- and 900-hectare (ha) scale to predict northern spotted owl presence/absence throughout national forests in northern California. Zabel et al. (2003) evaluated habitat descriptions developed by a team of USDA Forest Service and USDI Fish and Wildlife Service biologists. The team had created a seamless, ecologically based habitat map disregarding forest boundaries and incorporating ecological-zone boundaries that incorporated new habitat types and attributes that the original FSEIS (1994b) description had not included. The refined habitat descriptions that delineated owl nesting and roosting, and foraging habitat, were found to be better predictors of owl occupancy than the habitat description currently used by federal land managers (Zabel et al. 2003). Zabel et al. (2003) found that the best fitting model for predicting owl occupancy was at the 200 ha scale and exhibited a pseudo-threshold relationship to nesting and roosting habitat and a quadratic relationship to foraging habitat. This 200 ha scale is based on the estimated size of the average core home-range area for northern spotted owls in northern California (Bingham and Noon 1997). The model (LOGNR + $F = F^2$) performed most consistently across all data sets and correctly classified owl-occupied sites 94 percent of the time for the developmental data set and between 85 percent and 92 percent of the time on four independent test data sets.

In estimating the number of owl pairs within a given area, Zabel et al. (2003) used a focal point method. They used the best model at the 200-ha scale to estimate probabilities of northern spotted owl occupancy at potential nesting locations, positioned at incremental points 40 meters (m) apart throughout northern California. This created a continuous probability contour map over northern California. Therefore, within a particular project area Zabel et al. (2003) could estimate the number of northern spotted owl pairs by determining the sum of probabilities from the 40 x 40 m pixel map that overlaid the project area and dividing by 5625 (the number of pixels within a 900-ha area; 900 ha approximates the mean size of a northern spotted owl home range in the Klamath Province).

The Service utilized this method to determine the number of potential owl pairs within the Salt Project action area. This model is a good tool to compare with historic owl activity center data and to determine the landscapes potential carrying capacity within a predefined area. As such, using GIS the Service created a rectangular boundary that incorporates the Salt Project's action area and calculated the sum of probabilities (5030.71) then divided by 5625 to determine the number of potential owl pairs (0.89, or 1 pair) within the action area. Therefore, since the known historic activity center number is greater the Service will conclude that two owl pairs are likely to occupy the action area.

4 Effects of the Salt Project

This section presents an analysis of the direct and indirect effects of the Salt Project, including interrelated and interdependent actions, on the northern spotted owl. Implementation of the project as proposed in the BA will involve the following: *timber harvest, fuels treatments, road management (i.e., construction, reconstruction, and obliteration/decommissioning); and temporary road and landing rehabilitation.* The degree to which any of these activities affect the northern spotted owl is presented with respect to modification of suitable habitat, disturbance from human-generated noise, visual stimuli, smoke, and direct injury and/or mortality. Additionally, these effects are then discussed with respect to the conservation needs of the owl within the action area and within the larger conservation strategy established for the owl by the NFWP: 1) protection of large blocks of habitat to provide for clusters of breeding pairs of northern spotted owls; 2) distributed across a variety of ecological conditions; and, 3) connected by habitat within the intervening matrix to support survival and movement across the landscape between reserves.

4.1 Habitat Modification

Forest management activities can modify suitable spotted owl habitat to varying degrees, leading to direct and indirect effects on spotted owls at both site-specific and more landscape-level scales as discussed below.

4.1.1 Scientific Basis for Effects

4.1.1.1 Site-Specific Effects.

Forest management activities, whether intended to address silvicultural needs or to facilitate other actions (e.g., mining, recreation, etc.) have the potential to reduce availability of spotted owl nest and roost sites. As reported in Section 2.2.5.3, spotted owls do not construct their own nests, but depend upon existing structures such as cavities and broken tree tops, characteristics associated with stands in later seral stages of development. Silvicultural prescriptions (e.g., regeneration prescriptions) or management activities that specifically target the oldest, most decadent trees in the stand for economic purposes, or require removal of hazard trees and snags to address human safety concerns, are likely to result in loss of nesting opportunities for spotted owls by removing the trees that contain those structures (Blakesley et al. 1992). Further, prescriptions designed to reduce or remove ladder fuels or release co-dominant individuals can simplify vertical structure in the forest understory, where spotted owls perch for hunting or roosting (Forsman et al. 1984).

Intermediate timber harvest and fuels reduction activities can contribute to changes in structure, diversity, and habitat microclimate by reducing overall canopy closure within a stand. Northern spotted owls prefer to nest and roost in older forests (USDI Fish and Wildlife Service 1990, Blakesley et al.1992) presumably because they provide protection under most weather conditions (Forsman et al. 1984, North et al. 2000). During periods of rain, snow, or cold, Forsman et al. (1984) found northern spotted owls roosting significantly higher in the forest overstory than during hot weather, when northern spotted owls were commonly found roosting low in the forest understory. Weathers et al. 2001 documents physiological limitations that corroborate results of laboratory work and field studies which determined low heat tolerance of spotted owls compared to typical birds.

Various forestry activities that remove large trees, snags, and downed wood can affect prey composition and/or availability by altering characteristics of the habitat upon which prey species depend. Because the amount of standing dead (i.e., snags) and down material present on the forest floor is positively correlated with densities of some northern spotted owl prey species, removing these materials or temporarily disturbing material on the forest floor may contribute to declines in northern spotted owl prey, at least on a localized, short-term basis (Williams et al. 1992, Bevis et al. 1997). It may also be possible for prey species to be adversely affected by incidental loss of hardwoods, hazard trees, or snags during harvest. Because availability of large prey species, particularly dusky-footed woodrat and northern flying squirrels, has been shown to be important for spotted owl reproductive success (Barrows 1985, Zabel et al. 1995), activities that reduce prey populations could lower spotted owl recruitment and individual fitness.

4.1.1.2 Landscape-Scale Effects.

Any individual or suite of site-specific effects discussed above could change the habitat function that a forested stand provides for owls. For the purpose of the following discussion, the degree of change to habitat function has been categorized using the following terms: removal, downgrade, and degrade. The term *removal* represents a complete loss of habitat function

following an effect (i.e., an area that functioned as NR, F, or dispersal habitat for northern spotted owls before the effect, no longer provides any habitat function for spotted owls after the effect). *Downgrade*, a subset of the term *removal*, refers to a reduction in the function of habitat (i.e., an area that functioned as NR habitat before an effect, provides only F or dispersal habitat following the effect). This term could be used also to signify a change in function from foraging to dispersal as well. *Degrade*, to be distinguished from *downgrade*, indicates a reduction in habitat quality, but not habitat function following the effect (i.e., an area that functioned as F habitat prior to the effect, still provides such function after the effect, but perhaps is more limited due to a temporary reduction in prey base).

Landscape-level changes in habitat availability, distribution, and configuration have implications to individual spotted owl survival and productivity, as well as to spotted owl population dynamics. For example, removal or downgrading of habitat within home ranges, and especially close to the nest site, can be expected to have negative effects on northern spotted owls. Bart (1995) reported a linear reduction in northern spotted owl productivity and survivorship as the amount of suitable habitat within a spotted owl home range declined. In northwestern California, Franklin et al. (2000) found that survivorship of adult owls was greater where greater amounts of older forest were present around the activity center, but also found increased reproductive success where the amount of edge between older and younger forest was relatively high. Based on analysis of radio-telemetry data, Bingham and Noon (1997) reported that a sample of spotted owls in northern California focused their activities in heavily-used "core areas" that ranged in size from about 167 to 454 acres, with a mean of about 409 acres. These core areas, which included 60 to 70 percent of the owl telemetry locations during the breeding season, typically comprised only 20 percent of the area of the wider home range. These studies suggest that habitat removal within core areas could have disproportionately important effects on owls. Other research has demonstrated that spotted owl abundance and productivity significantly decrease when the proportion of suitable habitat within 0.7 miles of an activity center falls below 500 acres (50 percent of the total 1,000 acres within 0.7 miles) (O'Halloran 1989, Simon-Jackson 1989, Thomas et al. 1990).

Timber harvest that produces relatively open stands (less than 40 percent canopy closure) or patch clear-cuts can fragment forest stands, creating more forest edge, and reducing the area of interior old forest habitat (Lehmkuhl and Ruggiero 1991). Habitat fragmentation has the potential to isolate individual owls or populations of owls by increasing distances between suitable habitat patches and reducing habitat connectivity. Such isolation decreases the likelihood of successful dispersal of juvenile owls (Miller 1989), which in turn could reduce opportunities for genetic exchange between owl populations (Barrowclough and Coats 1985).

Currently there is little empirical data confirming that habitat fragmentation contributes to increased levels of predation on northern spotted owls. However, great horned owls (*Bubo virginianus*), an effective predator on spotted owls, are known to be closely associated with fragmented forest habitats (Johnson 1992). As mature forests are harvested, it is possible that great horned owls could colonize the fragmented forest and possibly increase spotted owl vulnerability to predation events.

4.1.2 Habitat Modification Related Effects of the Salt Project

During implementation of the Salt Project, proposed regeneration prescriptions would result in the complete removal of 11 acres of F habitat. Additionally, thinning prescriptions would result in 28 acres of moderate quality NR habitat being downgraded to F habitat conditions and 239 acres of F habitat being degraded, but still maintaining the functionality of foraging habitat.

In areas where habitat is removed (11 acres), the stands may remain unsuitable for approximately 80 years for foraging habitat conditions and more than 100 years for NR habitat conditions. In areas where habitat is downgraded to foraging conditions (28 acres), there would be a reduction in overall canopy closure from the existing 70 to 90 percent down to approximately 50 to 60 percent canopy closure, and a reduction in smaller diameter (i.e., less than or equal to 19 inches dbh) recruitment of snags and logs. However, the retention of large predominant (legacy) conifers, larger snags (i.e., greater than 19 inches dbh) and viable hardwoods would maintain snags and decadent conifers large enough to provide owl nest sites and contribute to vertical structure. It is estimated that the LRMP Standards and Guidelines of 1.5 snags and five tons of course woody material (i.e., logs) would be met at a 40-acre average. In areas where habitat is degraded (239 acres), habitat conditions (e.g., smaller snags, canopy closure and vertical structural complexity) may be somewhat reduced but the habitat would continue to function at the current level. Canopy closure would be maintained at the 50 to 60 percent level. Only northern spotted owl foraging habitat will be affected within the two owl activity center home ranges (1.3 mile buffer around an activity center) located within the project area; TR287 and TR295 (18 and 2 acres, respectively). Seven acres are proposed for removal in the home range of TR287. No habitat within the two northern spotted owl activity center territories (i.e., within 0.7 miles of the activity centers) will be impacted.

Proposed actions for the Salt Project will have no affect on high quality NR habitat within the action area. Therefore, the 408 acres of high quality NR habitat comprising 1.54 percent of Federal Forest Service land (26,491 acres) within the Salt Creek 5th field watershed will remain unchanged. However, proposed actions will result in downgrading 28 acres of moderate quality NR habitat to F habitat due to thinning prescriptions. Immediately following project implementation, moderate quality NR habitat would comprise 4.64 and 8.43 percent of Federal Forest Service land in the action area and watershed (respectively), which would result in a reduction of 0.16 and 0.10 percent from the current conditions of 4.80 and 8.53 percent[1]. The majority of foraging habitat (239 acres) will remain as foraging. Eleven acres will be removed and after downgrading 28 acres of moderate quality NR, those 28 acres will be classified as foraging. Therefore, foraging habitat post-treatment will comprise 15.21 and 11.7 percent of Federal Forest Service land in the action area and watershed (respectively), which would result in an addition of 0.10 and 0.06 percent from the current condition of 15.11 and 11.64 percent. However, at the watershed scale, the amount of NRF habitat as a whole will only by reduced by 0.04 percent directly after harvest due to 28 acres of moderate quality NR habitat being reduced to foraging habitat and the majority (95.6 percent) of foraging habitat maintaining its functionality as foraging habitat. Suitable northern spotted owl habitat (NRF) alone (21.67 percent post-harvest) comprises over 15 percent of the watershed as called for by the LRMP

[1] Current NR (high and moderate quality) habitat conditions within the Salt Creek 5th Field Watershed constitute 10.07 percent of Federal Forest Service land.

Standards and Guidelines. The Standards and Guidelines call for a 15 percent retention of old-growth fragments in watersheds where little remains, thus including non-northern spotted owl habitat (i.e., low-density late-successional 4P/S and 3P/S)[2]. Combined with northern spotted owl NRF, the amount of Standards and Guidelines old-growth comprises well over 50 percent of the Salt Creek 5th field watershed.

Overall short-term effects to northern spotted owl habitat would occur through reduction of overall canopy closure, simplification in vertical structure, a reduction in smaller diameter (i.e., less than 19 inches dbh) snags and logs, and a reduction in potential nesting opportunities. Proposed actions would affect a total of 278 acres of existing NRF habitat and 251 acres of connectivity habitat. Table 3 outlines effects to acres of northern spotted owl habitat within the Salt Creek 5th Field Watershed, the owl action area, and the northern spotted owl activity centers (TR287 and TR295) home range.

Table 3. Salt Project effects to acres of northern spotted owl NR and F habitat within the Salt Creek 5th Field Watershed, the project action area (owl action area) and Activity Centers TR287 and TR295.

		High Quality N/R Habitat (Old-Growth; 4G and 4N)		**Moderate Quality N/R Habitat (Dense late-successional; 3G)**		**Foraging Habitat (Moderate Density late-successional; 3N)**	
Analysis Area	**Effects to Habitat**	**Existing Available Habitat**	**Acres Affected**	**Existing Available Habitat**	**Acres Affected**	**Existing Available Habitat**	**Acres Affected**
Water-shed	Removed		0		0		11
	Downgraded		0		28		0
	Degraded		0		0		239
	TOTAL	408	0	2,260	28	3,083	250
Owl Action Area	Removed		0		0		11
	Downgraded		0		28		0
	Degraded		0		0		239
	TOTAL	94	0	813	28	2556	250
TR287 Owl Home Range	Removed		0		0		7
	Downgraded		0		0		0
	Degraded		0		0		11
	TOTAL	17	0	105	0	746	18
TR295 Owl Home Range	Removed		0		0		0
	Downgraded		0		0		0
	Degraded		0		0		2
	TOTAL	26	0	64	0	483	2

Downgrading of 28 acres of moderate quality NR habitat would temporarily decrease the functionality of the habitat as NR and therefore, only provide F habitat until a point in time that tree growth brings canopy closure above 70 percent (approximately 35 years). However, nearly all suitable NR habitat would remain intact within the watershed and all NR habitat would

[2] A discussion of "high quality nesting/roosting habitat," "moderate quality nesting/roosting habitat," "foraging habitat" and "non-NSO low-density late-successional" is provided in Attachment 1 of the Salt Project Biological Assessment (USDA Forest Service 2005).

remain intact in the northern spotted owl activity centers. The effects of the proposed project do constitute an adverse effect to the species because a primary threat to the northern spotted owl is loss of habitat (See section 2.3.1). Additionally, removal and degradation of foraging habitat is expected to occur within the home range of at least two known historic activity centers. Although no northern spotted owls have been recently detected in the project area, implementation of the Salt Project could potentially displace at least two northern spotted owl pairs[3]. However, due to the limited amount of habitat to be removed in the action area (i.e., 11 acres of NRF habitat within a total available 3,463 acres on Federal property), the Service does not expect that this adverse effect will impede the ability of the action area to provide for the intended conservation needs of the owl.

Connectivity habitat within the Salt Project action area appears to be relatively continuous across the landscape according to Forest Service reviews of aerial photographs, habitat mapping, and field visits. The Salt Project would maintain 84 percent connectivity habitat in the action area at well above the 50 percent threshold (Thomas et al. 1990) needed for dispersal in the action area. Only regeneration units (GTR, 59 acres) would reduce the existing 14,186 acres (including NRF habitat) of connectivity habitat in the action area. The size and location of the GTR units would not isolate existing NRF habitat and multiple connectors through the action area would be maintained (see map, USDA Forest Service 2007). Additionally, the proposed plantation thinning would accelerate the development of approximately 503 acres of connectivity habitat conditions in approximately 15 years. Without thinning, these plantations would likely reach 11-40 conditions but would remain so dense that owls would not be able to fly freely though them for 35+ years. Proposed thinning prescriptions in high and moderate quality NR and F habitat will ultimately produce a net increase in the mean dbh and quality of northern spotted owl habitat in the action area and therefore, the watershed over the next 35 years.

Approximately 3.9 percent (i.e., approximately 660 acres of the 16,920 acre action area) of the land-base within the action area is under private ownership (see Map 1 and 2). This private property is either residential, including the community of Trinity Pines or areas that were harvested in the 1960's. As a result, this land is dominated by very dense pine forest. While these areas meet the 11-40 condition of owl connectivity habitat, they are so dense as to prohibit the free movement of owls.

Additional potential adverse effects from competitors and predators may occur from the Salt Project as a result of proposed thinning activities and road construction. The probability of predation by great horned owls may be temporarily increased because thinning activities would provide more open stands. These open areas are more favorable to the larger, less maneuverable great horned owl.

[3] Two pairs of northern spotted owls are expected to be in the project area based on the known presence of at least two historic owl activity centers.

4.2 Disturbance

4.2.1 Scientific Basis

Removal of forested areas during thinning treatments, regeneration prescriptions, road construction, and road decommissioning would require use of heavy equipment, power tools, chainsaws, and large vehicles - all of which introduce an increased level of sound and human activity into the environment. The effect of sight- and sound-related disturbance on spotted owls is not well studied. Further, the effects of noise on birds can be difficult to establish due to difficulties associated with quantifying and qualifying characteristics of disturbance (i.e., type, frequency, proximity) and appropriate response variables (i.e., behavior, reproductive success, survival). Additional factors increase the complexity of evaluating effects of disturbance such as the individual bird's tolerance level, ambient sound levels, physical parameters of sound and how it reacts with topographic characteristics and vegetation, and differences in how species perceive noise.

In spite of these challenges, research conducted on a variety of bird species does suggest that disturbance can have a negative impact on reproductive success (Tremblay and Ellison 1979, Anderson 1989, Belanger 1989, Piatt et al. 1990, Henson and Grant 1991). Such studies have shown that disturbance can affect productivity in a number of ways including: interference of courtship (Bednarz and Hayden 1988), nest abandonment (White and Thurow 1985), egg and hatchling mortality due to exposure and predation (Drent 1972, Swensen 1979), and altered parental care (Fyfe and Olendorrf 1976, Bortolotti et al. 1984). The few studies that have examined spotted owl responses to several types of disturbance (helicopters, small chainsaw, hikers) suggest that owl behavior can be disrupted by such stimuli as demonstrated by flushing, altered prey delivery rates, and decreased prey handling behavior (Delaney et al. 1999b, Delaney and Grubb 2001, Swarthout and Steidl 2001, Swarthout and Steidl 2003). Further, spotted owls do exhibit indicators of physiological stress (increased corticosteroids) under some environmental conditions (Wasser et al. 1997). However, not surprisingly, these studies also indicate that owl sensitivity varies with stimulus distance, location (aerial or ground), type, and timing, as well as individual tolerance ((Delaney et al. 1999b, Delaney and Grubb 2001, Swarthout and Steidl 2001, Swarthout and Steidl 2003, Tempel and Guitierrez 2003).

4.2.2 Disturbance-Related Effects Resulting from the Salt Project

Although no northern spotted owls have been recently detected within the action area for the Salt Project, thorough protocol-level surveys have not been conducted throughout the area. Noise-related disturbance to any northern spotted owls present is very unlikely and thus discountable because a limited operating period (LOP) is proposed as part of the proposed action (see Section 1.1.10). The LOP would prohibit all activities that create loud noise or smoke (e.g., chainsaws, heavy equipment, etc.) within ¼ mile of spotted owl NR habitat from February 1 through July 10, unless protocol surveys indicate that nesting owls are not present. With implementation of this LOP, adverse effects to owls resulting from continuous loud noise or smoke is very unlikely and thus discountable.

4.3 Direct Injury or Mortality

4.3.1 Scientific Basis

Forest management activities can result in direct mortality of adults, eggs, or young. Such cases are rare, but direct mortality due to tree-felling has been documented (Forsman et al. 2002). The potential for northern spotted owls to be struck and killed or injured by falling trees during harvesting or exposed to high levels of smoke during prescribed burning is confined to the area relatively close to the nest tree. During timber harvest or prescribed burning, individual adult spotted owls can reasonably be expected to move from the area and avoid injury. However, nesting adult spotted owls tenaciously tending to reproductive activities such as incubation or brooding young may be reluctant to leave the area (Delaney et al. 1999a), and therefore may be vulnerable to such injury.

Young-of-the-year, whether in or out of the nest, may also be vulnerable to the effects of tree falling or smoke inhalation, or might disperse prematurely in response to the disturbance and thus be subject to predation or starvation outside of the nest grove. Potential effects to eggs range from the implications of parental abandonment (Drent 1972, Swensen 1979, White and Thurow 1985) to destruction during tree falling. These types of direct effects are only likely in nesting/roosting habitat during the breeding season when active breeding activities are underway.

4.3.2 Direct Injury or Mortality Related to the Salt Project

As stated in section 4.2.2, although no northern spotted owls have been recently detected within the action area for the Salt Project, thorough protocol-level surveys have not been conducted throughout the area. However, an LOP is included as project design criteria that prohibits all activities involving tree-felling or vegetation removal and/or modification in spotted owl NR habitat from February 1 through September 15 unless protocol surveys indicate that nesting owls are not present (see Section 1.1.10). With implementation of this LOP, the likelihood of direct injury or mortality of owls is very unlikely and thus discountable.

5 Cumulative Effects of the Salt Project

Cumulative effects are those impacts of future State and private actions that are reasonably certain to occur within the area of the action subject to consultation. Future Federal actions will be subject to the consultation requirements established in section 7 of the Act and, therefore, are not considered cumulative to the proposed action.

Approximately 3.9 percent (i.e., approximately 660 acres of the 16,920 acre action area) of the land-base within the action area is under private ownership (see map, USDA Forest Service 2007). This private property is either residential, including the community of Trinity Pines or areas that were harvested in the 1960's. As a result, this land is dominated by very dense pine forest. While these areas meet the 11-40 condition of owl connectivity habitat, they are so dense as to prohibit the free movement of owls. The California Department of Forestry and Fire

Protection (CDF) website[4] lists no private timber harvest plans in this area. No Forest Service projects are planned in the action area in the foreseeable future. (http://www.fire.ca.gov/ResourceManagement/THPStatusUpload/THPStatusTable.html)

6 Conclusion

Under Section 7(a)(2) of the Act, federal agencies must ensure that activities are not likely to jeopardize the continued existence of any listed species. Regulations implementing this section of the Act define "jeopardize the continued existence of" as: "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (FR §402.02).

After reviewing the current status of the northern spotted owl, the environmental baseline, the effects of the Proposed Action, and the cumulative effects, it is the Service's biological opinion that implementation of the Salt Project discussed herein is not likely to jeopardize the continued existence of the northern spotted owl. The Service reached this conclusion based on following factors:

1. Downgrading of 28 acres of moderate quality NR habitat will not result in a significant decrease (i.e., only 3.09 percent) in habitat availability (high and moderate quality NR) within the action area[5], nor within the Salt Creek 5th field watershed (decrease of 1.05 percent) and thus is not anticipated to impair the ability of the action area or watershed to provide for owl populations.
2. The removal of 11 acres of foraging habitat is insignificant compared to the availability within the action area (0.39 percent of available foraging habitat) and within the Salt Creek 5th field watershed (0.32 percent of available foraging habitat).
3. Thinning prescriptions would temporarily reduce, downgrade or degrade in the short-term (less than 35 years), but the quantity and relative quality would be increased in the long-term (greater than 35 years).
4. All habitat removal, downgrading and degrading will occur within the AMA, which is consistent with the Conservation Strategy established by the NWFP. No suitable habitat within Late-Successional Reserves will be affected, and thus the proposed action will not affect areas designated to provide for clusters of owls. Additionally, proposed habitat removal represents an immeasurable decrease in suitable habitat range-wide and is consistent with that expected to occur (2.5 percent or less per decade) under NWFP implementation.
5. Two potential owl pairs may be temporarily displaced, however, direct harm or disturbance to breeding activities would be avoided with a LOP. Additionally, no work will be completed within the two activity centers territories.
6. The probability of large-scale catastrophic loss of owl habitat due to fire would be reduced.

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[4] (http://www.fire.ca.gov/ResourceManagement/THPStatusUpload/THPStatusTable.html)

[5] A total of 907 acres of high and moderate quality N/R habitat exist within the Salt Project action area. High quality habitat constitutes 94 acres and moderate quality habitat constitutes 813 acres.

The Salt Project is not anticipated to compromise the conservation and recovery strategy established by the NWFP, or contribute to an appreciable reduction in the likelihood of survival and recovery of the northern spotted owl in the wild by reducing the owl numbers, reproduction, or distribution.

The proposed action will not affect any northern spotted owl critical habitat because there is none within the action area.

INCIDENTAL TAKE STATEMENT

1 Introduction

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the taking of endangered and threatened species, respectively, without special exemption. Take is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. Harm is further defined (50 CFR 17.3) by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined by the Service (50 CFR 17.3) as actions that create the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the STNF so that they become binding conditions of any grant or permit issued to the (applicant), as appropriate, in order for the exemption in Section 7(o)(2) to apply. The STNF has a continuing duty to regulate the activity covered by this incidental take statement. If the STNF (1) fails to assume and implement the terms and conditions or (2) fails to require any contractors to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the STNF must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50CFR§402.14(I)(3)].

2 Amount or Extent of Take: Northern Spotted Owl

As described in the Section 4 (Effects of the Action) of the BO, the Salt Project will downgrade 28 acres of moderate quality NR habitat and remove 11 acres of F habitat. Additionally, 239 acres of F habitat will be degraded. Because protocol-level surveys have not been conducted in the action area to determine an absence of owls, the Service anticipates that the proposed action could incidentally take northern spotted owls. Based upon the quality, quantity, and distribution of habitat within and adjacent to the project area, the Service estimates that the Salt Project area is likely to provide habitat for two pairs of northern spotted owls. Spotted owls within the project area will also experience an increase in predation risk by great horned owls following project completion due to the creation of more open stand conditions. Consequently, the Service authorizes incidental take in the form of harm or harassment of no more than two pairs of northern spotted owls associated with the downgrading of 28 acres of moderate quality NR habitat, removal of 11 acres of F habitat and the degradation of 239 acres of F habitat. For the purposes of this Incidental Take Statement, the STNF should consider take exceeded if more

northern spotted owl habitat is removed or downgraded than what is indicated above. ***No direct take of owls during the breeding season is authorized.***

Therefore, the requirements for exemption from the taking provisions of section 9 have been met. Any take of northern spotted owls resulting from incomplete compliance with measures described in the project description (Section 1.1) and management requirements is not covered by the exemption.

3 Effect of the Take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the northern spotted owl.

4 Reasonable and Prudent Measures

Pursuant to 50 CFR 402.14 (I) (ii), reasonable and prudent measures are those the Service considers necessary to minimize the impact of the incidental taking. Impacts of the proposed action largely will be minimized by compliance with the NWFP and measures incorporated into the project design, as described in Section 1.1.10. Consequently, no reasonable and prudent measures are necessary.

5 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of ESA, the Forest Service must comply with the following terms and conditions which implement the reasonable and prudent measures described above. These terms and conditions are nondiscretionary. As mentioned above, the Service considers the measures of the project as described to be sufficient to minimize take of northern spotted owls. Therefore, no terms and conditions are necessary other than those discussed under Monitoring Requirements below.

6 Monitoring Requirements

In order to monitor the impacts of incidental take, the Federal agency or any applicant **MUST** report the progress of the action and its impacts on the species to the Service as specified in the incidental take statement. The reporting requirements are established in accordance with 50 CFR 13.45 and 18.27 and specified as follows:

- Prior to January 31st of each year for the duration of project implementation, the STNF will provide annual monitoring reports of the estimated take that may have occurred in relation to the amount of take that is identified in this Incidental Take Statement. The report must specify whether pre-project surveys were conducted and the results of those surveys. The Service will subtract from the habitat baselines all acres of northern spotted owl habitat identified to be removed in this BO, unless formally adjusted by the STNF in conjunction with the Service at a later date.

7 Reporting Requirements

Any dead or injured northern spotted owls must be reported to the Service's Law Enforcement Division (916- 979-2987) or the Red Bluff Fish and Wildlife Office as soon as possible, and turned over to the Law Enforcement Division or to a game warden or biologist of the California Department of Fish and Game for care or analysis. The Service is to be notified in writing within three working days of the accidental death of, or injury to, a northern spotted owl or of the finding of any dead or injured northern spotted owls during implementation of the proposed action. Notification must include the date, time, and location of the incident or discovery of a dead or injured northern spotted owl, as well as any pertinent information on circumstances surrounding the incident or discovery. The Service contact for this written information is the Project Leader for the Red Bluff Fish and Wildlife Office at (530) 527-3043.

8 Coordination of Incidental Take with Other Laws, Regulations, and Policies

The incidental take statement provided in this opinion satisfies the requirements of the Act. The Fish and Wildlife Service will not refer the incidental take of any migratory bird or bald eagle for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§ 703-712), or the Bald and Golden Eagle Protection Act of 1940, as amended (16 U.S.C.§§ 668-668d), if such take is in compliance with the terms and conditions (including amount and/or number) specified herein.

CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a)(1) of the Act direct Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species and the ecosystems upon which they depend. Regulations in 50 CFR S.402.02 define conservation recommendations as Service suggestions regarding discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, or regarding development of information.

The Service offers to the STNF the following conservation recommendations:

1) Conduct two-year protocol surveys for owls within the project area prior to project implementation to determine whether spotted owls are present.

2) Design future forest management activities to reduce incidental take of spotted owls and impacts to other listed species and their habitat through continued interagency cooperation and planning with the Service.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects, or benefiting listed species or their habitats, the Service requests notification of the implementation of these conservation recommendations.

RE-INITIATION - CLOSING STATEMENT

This concludes formal consultation on this action. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required when discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

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APPENDIX A. Shasta-Trinity Timber and Successional Strata Definitions[6].

Table 1. Timber strata definitions used in reference to northern spotted owl habitat determinations. DBH refers to 'diameter at breast height'.

Size Class Definitions		Density class Definitions	
1	1 to 5.9 inches dbh.	S	10 to 19% canopy closure
2	6 to 12.9 inches dbh	P	20 to 39% canopy closure
3	13 to 24.9 inches dbh	N	40 to 69% canopy closure
4	25 to 40.0 inches dbh	G	> or equal to 70% canopy closure
5	> 40 inches dbh	6	two-storied stands

Table 2. Successional stage stratification based upon forest timber type.

Type	Description
Late-successional/Dense	4N, 4G, 5N, 5G: primarily commercial conifer forest. Includes 4P and 5P stands if they contain conifers as a primary component and conifers or black oak as a secondary component.
Late-successional/open	4S, 4P (except as noted above), 5S, 5P (except as noted above): primarily commercial conifer forest.
Mid-successional/dense	3N, 3G, 6 stands: primarily commercial conifer forest. Includes 3P stands if they contain conifers as a primary component and conifers or black oak as a secondary component.
Mid-successional/open	3S, 3P (excepted as noted above): primarily commercial conifer forest.
Early-successional/poles and saplings	2N, 2G and plantations older than 20 yrs: primarily commercial conifer forest. Includes 2S and 2P stands if they contain conifers as a primary and secondary component.
Early-successional/seedlings	1N, 1G and plantations younger than 20 yrs: primarily commercial conifer forest. Includes 1S and 1P stands if they contain conifers as a primary and secondary component.
Other	Includes hardwood stands, non-commerical conifer stands, early-successional S and P stands with conifers as a primary component and hardwoods as a secondary component with shrubs and grasses.

[6] Source: Forest-wide LSR Assessment, Shasta-Trinity National Forest, 1999.

Appendix H

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Glossary of Terms and Acronyms Used
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Glossary and Acronyms

Activity Fuels: Fuels generated by any number of timber harvesting methods.

ACS: Aquatic Conservation Strategy

APOO: Aquatic Period of Operation.

BA: Biological Assessment

Basal Area: The area of the cross section of a tree stem including the bark, near its base, generally at breast height, or 4 feet above the ground.

BE: Biological Evaluation

BMP: Best Management Practices

Burn Concentrations: See Jackpot burning.

Cable Logging (yarding): A harvest technology where cut logs are partially or fully suspended above the ground and transported to a landing.

Canopy: The more or less continuous cover of leaves and branches collectivity formed by the crowns of adjacent trees in a stand forest.

Canopy Bulk Density (CBD): Canopy bulk density is defined as the mass of available canopy fuel per unit canopy volume. It is a bulk property of a stand, not an individual tree, and is represented as the available canopy fuel load divided by canopy depth.

Canopy Closure: The degree to which the canopy (forest layers above ones head) blocks sunlight or obscures the sky. It can only be accurately determined from measurements taken under the canopy, as openings in the branches and crowns must be accounted for.

Canopy Base Height (CBH): Canopy base height (CBH) is the lowest height above the ground at which there is a sufficient amount of canopy fuel to propagate fire vertically into the canopy.

CWE: Cumulative Watershed Effect

DBH: Diameter at breast height

Decommissioned Road: These roads are not needed for future use and are taken off the Forest Service transportation system once the decommissioning activities have been implemented and earth berm barriers installed. However, the roads are still tracked by the Forest Service database. The goal is to remove those elements of a road that reroute hillslope drainage and present slope stability hazards by re-establishing natural drainage to the extent practicable.

DEIS: Draft environmental impact statement

Dozer Line: To rearrange, gather and push aside fuels with a bulldozer. This provides a break in the continuity of fuels, which helps prevent fire from spreading outside of the unit. Some fuels and the duff layer would remain on the forest floor in these areas.

Duff Layer: The layer of loosely compacted debris underlying the litter layer on the forest floor.

EFH: Essential Fish Habitat

End lining: Removing harvest trees by winching with a rubber tired or tracked skidder. Often used when trees must be moved a short distance over steep (over 35%) slopes or sensitive areas (Riparian Reserves).

EPA: Federal Environmental Protection Agency

EPIC: Environmental Protection Information Center

Equivalent Road Acre (ERA): A unit of measure used in cumulative watershed impact analyses, which represents the equivalent disturbance of one acre of roaded area. Disturbances primarily include soil exposure and compaction.

ERA: Equivalent roaded acre

ERA/TOC: Equivalent roaded acre/Threshold of Concern Risk Ratio

Erosion Hazard Rating: A relative rating of the potential for the loss of soil due to sheet and rill erosion from a specific site. Commonly used to address erosion response expected from a given land management activity. Ratings are the result of a cumulative analysis of soil type, topography, climate, and vegetative and protective factors.

ESA: Endangered species act

FSM: Forest Service Manual

Fuel Break: A strip of land strategically placed where hazardous fuels have been replaced with less burnable materials. Fuel breaks divide fire-prone areas into smaller parcels for easier fire control and provide access for firefighting.

Fuel: Any material capable of sustaining or carrying a forest fire, usually natural material both live and dead.

Fuel Loading: The amount of combustible material present per unit of area.

Fuel Management Zone: A specified area of land where natural fuels are either removed of manipulated in order to help slow or stop the spread of wildfire.

GIS: Geographical information system

Green Tree Retention - A stand management practice in which live trees as well as snags and large down wood are left as biological legacies within harvest units to provide habitat components over the next management cycle. The forest plan standard is to: Retain at least I5 percent of the

area associated with each cutting unit (stand). Only Matrix lands count towards the 15 percent. This limitation does not apply to intermediate harvests (thinning) in even age young stands because leaving untreated portions of young stands will retard stand development and be detrimental to the objective of creating late-successional patches.

Hand Line: To cut and remove understory vegetation to bare mineral soil. This width can be determined on site during a wildfire or during project planning, and is based on current and expected fire behavior. Trenches are constructed on the down hill side of the unit on steep slopes to prevent rolling material from crossing fire lines.

Hand pile: Piling of fuel using only human laborers.

Helicopter Logging (yarding): Use of helicopters to transport logs from where they are felled to a landing.

HUC: Hydrologic Unit Code

Intermediate Thinning: Removing immature trees from the forest sometime between reproduction and maturity to improve the quality of the remaining forest stand. An intermediate cut may or may not generate income (see thinning)

Jackpot Burning: A technique of applying fire to target fuels, which ignites only concentrations of burnable materials within the unit being treated.

Ladder Fuels: Fuels which provide vertical continuity between strata. Fire is able to carry from surface fuels by convection into the crowns with relative ease.

Landing: Any place on or adjacent to a logging site where logs are assembled for further transport.

Late-Successional Forest - Forest seral stages that include both old-growth and mature age classes that are defined below. There is a clear distinction between habitat provided by old-growth stands when compared to mature stands:

- **Old-Growth** – A forest stand usually at least 180-220 years old with moderate to high canopy closure; a multilayered, multi-species canopy dominated by large overstory trees; high incidence of large trees, some with broken tops and other indications of old and decaying wood; numerous snags; and heavy accumulations of wood, including large logs on the ground. Old-growth stands provide **high** quality nesting/roosting habitat for the northern spotted owl.
- **Mature Stand** – A mappable (>10 acres) stand of trees for which the annual rate of growth has peaked; generally greater than 80 years old but not yet old-growth. Mature stands generally contain trees with a smaller average diameter, less age class variation, and less structural complexity than old-growth stands of the same forest type**.** Dense and moderately dense mature conifer stands provide **moderate** quality nesting/roosting and foraging habitat respectively for the northern spotted owl. Mature forest with less than moderate canopy

closure does not necessarily provide habitat for species such as the northern spotted owl but often provides connectivity between owl nesting/roosting/foraging habitat.

LOP: Limited Operating Period

Lop and Scatter: Cutting, lopping and scattering residual vegetation. Usually to a height of less than 18 inches above the ground.

LWD: Large woody debris

Management Direction: A statement of goals and objectives and the associated management prescriptions and standards and guidelines for attaining them.

Mass Wasting: A general term for the dislodgement and downslope transport of soil and rock material under the direct application of gravity.

Mastication: To mechanically grind up forest fuels such as brush, branches and small diameter trees into small pieces, which are then left on site. This would occur on slopes < 35% inside plantations and fuel buffers.

Matrix: Federal lands outside of reserves, withdrawn areas, managed late-successional reserves, and adaptive management areas.

Mature: See Late-Successional Forest

Microclimate: A microclimate is a local atmospheric zone where the climate differs from the surrounding area. The term may refer to areas as small as a few square feet (for example a garden bed) or as large as many square miles (for example a valley).

MIS: Management indicator species

MMBF: Million board feet

NEPA: National Environmental Policy Act

NFMA: National Forest Management Act

NMFS: National Marine Fisheries Service

NOAA Fisheries: National Oceanic and Atmospheric Administration

Obliteration: Road removal where no presence of the road remains. All drainage structures are removed and the road is returned to the natural slope.

Old-Growth: See Late-Successional Forest

Overmature : the stage at which trees exhibit a decline in growth rate, vigor, and soundness as a result of old age.

Overstocked : a stand in which trees are so closely spaced that they are competing for required resources, resulting in less than full growth potential for individual trees and stress.

Overstory: That portion of trees in a forest, with more than one roughly horizontal layer of foliage, which forms the upper or uppermost layer.

Regeneration Harvest: Applies to the logging stands of rotation age or greater; and of stands below rotation age which cannot economically be held any longer because of poor stocking, health, thrift, quality, or composition. These cuttings are intended to replace the existing stands with a new stand. See also green tree retention.

Residual Stand: Trees that remain standing after some event such as thinning.

Riparian Reserve: A land designation where riparian-dependant resources receive primary emphasis and where special standards and regulations apply.

Sanitation/Salvage: The removal of dead or damaged trees, or trees susceptible to insect and disease attack such as intermediate and suppressed trees, essentially to prevent the spread of pest or pathogens and to promote forest health.

Sediment: Sediment is earth material. Soil and rock transported from hillslopes and other land surfaces into watercourses are the major sources of sediment in waterbodies. Sediment encompasses particles ranging in size from clay to boulders. It is the natural work of rivers to move these materials across the landscape. As earth material, sediment is obviously an important material affecting the physical, chemical and biological conditions of the environment. As such, sediment is neither “bad” nor “good”, but simply a part of the aquatic and terrestrial environments. We tend to see it as a problem when it is affecting another part of the environment that we place value on, such as fish habitat, backyards, recreational waters, or hydroelectric turbines.

Silviculture: The science of cultivating forest crops.

Silvicultural Prescription: A professional plan for controlling the establishment, composition, constitution, and growth of forests.

Silvicultural System: Establishing, growing, and tending of forests.

Site preparation : Treatment of an area prior to reforestation. Site preparation may include mechanical clearing or burning of vegetation.

Shelterwood Harvest: The cutting of most trees, leaving those shelter trees needed to produce sufficient shade to produce a new age class in a moderated microenvironment.

Skid Trail: A path created to drag logs to a landing.

Skyline: See cable logging.

Snag: A standing dead tree from which the leaves and most of the branches have fallen.

Stand: A community of trees occupying a specific area sufficiently uniform in composition, age arrangement and condition distinguishable as a silvicultural or management unit.

Stocking Level: In a forest, a subjective indication of the number of existing trees as compared to the desirable number for maximum productivity of wood.

Surface Fuels: All material lying on, or immediately above, the ground, including needles or leaves, duff grass, small dead wood, downed logs, stumps, large limbs, low brush and reproduction.

Temporary Road: Roads authorized by contract, permit, lease, and/or emergency operation. These roads are not part of the Forest Service transportation system, nor maintained for long-term use. Temporary road removal and site stabilization is required after approved use prior to the rainy season each year or when the facility is no longer needed, whichever is earliest.

Thinning: The selective removal of trees, primarily undertaken to improve the growth rate or health of remaining trees. Overcrowded trees are under competitive stress from their neighbors. Thinning may be done to increase the resistance of the stand to environmental stress such as drought, insect infestation or extreme temperature.

Tractor Pile: Piling fuels by the use of a bulldozer, most often equipped with a brush rake to minimize the amount soil incorporated into piles.

Tractor Logging (Yarding): Moving cut trees to a landing by dragging behind a ground based rubber tired or tracked skidder equipped with grapples.

Unauthorized Route: A road or trail that is not a forest road or trail or a temporary road or trail and is not included in the Forest Transportation Atlas.

Understocked: A stand of trees so widely spaced that, even when trees realize their full growth potential, crown closure (i.e., full site occupancy, as indicated by the crowns of adjacent trees forming a relatively continuous canopy) will not occur.

Understory: The lower layer of trees and shrubs under the forest canopy.

Unstable or Potentially Unstable Areas: Lands that need protection to maintain natural disturbance patterns and functions, prevent increased landslide distribution in time and space (rate and frequency), prevent increased delivery of sediment, and maintain landslide–delivered supply of large woody material over several rotations.

Watershed Condition Class (WCC): The Forest LRMP established Thresholds of Concern for 5th field watersheds and defines Watershed Condition Class (WCC). The WCC are defined as follows:

- Watershed Condition Class I: ERA less than 40 percent TOC;
- Watershed Condition Class II: ERA between 40 and 80 percent TOC; and
- Watershed Condition Class III: ERA greater than 80 percent TOC.

The following summarizes the FSM 2521.1 – Watershed Condition Classes. The ERA evaluates watershed condition and assigns one of the following three classes:

4. **Class I Condition**. Watersheds exhibit high geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. The drainage network is generally stable. Physical, chemical, and biologic conditions suggest that soil, aquatic, and riparian systems are predominantly functional in terms of supporting beneficial uses.
5. **Class II Condition**. Watersheds exhibit moderate geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. Portions of the watershed may exhibit an unstable drainage network. Physical, chemical, and biologic conditions suggest that soil, aquatic, and riparian systems are at risk in being able to support beneficial uses.
6. **Class III Condition**. Watersheds exhibit low geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. A majority of the drainage network may be unstable. Physical, chemical, and biologic conditions suggest that soil, riparian, and aquatic systems do not support beneficial uses.

Well Stocked: The stand density at which trees are spaced widely enough to prevent competition, yet closely enough to fully use site resources.

WEPP: Water Erosion Prediction Project computer model.

Whole Tree Yard: The removal of a whole tree (including its bole, limb wood, branches and bark) to the landing, except for where the top of the tree is determined to be 3-inches in diameter, which is lopped off and left on site. Whole tree yarding does not remove broken limb wood, bark sloughing, and broken boles. Once at the landing, the tree is delimbed and cut into logs at specified lengths.

Yarding: Moving logs from the stump to a central concentration area or landing.

Appendix I

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Fire Behavior Modeling Maps
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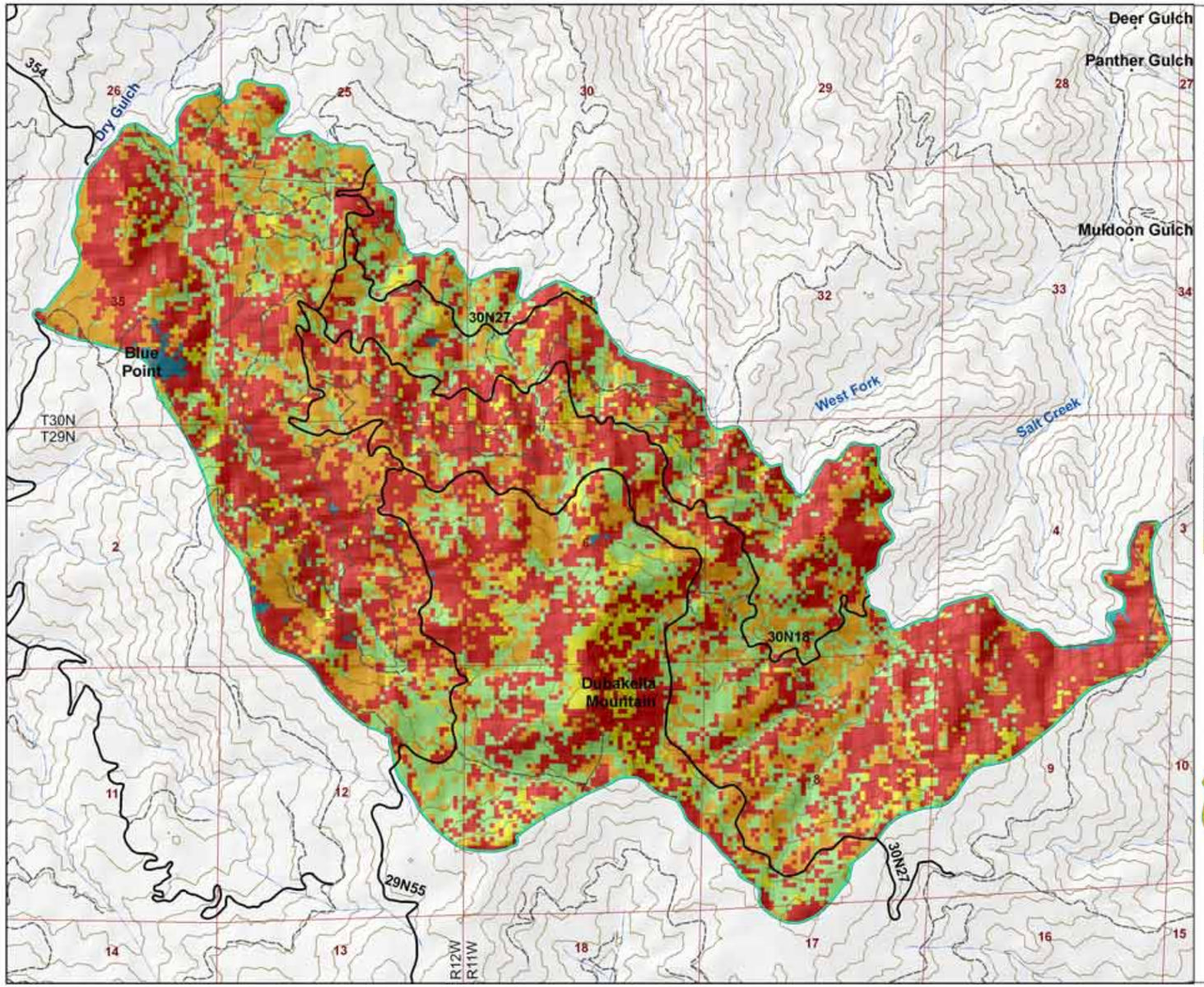

Salt Timber Harvest
and
Fuels Hazard Reduction Project

Flame Length
(Existing Condition)

Fire behavior susceptiblity predictions were arrived at by utilizing Farsite and Flammap3 programs. Topography and fuels spatial data along with local weather and wind data was used to model for surface fire, crown fire, spotting, post-frontal combustion,and fire acceleration into a two-dimensional fire growth model.

Flame Length

- Non-vegetated areas
- 0 to 4 feet flame length
- 4.001 to 8 feet flame length
- 8.001 to 11 feet flame length
- 11.001 plus feet flame length
- Project Boundary

Flame Lengths	Acres	Percent
Non-vegetated areas	25	1
0 to 4 feet flame length	1,030	24
4.001 to 8 feet flame length	290	6
8.001 to 11 feet flame length	1,075	25
11.001 plus feet flame length	1,910	44
Total	**4,330**	**100**

N
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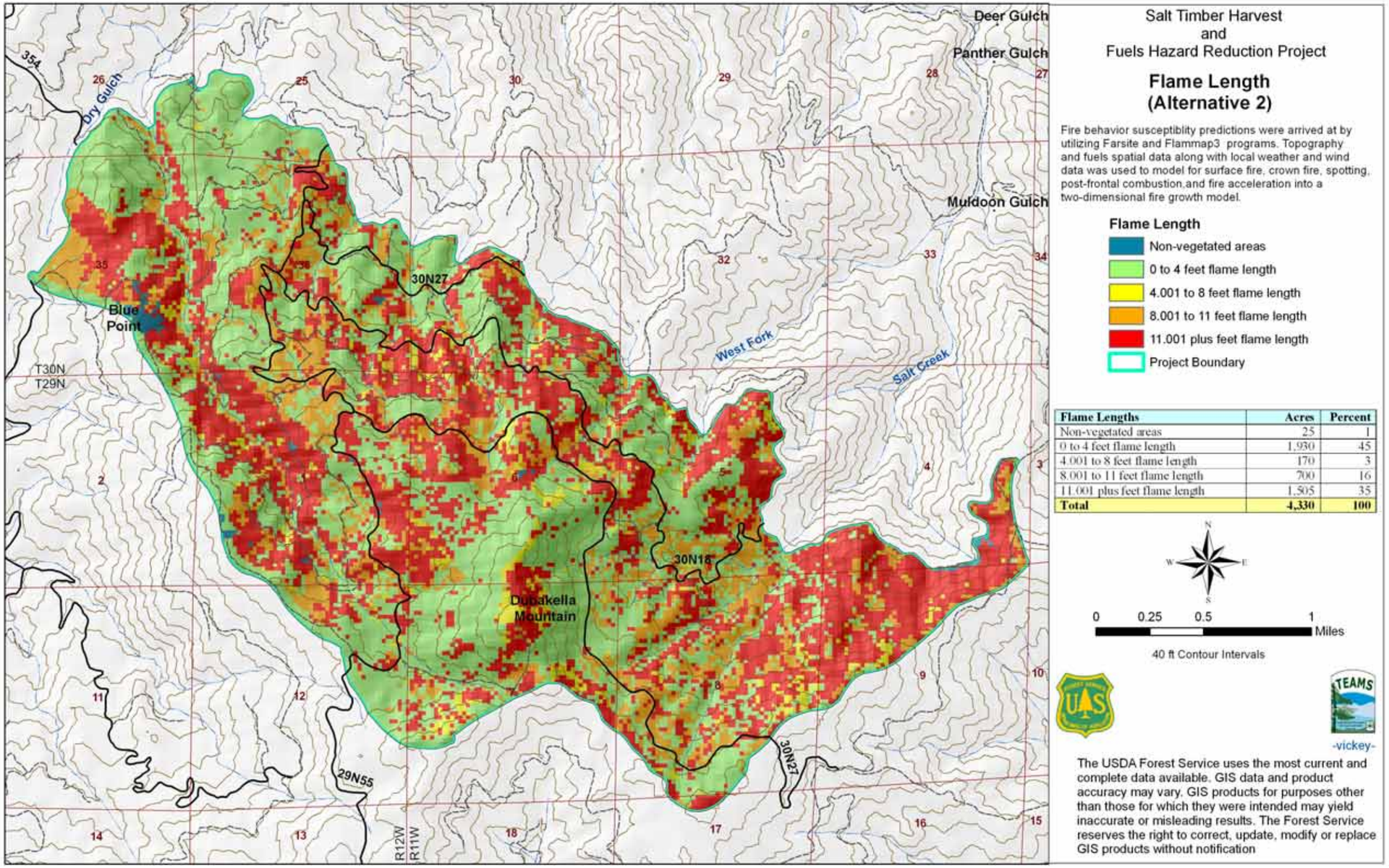
0 0.25 0.5 1 Miles

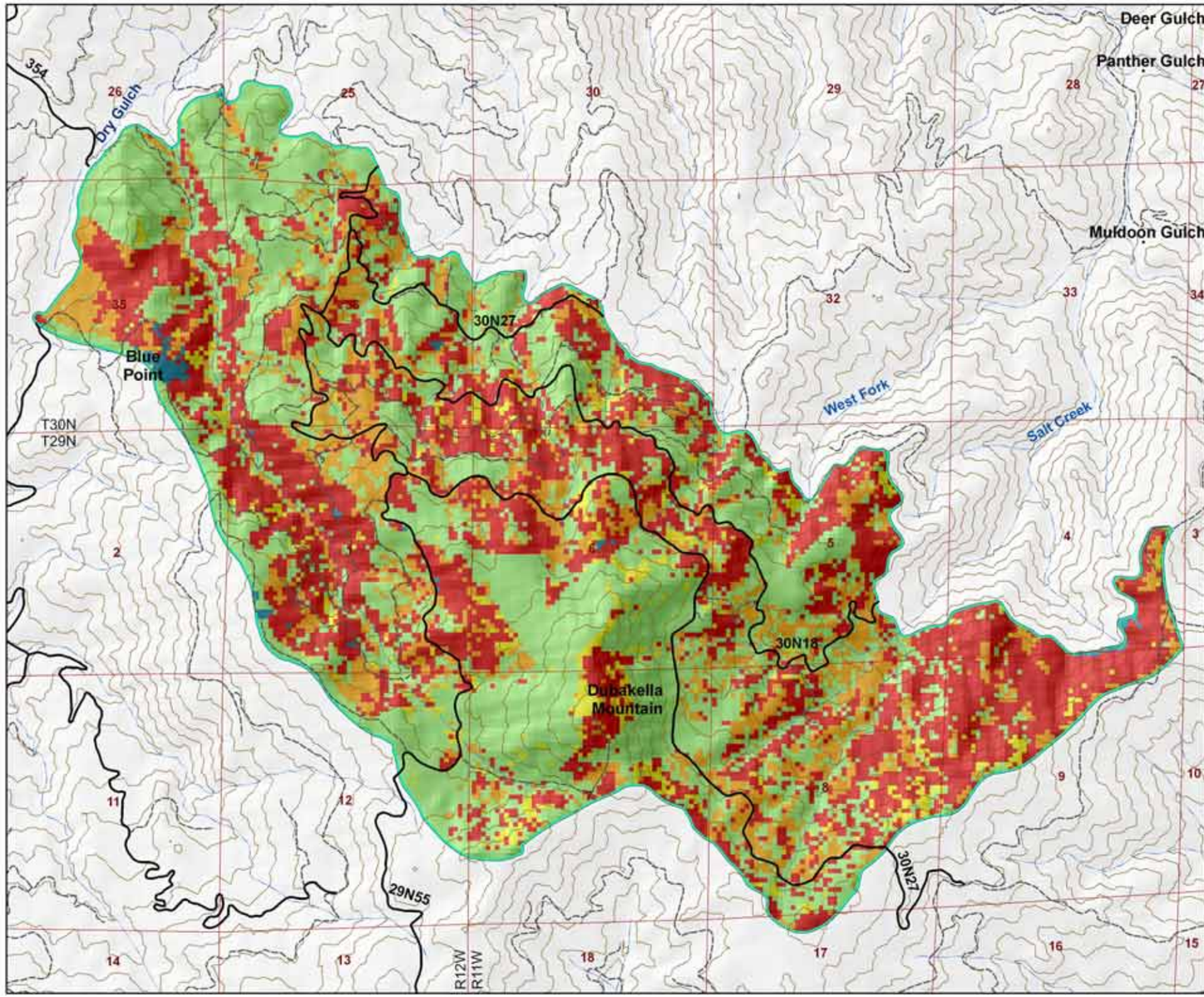
40 ft Contour Intervals

-vickey-

The USDA Forest Service uses the most current and complete data available. GIS data and product accuracy may vary. GIS products for purposes other than those for which they were intended may yield inaccurate or misleading results. The Forest Service reserves the right to correct, update, modify or replace GIS products without notification



Flame Lengths	Acres	Percent
Non-vegetated areas	25	1
0 to 4 feet flame length	1,930	45
4.001 to 8 feet flame length	170	3
8.001 to 11 feet flame length	700	16
11.001 plus feet flame length	1,505	35
Total	**4,330**	**100**



Salt Timber Harvest
and
Fuels Hazard Reduction Project

Flame Length (Alternative 3)

Fire behavior susceptiblity predictions were arrived at by utilizing Farsite and Flammap3 programs. Topography and fuels spatial data along with local weather and wind data was used to model for surface fire, crown fire, spotting, post-frontal combustion,and fire acceleration into a two-dimensional fire growth model.

Flame Length

- Non-vegetated areas
- 0 to 4 feet flame length
- 4.001 to 8 feet flame length
- 8.001 to 11 feet flame length
- 11.001 plus feet flame length
- Project Boundary

Flame Lengths	Acres	Percent
Non-vegetated areas	25	1
0 to 4 feet flame length	1,900	44
4.001 to 8 feet flame length	190	4
8.001 to 11 feet flame length	735	17
11.001 plus feet flame length	1,480	34
Total	**4,330**	**100**

N W E S

0 0.25 0.5 1 Miles

40 ft Contour Intervals

-vickey-

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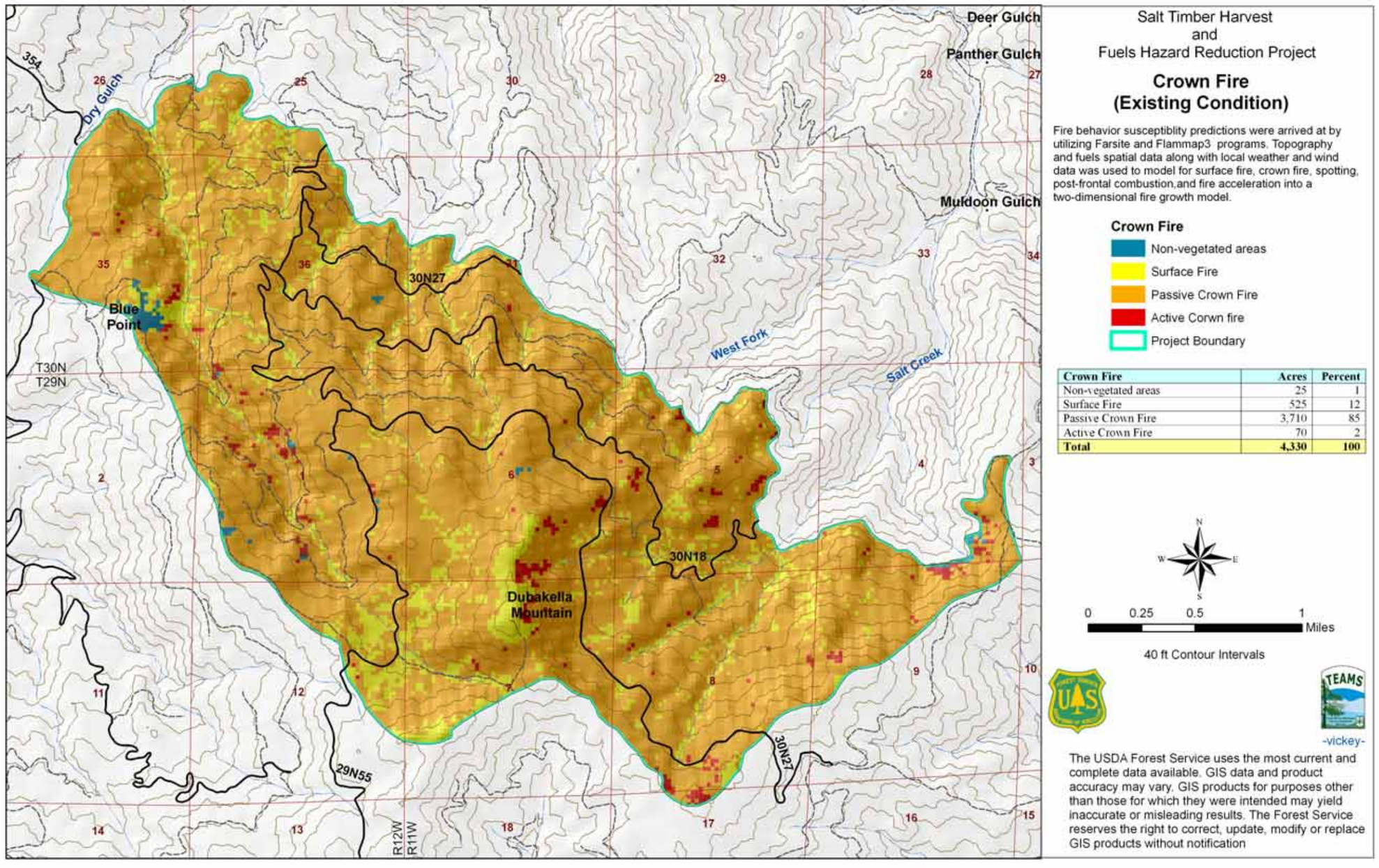
Salt Timber Harvest
and
Fuels Hazard Reduction Project
Crown Fire
(Existing Condition)
Fire behavior susceptiblity predictions were arrived at by utilizing Farsite and Flammap3 programs. Topography and fuels spatial data along with local weather and wind data was used to model for surface fire, crown fire, spotting, post-frontal combustion,and fire acceleration into a two-dimensional fire growth model.
Crown Fire
Non-vegetated areas
Surface Fire
Passive Crown Fire
Active Corwn fire
Project Boundary
Crown Fire | Acres | Percent
Non-vegetated areas | 25 | 1
Surface Fire | 525 | 12
Passive Crown Fire | 3,710 | 85
Active Crown Fire | 70 | 2
Total | 4,330 | 100
N
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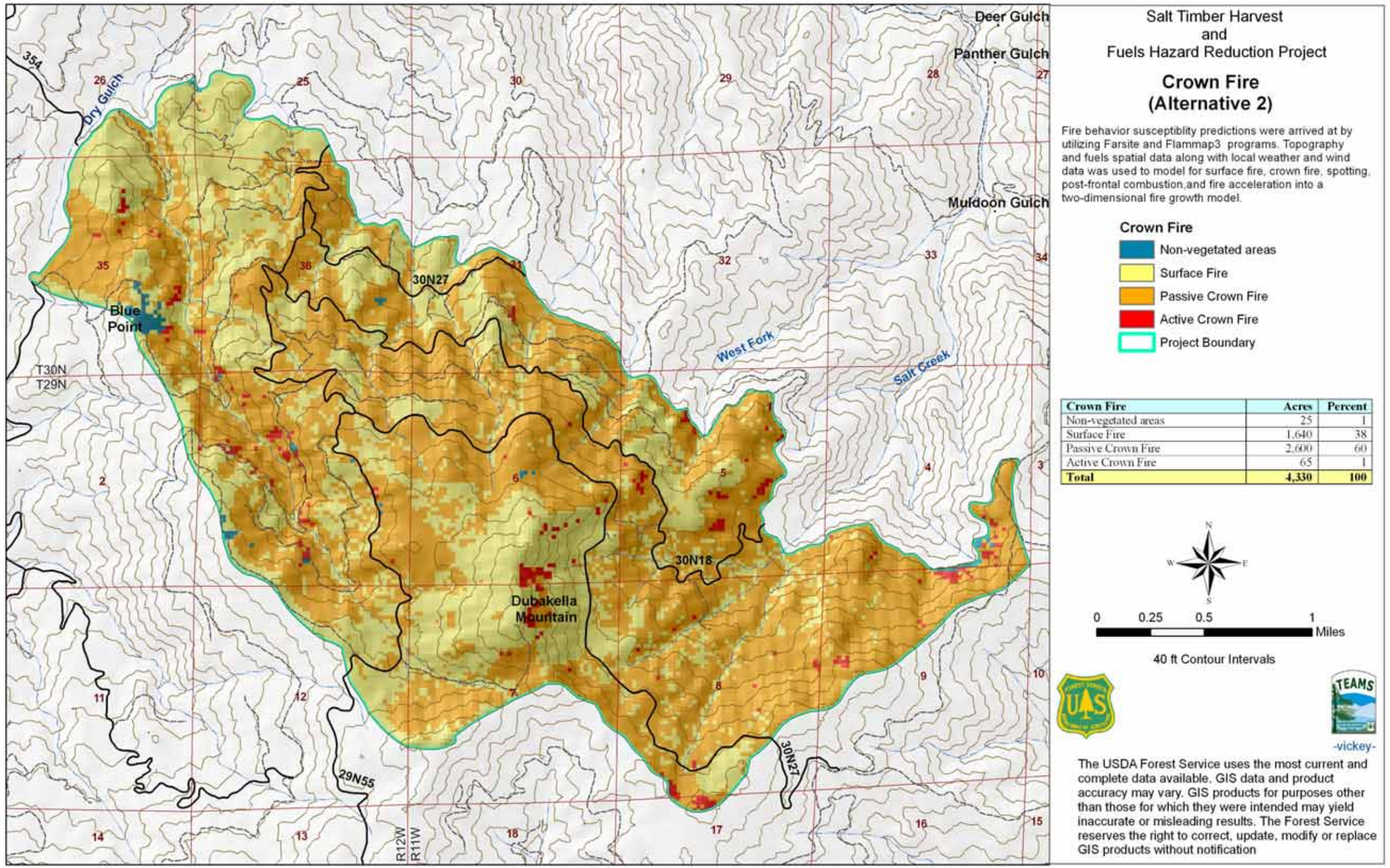
0
0.25
0.5
1
Miles
40 ft Contour Intervals
-vickey-
The USDA Forest Service uses the most current and complete data available. GIS data and product accuracy may vary. GIS products for purposes other than those for which they were intended may yield inaccurate or misleading results. The Forest Service reserves the right to correct, update, modify or replace GIS products without notification
Deer Gulch
Panther Gulch
Muldoon Gulch
Dry Gulch
Blue Point
Dubakella Mountain
West Fork
Salt Creek
30N27
30N18
29N55
T30N
T29N
R12W
R11W


Salt Timber Harvest
and
Fuels Hazard Reduction Project
Crown Fire
(Alternative 2)
Fire behavior susceptiblity predictions were arrived at by utilizing Farsite and Flammap3 programs. Topography and fuels spatial data along with local weather and wind data was used to model for surface fire, crown fire, spotting, post-frontal combustion,and fire acceleration into a two-dimensional fire growth model.
Crown Fire
Non-vegetated areas
Surface Fire
Passive Crown Fire
Active Crown Fire
Project Boundary
Crown Fire | Acres | Percent
Non-vegetated areas | 25 | 1
Surface Fire | 1,640 | 38
Passive Crown Fire | 2,600 | 60
Active Crown Fire | 65 | 1
Total | 4,330 | 100
N
W
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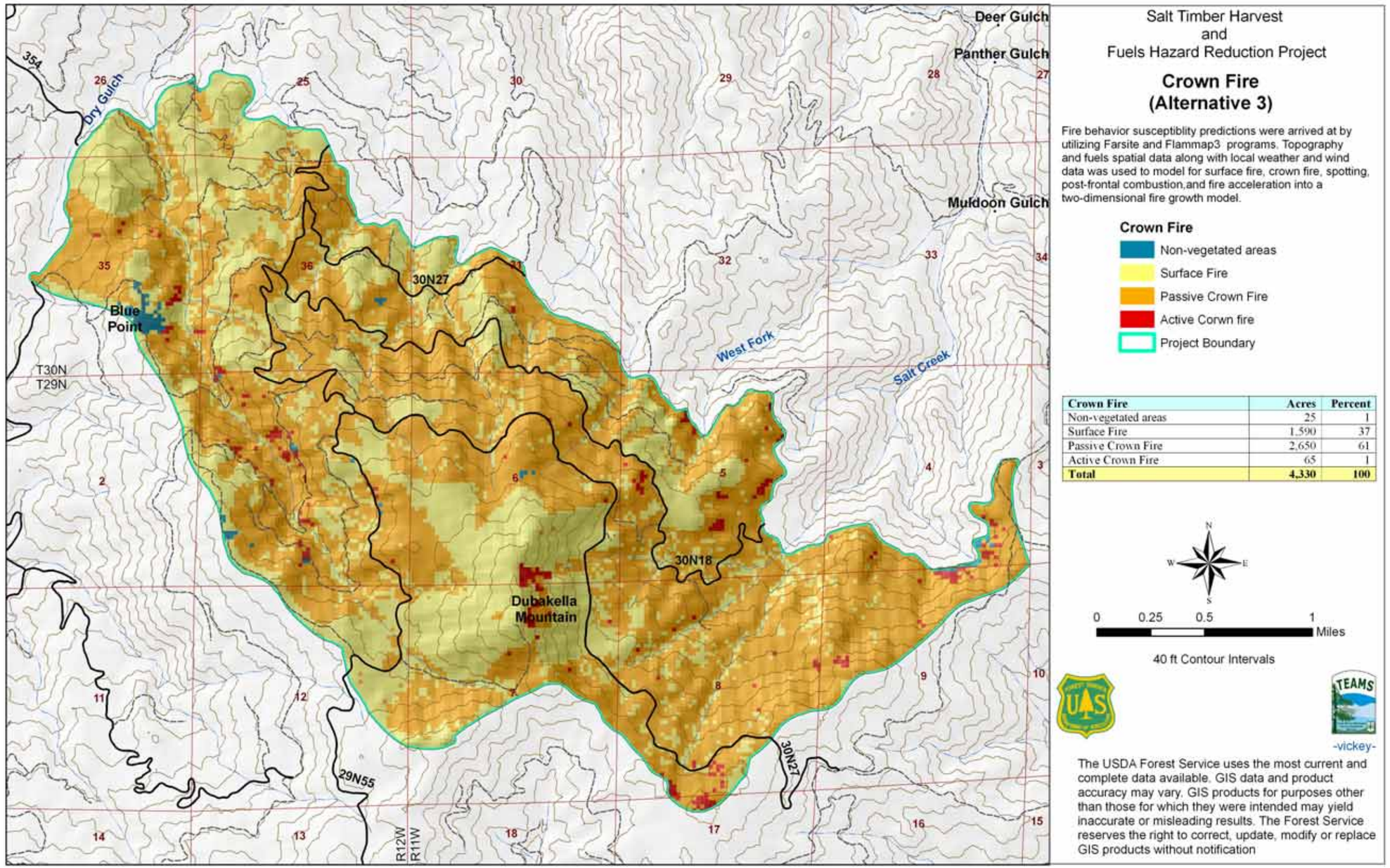
S
0
0.25
0.5
1
Miles
40 ft Contour Intervals
-vickey-
The USDA Forest Service uses the most current and complete data available. GIS data and product accuracy may vary. GIS products for purposes other than those for which they were intended may yield inaccurate or misleading results. The Forest Service reserves the right to correct, update, modify or replace GIS products without notification
Deer Gulch
Panther Gulch
Muldoon Gulch
Dry Gulch
West Fork
Salt Creek
Blue Point
Dubakella Mountain
30N27
30N18
29N55
T30N
T29N
R12W
R11W
354



Crown Fire	Acres	Percent
Non-vegetated areas	25	1
Surface Fire	1,590	37
Passive Crown Fire	2,650	61
Active Crown Fire	65	1
Total	**4,330**	**100**

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