ANAKTUVUK THIN PROJECT ENVIRONMENTAL ASSESSMENT

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United States Department of the Interior
Bureau of Land Management
Medford District
Glendale Resource Area

Lead Agency: Bureau of Land Management

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Abstract:

The Anaktuvuk Thin Project Environmental Assessment (EA) analyzes the predicted environmental effects of forest management near Anaktuvuk Saddle, located approximately 18 miles west of the town of Glendale, Oregon. This EA recognizes the need to manage O&C lands for permanent forest production. The Glendale Resource Area proposes to commercially thin approximately 145 acres of Douglas-fir plantations 39 to 48 years of age. Harvesting would include ground based and skyline cable yarding methods within matrix and riparian reserve areas. Associated harvest activities include the re-construction of four existing route segments totaling nine tenths of a mile; the construction of two temporary routes totaling two tenths of a mile; and the construction of four temporary stream crossings. Approximately 1.5 acres of existing temporary routes and up to 13 acres of existing skid trials would be decommissioned. Road maintenance is proposed on two miles. Created slash from harvesting would be removed for biomass utilization.

Other forest management activities include: manually brushing competing vegetation on 48 acres, pre-commercial thinning 37 acres, removing biomass, and pruning on 145 acres of matrix lands. Harvesting and other forest management treatments would total approximately 230 acres.

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FINDING OF NO SIGNIFICANT IMPACT

The planning, design, and analysis for the Anaktuvuk Thin Project was initiated under the 1995 *Medford District Record of Decision and Resource Management Plan* (1995 ROD/RMP) and completed after the 2008 Medford District *Record of Decision and Resource Management Plan* (2008 ROD/RMP) became effective December 30, 2008. The 2008 Medford District ROD selected the Proposed Resource Management Plan set forth in the October 2008 Proposed Resource Management Plan and Final Environmental Impact Statement for the Western Oregon Bureau of Land Management (BLM) as the Approved Resource Management Plan for BLM-administered lands under the jurisdiction of the Medford District.

The 2008 ROD allowed for transition projects, such as Anaktuvuk Thin, to be implemented consistent with the management direction of either the 1995 RMP or the 2008 RMP, at the discretion of the decision maker (2008 Medford ROD/RMP, pp. 5-6).

The Anaktuvuk Thin Project meets the following requirements designated in the 2008 ROD for such transition projects:

1. A decision was not signed prior to the effective date of the 2008 ROD.
2. Preparation of the National Environmental Policy Act documentation began prior to the effective date of the 2008 ROD. The Scoping Report for the Anaktuvuk Thin Project was made available to the public in April 2007.
3. A decision on the project will be signed within two years of the effective date of the 2008 ROD.
4. Regeneration harvest would not occur in a late-successional management area or any harvest in deferred timber management area.
5. There would be no destruction or adverse modification of critical habitat designated for species listed as endangered or threatened under the Endangered Species Act.

The effects analysis will incorporate 1995 RMP language such as “matrix” and “riparian reserve” land allocations rather than interchange new 2008 RMP terms such as “Timber Management Areas” and “Riparian Management Areas.” This transition from the old resource management plan to the new resource management plan avoids disruption of the management of BLM-administered lands and allows the BLM to utilize work already begun on the planning and analysis of the Anaktuvuk Thin Project.

The Anaktuvuk Thin Project EA (OR-118-06-010) analyzes for effects of project elements that incorporates the management direction found in the 1995 RMP. Based upon review of the EA and supporting project record, I conclude that Alternative 2 (Proposed Action) and Alternative 3 would result in less change in the affected environment than if the projects were implemented consistent with management direction in the 2008 RMP. Therefore the projects would result in no significant effects beyond those disclosed in the 2008 FEIS.

Alternatives 2 or 3 are not a major federal action and would not significantly affect the quality of the human environment, individually or cumulatively with other actions in the general area. No environmental effects meet the definition of significance in context or intensity as defined in 40 CFR § 1508.27. Therefore, an environmental impact statement is not needed. This finding is based on the following discussion:

Context. Alternatives 2 and 3 are site-specific actions directly involving approximately 230 acres of BLM (Bureau of Land Management) administered National System of Public Lands that by itself does not have international, national, region-wide, or state-wide importance. The Action Alternatives are located within the matrix and riparian reserve land use allocations and within the 6th field Hydrologic Unit Condition (HUC 6) boundaries of the West Fork Cow Creek-Golden Mountain Creek and Rogue River/Horseshoe Bend-Mule Creek sub-watersheds.

The discussion of the significance criteria that follows applies to the intended actions and is within the context of local importance. Chapter 3 of the EA details the effects of the alternatives. None of the effects identified, including direct, indirect and cumulative effects, are considered to be significant and do not exceed those effects described in the 1994 *Medford District Proposed Resource Management Plan/Environmental Impact Statement (1994 PRMP/EIS) or the* 2008 *Final Environmental Impact Statement for the Revision of the Resource Management Plans of the Western Oregon Bureau of Land Management* (2008 FEIS).

Intensity. The following discussion is organized around the Ten Significance Criteria described in 40 CFR 1508.27. The impacts of Alternative 2 and Alternative 3 are compared in Table 2-2 (Summary of Consequences) of the Anaktuvuk Thin EA.

1. Impacts may be both beneficial and adverse. The predicted environmental effects of the Action Alternatives most noteworthy include the following.

a) Social and economic benefits by providing a sustainable supply of timber and other forest commodities to provide jobs and contribute to community stability.

b) Under Alternative 2, fire hazard would continue to maintain (unchanged) or move slightly towards the historical reference fire regime on BLM-administered lands. Potential risk of losing key ecosystem components would decrease for each treatment area by the reduction in fuel loading, canopy closure, fuels arrangement, and creating strategically defensible fuel breaks for suppression of wildfire. Fire suppression resources would have a higher percentage to suppress fires by direct attack methods and keeping them to Size Class A (less than 1 acre) or B (1 to 9 acres). Under Alternative 3, 105 acres of commercial thinning would be lop and scatter and 40 acres along the main travel corridors would be slashed, handpile and handpile burned. The short term cumulative effect would be an increase in fire hazard due to the presence of slash left on 105 acres of commercial thinning units and 37 acres of pre-commercial thin unit. Long term effects would be mitigated through decomposition of slash and underburning.

c) Under Alternative 2, total compaction within the Planning Area would increase from 317 acres to 350 acres, or 4.5%. Compacted acres within the West Fork Cow Creek-Gold Mountain Creek HUC 6 sub-watershed would increase negligibly from an estimated 640 acres or 3.9% to 654 acres or 4.0%, not including reductions in compaction from sub-soiling. Within the Mule Creek HUC 6 sub-watershed compacted acres would increase from an estimated 445 acres or 2.3% to 464.5 acres or 2.4%. However, severe compaction that is a result of past management activities that left skidtrails and roads severely compacted would be reduced in a majority of units. The decommissioning of 1.5 acres of existing temporary routes, and up to 13 acres of existing skid trials would reduce soil recovery time on up to 14.5 acres that are currently severely compacted within this Planning Area by up to 50 years.

Under Alternative 3, total compaction within the Planning Area would increase from 317 acres to 346 acres, or 4.5%. Compacted acres within the West Fork Cow Creek-Gold Mountain Creek HUC 6 sub-watershed would increase negligibly from an estimated 640 acres or 3.9% to 650 acres or 4.0%, not including reductions in compaction from sub-soiling. Within the Mule Creek HUC 6 sub-watershed compacted acres would increase from an estimated 445 acres or 2.3% to 460 acres or 2.4%.

Under Alternatives 2 and 3 the combined management actions in these sub-watersheds that would result in soil compaction, disturbance, topsoil loss, or erosion would not exceed a reduction in productivity of more than 5%, and would be designed to maintain or improve soil productivity within the Planning Area as directed in the 1995 RMP.

d) The new temporary route construction on BLM land (1.1 miles), thinning activity, road maintenance and hauling activity, the construction of four temporary stream crossings and fuel treatments would have no effect on Essential Fish Habitat (EFH). EFH in Mule and Walker Creek is approximately 0.39 mile (2,059 feet) and 1.92 miles (10,140 feet) respectively from the proposed project. The proposed new temporary routes and four temporary stream crossings are located on ridgetop, with few existing stream crossings. Sediment would not be transported to coho critical habitat (CCH) because of dry season haul, the ridgeline location, the low number of stream crossings, the location of the road outside of riparian reserves, the proximity of the road to fish habitat and the design features to reduce the transmission of fine sediment.

Sediment resulting from the installation of the road culverts, use, and decommissioning of the road, would not be of a magnitude that would result in a visible increase in stream turbidity, or a measurable increase in the overall stream sediment deposition for more than 25 feet downstream within any of the stream channels.

e) See effects to ESA threatened and endangered species in criteria # 9 below.

None of the environmental effects disclosed above and discussed in detail in Chapter 3 of the EA are considered significant.

2. The degree to which the selected alternative will affect public health or safety. Public health and safety would not be affected. The Action Alternatives are comparable to other timber harvest projects which have occurred within the Glendale Resource Area with no unusual health or safety concerns. Public scoping included mailing the proposed Anaktuvuk Thin Scoping Report to individuals and organizations expressing interest in Glendale Resource Area projects. Public comment was available from April 27, 2007 to May 31, 2007. The BLM received three public response letters that are fully responded to (see Appendix 3). Comments were considered in the development of the alternatives (Appendix 1). The Glendale Resource Area also accepts public comment of proposed forest management activities through the quarterly BLM Medford Messenger publication. A brief description of proposed projects, such as Anaktuvuk Thin, a legal location and general vicinity map were provided along with a comment sheet for public responses. The Anaktuvuk Thin Project was included in these quarterly publications beginning in fall, 2005.

Prescribed fire would be consistent with the Oregon Department of Forestry's Smoke Management Plan and the Department of Environmental Quality's Air Quality and Visibility Protection Program. The Planning Area is not located within a Class I designated airshed or non-attainment area. The impact of smoke on air quality is expected to be localized and of short duration. Particulate matter would not be of a magnitude to harm human health, affect the environment, or result in property damage. The general policy for prescribed burning on the Medford District is to notify residents prior to seasonal burning through news releases. There are no nearby residents and the public has not contacted the Glendale Resource Area regarding burning associated with the Anaktuvuk Thin Project. Dust created from vehicle traffic on gravel or natural-surfaced roads, road construction, and logging operations would be localized and of short duration. As such, the Action Alternatives are consistent with the provisions of the Federal Clean Air Act.

3. Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farm lands, wetlands, wild and scenic rivers, or ecologically critical areas. There are no prime farm lands, wetlands, wild and scenic rivers or wildernesses located within the Planning Area. See Criteria #8 on cultural resources.

4. The degree to which the effects on the quality of the human environment are likely to be highly controversial. The effects of the Action Alternatives on the quality of the human environment are adequately understood by the interdisciplinary team to provide analysis for the decision. The three public comment letters were analyzed by the Anaktuvuk Thin interdisciplinary team. While comments, such as other scientific research, were mentioned by the public, the actions of the Anaktuvuk Thin alternatives are within those identified in the 1995 RMP and the predicted effects are contained in Chapter 3 of the EA. BLM fully responded to these comments in Appendix 3 and none of the comments were considered controversial in respect to their context and intensity in determining significance.

5. The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks. The Action Alternatives are not unique or unusual. The BLM has experience implementing similar actions in similar areas and have found effects to be reasonably predictable. The environmental effects to the human environment are fully analyzed in Chapter 3 of the EA. There are no predicted effects on the human environment which are considered to be highly uncertain or involve unique or unknown risks. Public scoping included mailing the proposed Anaktuvuk Thin Scoping Report to individuals and organizations expressing interest in Glendale Resource Area projects. Public comment was available from April 27, 2007 to May 31, 2007. The BLM received three public response letters that are fully responded to (see Appendix 3). Comments were considered in the development of the alternatives (Appendix 1). The Glendale Resource Area also accepts public comment of proposed forest management activities through the quarterly BLM Medford Messenger publication. A brief description of proposed projects, such as Anaktuvuk Thin, a legal location and general vicinity map were provided along with a comment sheet for public responses. The Anaktuvuk Thin Project was included in these quarterly publications beginning in fall, 2005. No unique or unknown risks were identified in public comments.

6. The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration. Alternatives 2 or 3 do not set a precedent for future actions that might have significant effects nor does it represent a decision in principle about future consideration. These Action Alternatives would occur within the matrix and riparian reserve land allocations. Chapter 1 of the Anaktuvuk Thin EA identifies how Alternatives 2 and 3 would be consistent with the Purpose and Need and compliance with higher level EIS documents. Chapter 3 evaluates the effects of the alternatives and the findings are that all projects proposed would be within the effects anticipated under the 1995 Medford RMP. Any future projects, not identified in the Anaktuvuk Thin EA would be evaluated through the NEPA (National Environmental Policy Act) process and would stand on their own as to environmental effects.

7. Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. The interdisciplinary team evaluated Alternatives 2 and 3 in context of past, present and reasonably foreseeable actions. Significant cumulative effects outside those already disclosed in the 1994 *Medford District Proposed Resource Management Plan/Environmental Impact Statement (1994 PRMP/EIS)* or the 2008 *Final Environmental Impact Statement for the Revision of the Resource Management Plans of the Western Oregon Bureau of Land Management* (2008 FEIS) are not predicted. A complete disclosure of the effects of the Action Alternatives is contained in Chapter 3 of the EA.

8. The degree to which the action may adversely affect districts, sites, highways, structures, or other objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources. The Action Alternatives would not adversely affect districts, sites, highways, structures, or other objects listed in or eligible for listing in the National

Register of Historic Places, nor would cause loss or destruction of significant scientific, cultural, or historical resources. Cultural surveys were completed for the Anaktuvuk Thin Planning Area. The one recorded known site would not be affected by any proposed management activity under Action Alternatives 2 or 3. As such, cultural resources would not be affected. If cultural resources are located during the implementation of an action, the project would be redesigned to protect the values present.

9. The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973. The new temporary road construction on BLM land (1.1 miles), thinning activity, road maintenance and hauling activity, and fuel treatments would have no effect on Southern Oregon Northern California (SONC) and Oregon coast (OC) coho salmon (ESA-Threatened) or coho critical habitat (CCH). The closest coho presence and CCH in Walker Creek and Mule Creek is approximately 1.92 miles (10,140feet) and 0.39 mile (2,059 feet) respectively from the proposed project. Sediment would not be transported to CCH because of the dry season haul, ridgeline location, EPZs, the location of the road outside of riparian reserves (four stream crossings), the proximity of the road to fish habitat and the design features to reduce the transmission of fine sediment. Sediment resulting from the installation of the road culverts, use, and decommissioning of the road, would not be of a magnitude that would result in a visible increase in stream turbidity, or a measurable increase in the overall stream sediment deposition for more than 25 feet downstream within any of the stream channels.

There are no treatment units that contain spotted owl nesting, roosting, foraging (NRF) habitat and therefore there is no effect to NRF habitat. Surveys have shown that the closest owl nest sites are well beyond potential disturbance distances and therefore no effect from loud noise to known individual owls. Units 9-1, 9-2, 0-3, 16-1, 17-1 and 21-6 are dispersal-only habitat for the species.

No units, landing or proposed road construction areas contain nesting habitat for the marbled murrelet. The Medford BLM BA states that there would be a daily operating restriction on the proposed actions within 360 feet of any potential habitat. There would not likely to be a negative effect of disturbance by noise to marbled murrelets within 360 feet of the stands to the south and west of Unit 17-1, and the north of Units 21-7 and 21-8. Utilizing mandatory Project Design Criterion provided in Appendix C of the Medford BLM 2008 Biological Opinion (DA 08 BAFH) would avoid negative effects and would "may affect and not likely adversely affect" spotted owls or marbled murrelets. However, daily/seasonal restrictions for the marbled murrelet would be implemented, if required, in concurrence with the U.S. Fish and Wildlife Service.

10. Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment. Alternatives 2 or 3 do not violate any known federal, state, or local law or requirement imposed for the protection of the environment. Furthermore, the Action Alternatives are consistent with applicable land management plans, policies, and programs (see section 1.5 of the EA).

Chapter 1.0 Purpose and Need

1.1 Introduction

This Environmental Assessment (EA) will analyze the predicted impacts of proposed forest management activities on the human environment in the Anaktuvuk Thin Planning Area (PA). The EA will provide the decision maker, the Glendale Field Manager, with current information to aid in the decision making process.

Chapter 1 discloses to the reader:

- what the BLM proposes to do (Proposed Action),
- the location and description of the Planning Area,
- why the BLM is proposing these forest management activities (Purpose and Need),
- what factors the decision maker will use for choosing the alternative (Chapter 2) that will best meet the purpose and need for this proposal,
- how the public has been involved in this project,
- the method for developing alternatives,
- what the decision maker will decide upon.

The analysis utilizes field data, ground verification by resource specialists and Geographical Information System (GIS) technology to estimate acres, road miles and produce reference maps. Estimates are intended to aid the reader in understanding the proposed actions. The reader should be aware that electronic technology can produce information that appears precise but is still dependent on further field work. During implementation, unit boundaries are posted and surveyed and unforeseen features, such as water sources, are appropriately buffered. It has been the experience for past Glendale Resource Area environmental assessments that estimates of treatment acres in the EA have been generally more than the actual acres treated on the ground.

Transition from the 1995 Plan to the 2008 Plan

The planning, design, and analysis for the Anaktuvuk Thin Project was initiated under the 1995 *Medford District Record of Decision and Resource Management Plan* (1995 ROD/RMP) and completed after the 2008 Medford District *Record of Decision and Resource Management Plan* (2008 ROD/RMP) became effective December 30, 2008. The 2008 Medford District ROD selected the Proposed Resource Management Plan set forth in the October 2008 Proposed Resource Management Plan and Final Environmental Impact Statement for the Western Oregon Bureau of Land Management (BLM) as the Approved Resource Management Plan for BLM-administered lands under the jurisdiction of the Medford District.

Revision of a resource management plan necessarily involves a transition from the application of the old resource management plan to the application of the new resource management plan. A transition from the old resource management plan to the new resource management plan avoids disruption of the management of BLM-administered

lands and allows the BLM to utilize work already begun on the planning and analysis of projects.

The 2008 ROD allowed for transition projects, such as Anaktuvuk Thin, to be implemented consistent with the management direction of either the 1995 RMP or the 2008 RMP, at the discretion of the decision maker (2008 Medford ROD/RMP, pp. 5-6).

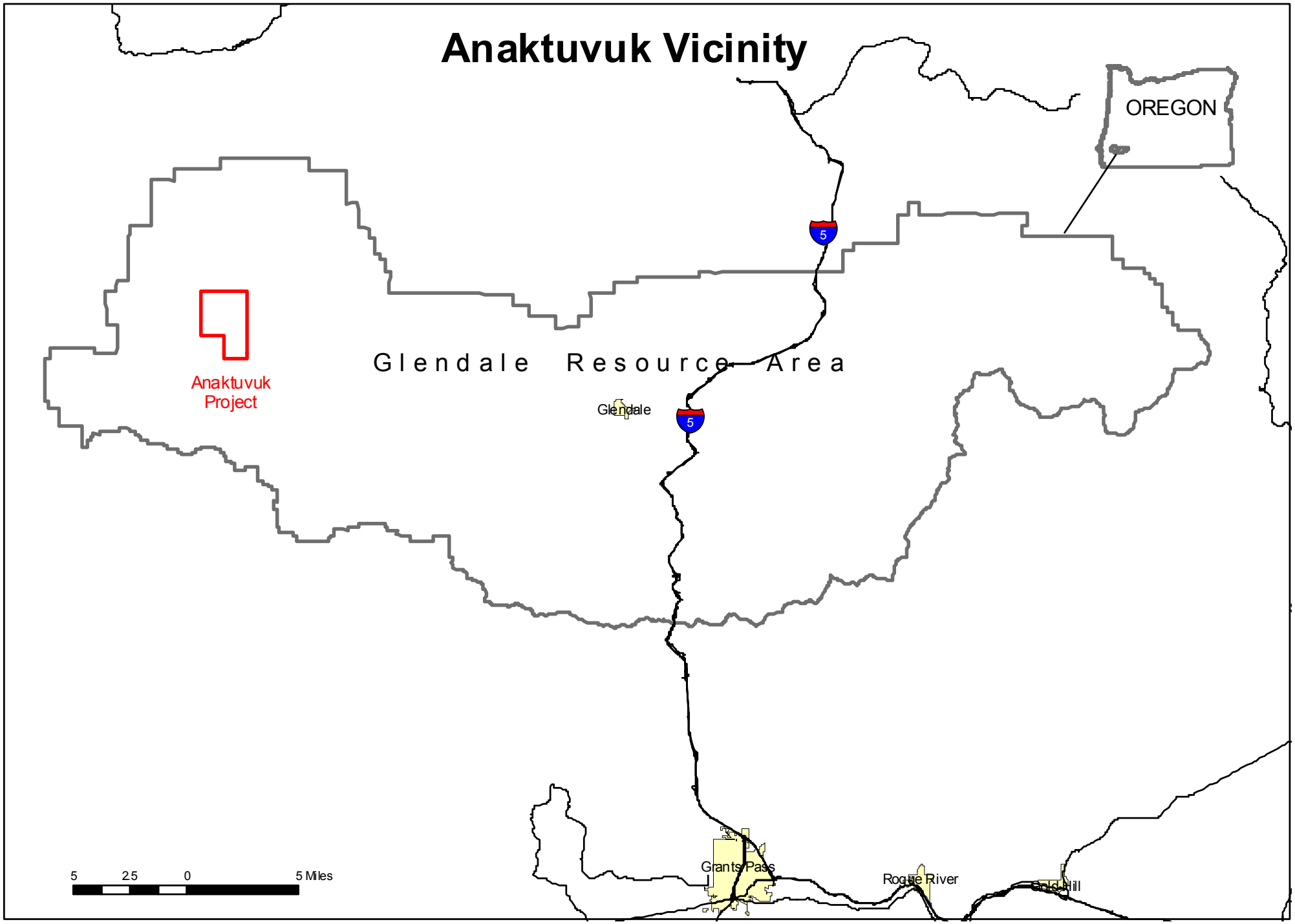
The Anaktuvuk Thin Project meets the following requirements designated in the 2008 ROD for such transition projects:

1. A decision was not signed prior to the effective date of the 2008 ROD.
2. Preparation of the National Environmental Policy Act documentation began prior to the effective date of the 2008 ROD. The Scoping Report for the Anaktuvuk Thin Project was made available to the public in April 2007.
3. A decision on the project will be signed within two years of the effective date of the 2008 ROD.
4. Regeneration harvest would not occur in a late-successional management area or any harvest in deferred timber management area.
5. There would be no destruction or adverse modification of critical habitat designated for species listed as endangered or threatened under the Endangered Species Act.

The Anaktuvuk Thin Project incorporates the management direction found in the 1995 Medford District RMP. Much of the analysis of this EA was completed or in process at the time the 2008 ROD/RMP was signed. Therefore, the effects analysis below will incorporate 1995 RMP language such as "matrix" and "riparian reserve" land allocations rather than interchange new 2008 RMP terms such as "Timber Management Areas" and "Riparian Management Areas." This allows previous specialist reports and analysis to be used rather than modifying their work to in order to use new terminology and discuss compliance with the 2008 RMP. These previous specialist reports remain relevant because, as explained in the 2008 ROD, projects consistent with the 1995 RMP in almost all cases will "result in less change to the current condition of the affected environment than if the . . .projects were implemented consistent with the management direction" in the 2008 RMP (2008 Medford ROD/RMP, p. 6). See Plan Conformance (Section 1.5) for further clarification.

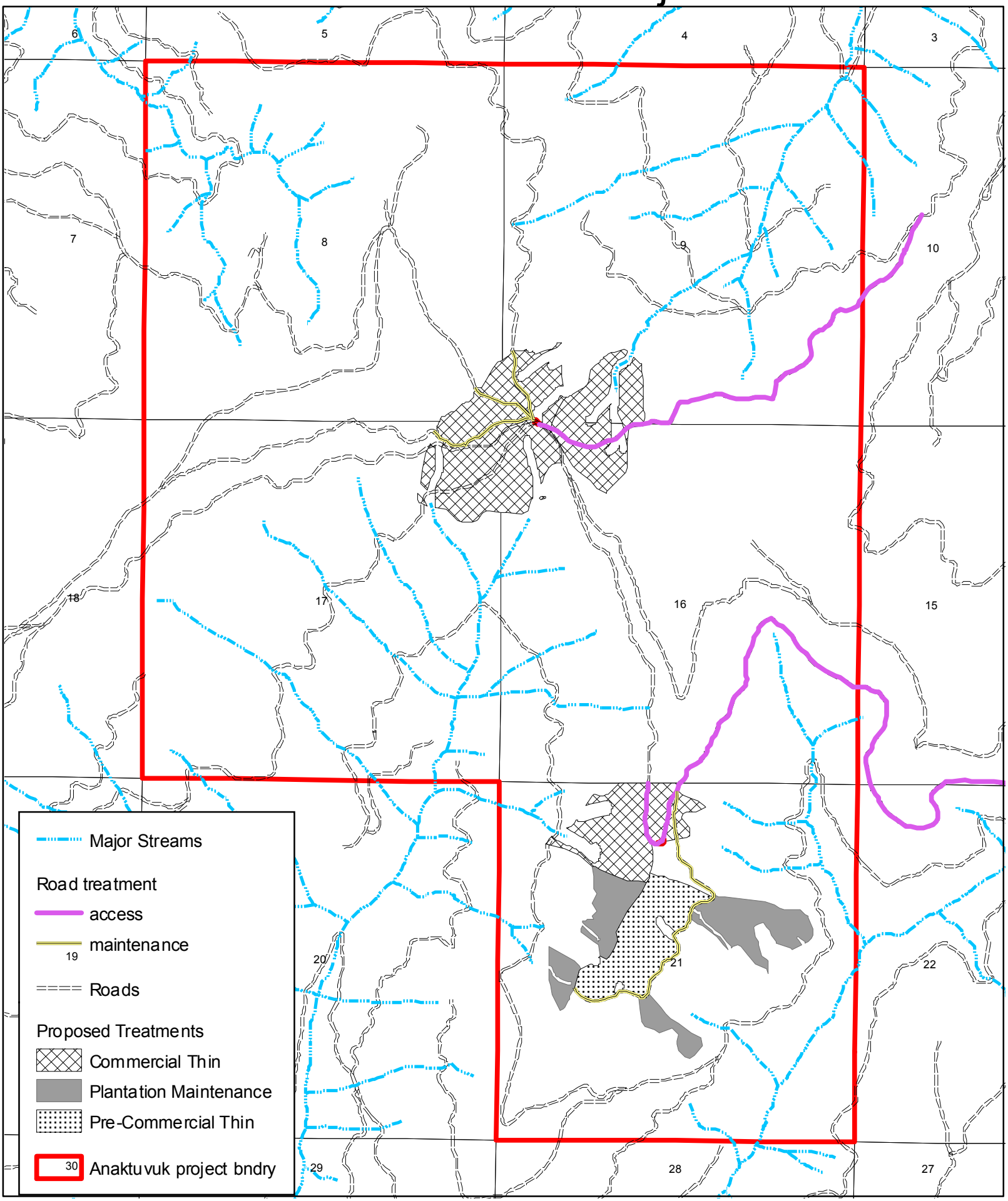
Maps

Anaktuvuk Vicinity



No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources and may be updated without notification.

Anaktuvuk Thin Project



N
W E
S

1 inch = 1,759 feet

0 0.5 1 Miles

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources and may be updated without notification.

1.2 Proposed Action

The Glendale Resource Area proposes forest management activities on approximately 230 acres of BLM national system of forest lands. This includes commercial harvest thinning on approximately 145 acres of Douglas-fir plantations 39 to 48 years of age. Harvesting would be accomplished by ground based yarding on 101 acres and skyline cable yarding on 44 acres within matrix and riparian reserve areas (outside of no cut buffers). Associated harvest activities include the re-construction of four existing route segments totaling nine tenths of a mile; the construction of two temporary routes totaling two tenths of a mile; and the construction of four temporary stream crossings. Approximately 1.5 acres of existing temporary routes and up to 13 acres of existing skid trials would be decommissioned. Road maintenance is proposed on two miles of existing natural and rocked roads. Created slash from harvesting would be utilized for biomass where feasible. Areas not feasible for biomass removal would be treated by the lop-and-scatter method or by the slash/handpile/handpile burn method within 100' of existing roads.

Slash vegetation to be cut would be between 1 and 7 inches in diameter leaving conifers at a prescribed spacing of 20 x 20 feet and hardwoods 40 x 40 feet or closer. Biomass extraction would include a combination of manual, ground base equipment and/or cable yarding.

Other forest management activities include manually brushing 48 acres of five to eight year old plantations and pre-commercial thinning the understory on 37 acres of multi-layered previously partial cut stands. Biomass utilization would occur on the pre-commercial thin unit. Pruning of lower live limbs up to 25' on the tree bole is proposed on 145 acres within matrix lands. Subsequent maintenance underburning within 10 years is proposed for the 145 acres of commercial thin units and 37 acres of the pre-commercial thin unit.

All Bureau of Land Management (BLM) lands within the Planning Area are governed by the Oregon and California (O & C) Lands Act. Harvesting and associated forest management activities are planned to occur between 2009 until 2018. BLM planning decisions and harvest activities would apply only to BLM-administered O & C lands.

1.3 Project Location

The Planning Area is located within Douglas and Curry Counties approximately 18 miles west of the town of Glendale, Oregon. Project activities are proposed on national system of public lands managed by the Glendale Resource Area, Medford District BLM. The proposed treatments are within the West Fork Cow Creek and Rogue River/Horseshoe Bend 6th field watershed. Elevations within the Planning Area range from 2800 to 3400 feet. The legal description of the Planning Area is Township (T) 32S, Range (R) 9W, Sections 8-9, 16-17, and 21 WM. (Map 1). The Planning Area includes the land allocations of matrix and riparian reserves.

1.4 Purpose and Need for the Proposal

1.4.1 Need for Action

The O & C Lands Act requires the Secretary of the Interior to manage O&C lands for permanent forest production in accord with sustained yield principles

The Anaktuvuk Planning Area is within O & C lands administered by the Department of the Interior, BLM National System of Public Lands "for permanent forest production… in conformity with the principles of sustained yield for the purposes of providing a permanent source of timber supply" (O&C Act).

Forest Management is appropriate at this time to manage developing stands in the Anaktuvuk Thin PA in order to reduce stand density for residual tree development and provide an entry that is economical.

1.4.2 Purpose (Objectives) for Action

The Anaktuvuk Thin interdisciplinary team (IDT) narrowed the purpose of this project by identifying the following objectives (under management guidance within the 1995 RMP) to meet the need in managing public lands in the Planning Area:

Project objectives include.

1. Commercial thinnings to "control stand density, maintain stand vigor, and place or maintain stands on developmental paths so that desired stand characteristics result in the future" while providing "an entry that is economical" (1995 RMP, p. 185).
2. Pre-commercial thinnings to "control stand density, influence species dominance, maintain stand vigor, and place stands on developmental paths so that desired stand characteristics result in the future" (1995 RMP, p.185).
3. "silvicultural systems and activities should be based on the objectives of the land allocation, ecological processes, site and stand characteristic, and economic feasibility" (1995 RMP, p 180).
4. "Apply silvicultural practices for riparian reserves to control stocking, re-establish and manage stands, and acquire desired vegetation characteristics to attain Aquatic Conservation Stategy and riparian reserve objectives" (1995 RMP. p 27).
5. Pruning to "increase wood quality through the production of clear wood on rotations shorter than would be required without the action" (1995 RMP, p.185).
6. "Produce a sustainable supply of timber and other forest commodities to provide jobs and contribute to community stability" (1995 RMP, p. 38).
7. "Reduce tree mortality and restore the vigor, resiliency, and stability of forest stands that are necessary to meet land use allocations objectives" (1995 RMP, p. 62).

8. "Manage developing stands on available lands to promote tree survival and growth and to achieve a balance between wood volume production, quality of wood, and timber value at harvest (1995 RMP, p.72).
9. "Contain and/or reduce noxious weed infestations on BLM-administered land" and "void introducing or spreading noxious weed infestations in any areas. Reduce infestations where possible" (1995 RMP, p. 92).
10. "Modify fuel profiles in order to lower the potential of fire ignition and rate of spread; protect and support land use allocation objectives by lowering the risk of high intensity, stand-replacing wildfires; and adhere to smoke management and air quality standards" (1995 RMP, p. 91).

1.4.3 Decision Factors

In choosing the alternative that best meets the purpose and need, the Glendale Field Manager would evaluate alternatives on:

- silvicultural systems that are sustainable, economically practical, and capable of maintaining the long-term health and productivity of the forest ecosystem;
- providing timber resources and revenue to the government from the sale of those resources;
- lower the risk of stand-replacing wildfires.

1.5 Plan Conformance

All proposed actions under the Anaktuvuk EA conform to the:

- Medford *Record of Decision and Resource Management Plan ROD*/RMP, 2008*)*
- *Medford District Integrated Weed Management Plan and Environmental Assessment (1998*) and tiered to the *Northwest Area Noxious Weed Control Program* (EIS, 1985).

All proposed actions under this EA are also consistent with management direction in the:

- *Medford District Record of Decision/Resource Management Plan* (RMP/ROD, 1995);
- *Record of Decision To Remove The Survey And Manage Mitigation Measure Standards And Guidelines* (ROD, 2007) and;
- *2004 Record of Decision for Management of Port-Orford-Cedar in Southwest Oregon* , Coos Bay, Medford, and Roseburg Districts (ROD, 2004).

The *Wild Rogue North Watershed Analysis* and the *West Fork Cow Creek Watershed Analysis* are incorporated by reference. Watershed analysis is an analytical process and not a decision-making process as discussed in the Record of Decision for the Northwest Forest Plan (p. B-20).

Since the planning and design for this project was initiated prior to the 2008 ROD and will use management direction consistent with the 1995 RMP, it contains certain project design features that are not consistent with the management direction contained in the 2008 RMP. However, the 2008 ROD acknowledged that transition projects, such as Anaktuvuk Thin, could include project design features not consistent with the 2008 RMP (2008 Medford ROD/RMP, pp. 5- 6). The 2008 ROD anticipated these inconsistencies and projected they would not alter the analysis of effects in the associated final environmental impact statement. Additionally, it was anticipated that any inconsistencies with the management direction in the 2008 ROD would result in less change to the current condition of the affected environment than elements contained in the 2008 ROD/RMP could not result in significant effects beyond those disclosed in the 2008 ROD/RMP.

The Anaktuvuk Thin Project does not propose regeneration harvesting. The 2008 ROD anticipated that the primary inconsistency with the 2008 RMP Plan would be the retention of merchantable material in regeneration harvest units for green tree retention, snags, and coarse woody debris where the management direction in 2008 RMP would direct the removal of all merchantable material.

1.6 Permits and Approvals Required

The following permits and approvals are required prior to project implementation: in compliance with the Oregon Smoke Management Plan, prescribed burning activities on the Medford District require pre-burn registration of all prescribed burn locations with the Oregon State Forester.

1.7 Scoping and Alternative Use of Resources

1.7.1 Public Scoping

Public scoping included mailing the Anaktuvuk Thin Scoping Report to individuals and organizations expressing interest in Glendale Resource Area projects. Public comment was available from April 27, 2007 to May 31, 2007. The BLM received three public response letters that are fully responded to (see Appendix 3). Comments were considered in the development of the alternatives (see Appendix 1). The Glendale Resource Area also accepts public comment of proposed forest management activities through the quarterly BLM Medford Messenger publication. A brief description of proposed projects, such as Anaktuvuk Thin, a legal location and general vicinity map were provided along with a comment sheet for public responses. The Anaktuvuk Thin Project was included in these quarterly publications beginning in fall, 2005.

1.7.2 Alternative Use of Available Resources

The Anaktuvuk Thin interdisciplinary team (IDT) considered conflicts of alternative uses of available resources through scoping comments by the public and IDT members. Project Design Features (Chapter 2) were developed by the interdisciplinary team to

reduce most of the potential conflicts of alternative uses of available resources. The remaining conflicts were considered by the IDT in this EA:

1. eliminating ground based harvest methods to reduce compaction
2. economic feasibility
3. feasibility due to seasonal restrictions

Alternative uses of available resources were analyzed to determine if an alternative action would be developed as specified in 40 CFR § 1501.2 (c). The IDT developed Alternative 3 in response to the economic feasibility of the Proposed Action. Appendix 1 explains the reasons why some alternatives, such as eliminating ground based harvest methods, were considered but not analyzed in detail and eliminated from further study.

1.8 Decisions to be Made

The Glendale Field Manager is the official responsible for deciding whether or not to prepare an Environmental Impact Statement (EIS), and whether to approve the treatments as proposed, not at all, or to some other extent.

Chapter 2.0 Alternative Ways of Accomplishing the Objectives

2.1 Introduction

This chapter presents alternative proposals that meet the project objectives identified in Chapter 1 and describes and compares each of the alternatives as specified in 40 CFR (Code of Federal Regulations) § 1502.14. Descriptions summarize potential environmental consequences and focus on potential actions and outputs. Project Design Features were identified and are included here to ensure project compliance with higher-level National Environmental Policy Act (NEPA) documents, laws and BLM guidelines.

Through the scoping process, public comments were considered by the interdisciplinary team and responded to in Appendix 3 (Public Comment to Anaktuvuk Thin Project Scoping Report and BLM Response). As such, the alternatives that will be analyzed in detail in this EA include the No Action Alternative (Alternative 1), Proposed Action (Alternative 2) and No Biomass Removal (Alternative 3).

Chapter 2 provides the reader:

- a brief description of the types of forest management treatments proposed
- specific measures incorporated in the design of Alternatives 2 and 3 to eliminate or minimize adverse impacts on the human environment (Project Design Features)
- description of the alternatives

2.2 Proposed Projects

2.2.1 Description of Forest Management Treatments

Biomass Processing Landings would allow the operator to gather and process biomass. Landings would be constructed on pre-disturbed sites and would be restored to its original or modified conditions. Landings would be approximately one acre or less each in size.

Biomass Removal. Biomass is any dead or living vegetation within the proposed unit that is ≤8" in diameter for conifers and ≤12" for hardwoods. For slopes <35%, mechanized low ground pressure machinery would be used to transfer biomass to a designated landing for processing. On slopes >35%, biomass would be cable yarded.

Brushing and Pre-commercial Thinning. Pre-commercial thinning and release treatments would be designed to control stand density, influence species dominance, maintain stand vigor and place stands on developmental paths so that desired stand characteristics result in the future (ROD/RMP, p.185).

Hazardous Fuel Treatments (HFT) are designed to reduce activity slash created as a result of stand treatments (pre-commercial thinning, brushing, pruning and commercial thin).

The objective of proposed HFT is to alter fuel loading and configuration to reduce the potential for high severity fire, reduce the time of elevated hazard, and make suppression efforts safer and more effective in the event of a wildfire, thereby protecting resource values. Hazardous fuel treatments include slashing, hand-piling, pile-burning, underburning, and/or lop-and-scatter.

Treatment Descriptions

Initial Fuel Reduction: Activity fuels not feasible for biomass removal would be treated using manual and mechanical techniques to the desired stand prescription. Slash would then be handpiled and burned (HP/B) or lop-and scattered.

Slashing (SL) Understory vegetation density would be reduced by cutting and spacing of conifers <7" DBH. Retained vegetation would be spaced 20 x 20 feet for conifers and 40 x 40 feet or closer for hardwoods.

Lop-and Scatter (LS) would be used when the slash (live and dead material 7 inches or less) remaining in the units after harvest is less than 12 tons per acre. All stems and branches would be cut from the central stem and scattered. Central stems 7 inches in diameter and less would be cut to 3-foot lengths. The depth of the slash would not exceed 18 inches.

Hand Piling and Burning (HP) is typically used when underburning is not recommended due to heavy fuel loads or to create hazardous fuel buffers for defensible space. Slash 1-7" diameter and longer than two feet would be piled by hand. The piles would be covered with plastic to create a dry ignition point and would be burned in the fall or winter when the risk of fire spread (scorch or mortality) to nearby residual trees and shrubs is minimized. It is expected that hand piles would be burned in the first winter or early spring following the construction of the pile unless fuels have not cured or atmospheric conditions are not conducive for adequate smoke management.

Understory Burning (underburning) (UB) is used where the objective is to maintain ≥80% of the overstory. The objective is to reduce dead and down woody material, shrubs and small trees in the understory, and live and dead branches close to the ground. Underburning is conducted throughout the year when fuel and weather conditions permit. Typically, burning occurs between fall and spring. Summer or early fall burning is less common, but can be feasible to meet resource objectives and when risk of fire escape can be mitigated.

Underburning is conducted using hand ignition methods and drip torches as the primary ignition device. Desired fire intensity is site specific based on the desired site conditions, vegetation type and size and fuel loadings and would be controlled by number and spacing of burn strips. Most underburns require a control line around the burn area. Existing natural control lines such as major

streams and rocky areas or man-made barriers such as roads are used as much as possible to minimize soil disturbance. In the absence of existing control lines, hand lines would be constructed using chainsaws and hand tools. Hand lines consist of the removal of all fuels down to mineral soil for a width of 1-3 feet, depending on fuel loading. Water bars would be used on slopes exceeding 10%. Hand lines would rehabilitate naturally and would likely be used during future maintenance underburn.

Commercial Thinning (CT). *Commercial thinning is the removal of merchantable trees from an even-aged stand to encourage growth of the remaining trees (ROD/RMP, p. 103).*

Commercial thinning is a silvicultural practice generally applied to control stand density, maintain stand vigor, and place or maintain stands on developmental paths so that desired stand characteristics result in the future while providing an entry that is economical (RMP, p. 185). This treatment would promote better stand health, as well as increased vigor and better crown development on retained trees. Fewer but larger trees would make up these stands in the long term and overall stand health would be improved. Production of some wood volume at the present time and an increase/maintenance of growth rates for wood volume production in the future are primary objectives.

Pruning Treatments. Pruning is the manual removal of lower limbs to improve wood quality, forage production, and reduce ladder fuels (hazardous fuels). Treatments involve removing the bottom portion of the live crown up 17.4 to 25 feet (depending on first, second, or third lift), leaving 50% live crown after each pruning operation.

Riparian Thinning. The objective of riparian thinning treatments is to create a stand that is on a trajectory to reach a late-successional condition.

To expedite the development of late-successional, multi-story habitat conditions and "restore the species composition and structural diversity of the plant communities" needed to achieve ACS and riparian reserve objectives (RMP, pp. 22, 26), portions of the riparian reserves would be treated as part of this project. Small canopy gaps would also be created outside the primary shade zones, as necessary to promote multiple-layered stands and promote species diversity that is a key element in late-successional habitat. The West Fork Cow Creek and Wild Rogue North Watershed Analyses were used in the analysis of this project. Treatments within the riparian reserves would be done in accordance with the following protection zones:

- On all units, a minimum 25 foot no treatment buffer, from bankfull width, would be used to protect streambank stability.

- Where treatments occur between 25'- 60' of the stream, angular canopy density would remain at existing levels to protect stream shading. Understory trees, which are not providing shade, would be treated within this buffer to reduce fire hazard

and to improve the vigor of the remaining overstory trees by increasing available growing space, water, and nutrients.

- Between 60 and up to 110 feet wide, measured from bankfull width, a variable width ecological protection zone (EPZ) would be used to protect water quality within the stream. This buffer is based on the Ecological Protection Width Needs chart in the Record of Decision for the NWFP Standards and Guidelines (ROD, 1994). Within this buffer zone only forest health treatments would occur and angular canopy density would remain within 5% of existing levels to protect stream shading and temperature. No ground disturbing yarding methods would be used within the EPZ. All pre-existing coarse and large woody debris would be left on site.

- Canopy closures within the NWFP riparian reserve that are outside the variable width ecological protection zone (EPZ) would remain above 50%. All pre-existing large woody debris would be left on site.

Road decommissioning would include channel stabilization, removal of culverts and cross drains, sub-soiling, planting, barricading, placement of woody material, seeding with native seed and mulching. Roads would be closed with a device similar to an earthen barrier or equivalent. Roads would not be maintained in the future.

Road Maintenance would keep a facility (road) in such a condition that it may be continuously utilized at its original or designed capacity and efficiency, and for its intended purposes.

Road Reconstruction would restore a road to its original or modified condition.

Stream Crossing. Crossing of stream channels would be designated by the area hydrologist and engineer, and would be done using culverts, located in line with the channel.

Temporary Spur Route Construction would allow operator access to harvest units. After harvest is complete, these routes would be decommissioned. Additionally, temporary routes that would utilize a new footprint would be partially re-contoured (fills would be placed back over road surface following sub-soiling).

2.3 Project Design Features

Project Design Features (PDFs) are specific measures included in the site specific design of Alternatives 2 and 3 to eliminate or minimize adverse impacts on the human environment. These PDFs were developed by the Anaktuvuk Thin interdisciplinary team from guidance of Best Management Practices (BMPs) identified in the Medford District ROD/RMP, Appendix D, and other regulatory laws, for resource protection measures specific to the Planning Area. The following project design features were developed prior to the 2008 ROD and would result in less change in the affected environment than if the projects were implemented consistent with management direction in the 2008 RMP.

2.3.1 Soil Productivity, Residual Trees and Coarse Woody Debris

- Lateral yarding would be required on all units to protect residual leave trees and existing conifer regeneration. Yarding carriages would be required to maintain a fixed position during lateral yarding to reduce damage to the residual stand.

- To prevent damage of bark slippage on residual trees yarding would be suspended if the Authorized Officer finds unacceptable amounts of tree damage.

- Whole tree yarding would be permitted as long as contractor can operate without causing unacceptable damage from bark slippage, girdling, broken tops, or damage to live crowns. If it is determined by the Authorized Officer that unacceptable amounts of damage is occurring, trees would be required to be bucked and limbed as directed by the Authorized Officer.

- Productivity loss resulting from topsoil disturbance and soil compaction would not exceed a combined calculated total of 5% of the unit.

- Directional falling toward the lead would be required to minimize damage to residual (reserve) trees.

- Hardwoods not designated for cutting within treatment units would be reserved and to the extent possible would not be cut during falling and yarding operations.

- Prescribed fire plans are prepared for all burning activities and are designed to ensure that resource and fire management objectives are met by setting parameters under which the burning may take place. Prescribed burning would be conducted in a manner that would minimize damage to reserve trees, duff, and soil, and to minimize loss of large, coarse woody debris.

- Prescribed pile burning would occur in the fall to winter season after one or more inches of precipitation have occurred to reduce the potential for fire spread and scorch and mortality to the residual trees and shrubs. Patrol and mop-up of

burning piles would occur when needed to prevent treated areas from reburning or becoming an escaped fire.

- Landing piles would be burned, if necessary, on all harvest units. No material would be allowed on the running surface of roadways, including turnouts, or between the ditch line and the shoulder.

- All non-hazardous snags would be retained in all harvest units. If it is necessary to fall snags for safety reasons, they would remain on site as down wood. All pre-existing dead and down coarse woody debris, greater than or equal to 16 inches diameter, would remain on site.

- Firelines would be constructed by hand on slopes greater than 35%. On slopes less than 35%, one-pass with a brush blade could be used to construct fireline using machinery. Machine firelines would not be constructed in riparian reserves.

- All prescribed burn areas with sensitive plant species would be burned under the weather, fuel conditions or season that minimizes impacts on plant reproduction and active growth. Low intensity (winter/spring) underburning could occur after treatment to reduce existing activity slash and fire hazard within 10 years of post-treatment. Fires would be allowed to back into riparian reserve no-treatment areas, but no ignition would take place within 50 feet of streams.

2.3.2 Air Quality / Smoke Management

- Prescribed fire would be consistent with the Oregon Department of Forestry's Smoke Management Plan and the Department of Environmental Quality's Air Quality and Visibility Protection Program. Additional measures to reduce smoke emissions would include rapid mop-up, burning with lower fuel moisture in smaller fuels to facilitate quick and complete combustion, burning with higher fuel moisture in the larger fuels to minimize consumption and burn out time, and covering hand piles to permit burning during the rainy season when atmospheric mixing and smoke dispersal are more likely.

2.3.3 Cultural Sites

- Surveys indicate that no cultural resources would be affected by any proposed activity. If cultural resource sites are found during implementation they would be avoided. Areas that require protection would be buffered with a flagged buffer prior to project implementation. No treatment would occur inside the buffered areas.

2.3.4 Noxious Weeds

- In order to prevent the potential spread of noxious weeds, the operator would be required to clean all logging, construction, and transportation equipment prior to entry on BLM lands. Cleaning would be defined as removal of dirt, grease, plant parts and material that may carry noxious weed seeds and parts onto BLM lands. Cleaning prior to entry onto BLM lands may be accomplished by use of a pressure hose.

- Areas disturbed by temporary route construction and use as well as areas along roads that have been burned would be planted with a native grass and forbs seed mix.

- Logging/construction activities will only occur during the dry season.

2.3.5 Streams and Riparian Zones

- On all units, a minimum 25 foot no treatment buffer, from bankfull width, would be used to protect streambank stability.

- Within the variable width ecological protection zone (discussed in section 2.2.1) angular canopy density would remain within 5% of existing levels and vegetative species diversity would be maintained. Young stand management activities that do not use ground disturbing yarding systems would be allowed.

- In the area outside the ecological protection zone but within the 180' (one site potential tree length) NWFP riparian reserve boundary, minimum canopy closures would remain above 50%, and vegetative species diversity would be maintained. All pre-existing coarse woody debris would be left on site.

- Unless unsafe, trees within riparian reserve boundaries (180') would be directionally felled away from the stream, and adjacent trees would not be felled into riparian reserves.

- Springs and perennial wet areas would receive a radial buffer that would prohibit any overstory canopy removal or ground disturbance. This buffer would extend outward from the edge of the riparian vegetation for a distance equal to the EPZ width designated for that unit, or 100 feet (whichever is smaller), in order to protect the ecology of these sites. Additionally, intermittent seeps, slumps, and other unstable areas would be buffered by leaving one row of overstory trees or a 25 foot diameter (whichever is greatest) around these areas to minimize erosion and stabilize soils. Any of these distances may be increased, as necessary, to protect individual sites.

- Trees in no-harvest portions of riparian reserves that are accidentally knocked over during falling and yarding would be retained on site for fish /wildlife habitat or would be treated with activity fuels.

- Landings with exposed soils would be winterized prior to October 15 of the same year. Landings would be rehabilitated following use. However, if existing road surfaces or landings are utilized, only areas outside of the road prism would be sub-soiled, planted, and mulched.

- One expansion of an existing landing in unit 9-1 within the riparian reserve would be allowed outside the EPZ to facilitate logging systems and would be pre-designated and approved by the Authorized Officer.

- Upon completion of harvest, all utilized skidtrails within riparian reserves would be discontinuously sub-soiled, seeded, water-barred, mulched and blocked in accordance with the actions described for rehabilitating skidtrails in section 2.3.6.1

- Hydraulic fluid and fuel lines on heavy mechanized equipment would be in proper working condition in order to minimize potential for leakage into streams. No re-fueling of heavy equipment would occur within 150 feet of streams or stream crossings. Absorbent materials would be required to be onsite to allow for immediate containment of any accidental spills.

- Cleaning culvert inlets, culvert installations, and culvert removals in stream channels would be restricted to between July 1 and September 15 in accordance with Oregon Department of Fish and Wildlife (ODFW) in-stream work period recommendations, except where the potential for greater damage to water quality and fish habitats exists.

- Flowing water would be diverted around each culvert or cross drain installation or removal site whenever there is sufficient water volume. Diverted water would be returned to the channel immediately downstream of the work site. Effective erosion control measures would be in place at all times during installation or removal, and would be removed from the channel prior to October 15th of the same calendar year. Stored sediment behind erosion control devices would be removed from channel and disposed of in a stable location outside the EPZ.

- Fire suppression foam would not be used within 150 feet of streams and wetland.

- Refueling of chainsaws and pumps would be done no closer than 150 feet of any stream or wet area. Spilled fuel and oil would be cleaned-up and would be disposed of at an approved disposal site.

2.3.6 Sedimentation and Soil Compaction

2.3.6.1 Sedimentation and Soil Compaction from Logging

- Ground base yarding would be allowed between May 15 and October 15 (during the dry season, typically) of the same year to minimize the amount of soil disturbance and compaction.

- Existing skidtrails would be used whenever practical and new skidtrails would be placed at least 150 feet apart, where topography allows, to reduce the amount of compaction within tractor yarded units. New skidtrails would be pre-designated and approved by the Authorized Officer. The total area compacted by skidtrails would not exceed 12% of the unit.

- Tractors would be equipped with an integral arch to minimize soils disturbance and compaction. Skidtrails including turning points would be 12 feet width on average.

- To minimize soil disturbance and root damage the use of blades while tractor yarding would not be permitted to keep soil organics on site. Equipment would walk over as much ground litter as possible to reduce compaction.

- Native grass/forb seeding, mulching or hay bale placement would be used where necessary to minimize surface erosion, and reduce stream sedimentation.

- Partial suspension (at a minimum) would be required on all units to minimize soil disturbance.

- Any yarding corridor that has sufficient soil displacement to result in the collection or routing of surface, or subsurface runoff, would be rehabilitated by installing waterbars, recontouring displaced soils that are adjacent to corridors, and applying mulch or fine slash to cover exposed soil, as necessary to minimize erosion. Waterbars would be installed in accordance with RMP standards and guides (RMP, p.167). Any continuous areas of exposed mineral soil in excess of 10 linear feet within yarding corridors would be also rehabilitated using any combination of the above techniques, as necessary to minimize erosion.

- Cable yarding lines would be respooled when changing yarding corridors.

- The number of yarding corridors would be minimized to reduce soil compaction and displacement from cable yarding. Corridors would be located approximately 150 feet apart at the tail end.

- Ground based yarding equipment would be restricted to slopes less than 35% in order to prevent excessive soil disturbance.

- Total compaction, including compaction associated with pre-existing skidtrails within the unit, would be reduced to less than 12% within thinning units, upon

completion of harvest (RMP, p. 166). To reduce soil compaction, minimize sedimentation, and improve site productivity temporary routes, skidtrails, and landings would be rehabilitated by discontinuously sub-soiling, seeding, water-barring, mulching, and blocking prior to October 15 of the year of harvest. For all sub-soiling, a winged ripping device would be used to sub-soil the full width of the skidtrail, rips would be no more than 36 inches apart, and would be to a depth of 18 inches or to bedrock, whichever is shallower. All rehabilitation activities that utilize heavy equipment would be required to take place at same time as sub-soiling to prevent machinery from driving back over sub-soiled ground. Waterbar spacing and drainage angles would be based on the NWFP Standards and Guidelines erosion control measures for timber harvest which considers slope and soil series (RMP, p. 167). Where it is determined that sub-soiling would cause damage to the root plate of residual trees, sub-soiling would be reduced to less than 60% of the critical root area.

- Where necessary or advantageous, cut-to-length equipment with a ground pressure less than, or equal to 5.0 psi may be used instead of designated skidtrails. At time of operation, soil moistures must remain below 20%. This equipment would be required to remain on a minimum of 8 inches (uncompacted) slash at all times, and would be limited to 35% slope. A maximum of two passes would be allowed over any given area, regardless of the number or type of equipment present onsite. If a forwarder is used in conjunction with this equipment, it must be outfitted to remain below 5.0 psi and must be operated in accordance with the parameters outlined above for the cut-to-length equipment, or must remain on pre-existing, pre-approved designated skidtrails that would be rehabilitated following use. In addition, when used off designated skidtrails, the forwarder would be required to operate perpendicular to the slope when slopes exceed 20% (no sidesloping).

2.3.6.2 Sedimentation and Soil Compaction from Roads, Temporary Routes and Landings

- Temporary routes and new landings would be located in approved sites and designed with adequate drainage.

- All temporary routes, new landings, and landing expansions would be rehabilitated prior to October 15th of the same year of use. Requirements for completing rehabilitation are the same as described above for skidtrails. All activities detailed above for skidtrails must be completed as described, as well as the following additional measures: removal of culverts and cross drains. Additionally, temporary routes that would utilize a new footprint (Temp route 9-3 and Temp route 16-1) and step landings would be partially re-contoured (fills would be placed back over road surface following sub-soiling). Exceptions would be where landings utilize existing road prisms, in which case the original roads would not be sub-bsoiled or planted. Temporary routes would be closed with a device similar to an earthen barrier or equivalent.

- If temporary routes or landings would be needed to complete harvest, process biomass or hauling the following season, waterbars, berms, dikes, dams, sediment catchment basins, gravel, or mulch would be used as needed to minimize the amount of erosion which would take place before disturbed soil and new surfaces stabilize.

- Routine road maintenance, temporary route construction or reconstruction, and log hauling on natural surface and rocked roads would only be allowed between May 15 and October 15 of the same calendar year. Post storm road inspections and required maintenance such as slide removal and the cleaning of plugged culverts and cross drains would be allowed throughout the year to minimize the potential of road damage and mass erosion events.

- Log haul on all road surface types would be suspended by the Authorized Officer at any time if road damage may occur, or road drainage is visibly increasing stream turbidities, or where surface conditions are being created that would result in water being chronically routed away from designed drainage patterns (ie. water is running down the road instead of ditchlines or downslope vegetation).

- All natural surface or rocked roads that are re-opened for harvest operations or log haul would receive adequate surfacing, be gated, or be blocked prior to the wet season and stabilized in such a way that no future maintenance would be necessary to prevent road damage or stream sedimentation.

- Light vehicular traffic associated with young stand management or hazardous fuel treatments done during the off season would be scheduled in such a way that road damage would not occur, offsite erosion from road surfaces would be minimized, and any sediment entering the streams from stream crossings or ditchlines would not be measurable.

- Crossdrain culverts would be added to haul roads as determined as needed to help reduce downslope surface erosion and sediment entering streams and draws. Dispersing flow into multiple culverts where necessary would reduce ditchline and outlet scour caused by excess water within ditchlines, and allow water to absorb into streamside vegetation without gully formation or downcutting of draws.

- Energy dissipaters and down spouts would be installed as needed (e.g. rock material) at new or existing cross-drain and stream culverts, where necessary, to protect road fill slopes that are not adequately protected by natural materials.

- Road cuts, fill slopes, borrow material and other bare ground disturbed by road construction activities would be mulched and seeded prior to fall rains (generally October 15).

- No blading of ditchlines within 50 feet of streams unless needed to maintain the integrity of the road prism. If blading of ditch lines within 50 feet of streams is necessary and no crossdrain is present within 200 feet and is needed in order to maintain the integrity of the road prism, then extra crossdrains would be added to allow for hillslope relief and reduce sediment delivery to streams. Also, if blading within 50 feet of streams is required, Best Management Practices of placement of rock baffles or similar sediment trapping devices in the ditch would be required

2.3.7 Special Status Species and their Habitats

2.3.7.1 Northern Spotted Owl

Spotted owl surveys have occurred in the Glendale Resource Area for approximately the last three decades. Surveys have shown that the closest owl nest sites are well beyond potential disturbance distances and therefore no effect from loud noise to known individual owls. If a spotted owl is found, work activities that produce loud noises above ambient levels will not occur within specified distances (Table 2-1) of any documented or generated owl site during the critical early nesting period, March 1 and June 30, or until two weeks after the fledging period, as determined by an agency wildlife biologist. This seasonal restriction may be waived if protocol surveys have determined the activity center is not occupied, owls are non-nesting, or owls failed in their nesting attempt (DA 08 BAFH, p. 88).

If a spotted owl is found, burning will not take place within 0.25 miles of a spotted owl nest from March 1 through June 30, or until two weeks after the fledging period, unless substantial smoke will not drift into the nest stand.

Table 2- 1. Mandatory Spotted Owl Restriction Distances

Activity	Documented Owl Site
Heavy Equipment	105 feet
Chain saws	195 feet

2.3.7.2 Marbled Murrelet

BLM will implement Mandatory Project Design Criterion in or adjacent to occupied or unsurveyed suitable marbled murrelet habitat as stated in the Medford 2008 Biological Assessment (DA 08 BAFH, p. 90). Distances and seasonal restrictions for marbled murrelets would affect units 21-5, 21-6, 21-7, 21-8 and part of unit 17-1. However, daily/seasonal restrictions for the marbled murrelet would be implemented, if required, in concurrence with the U.S. Fish and Wildlife Service. Potential harassment distances given in the BA are 120 yards for both chainsaws and heavy equipment (DA 08 BAFH, p. 92). No open air or unmuffled blasting activities will occur from April 1 through

September 15 within 1.0 mile~~s~~ of occupied stands or unsurveyed suitable habitat.. Work activities would be confined to the time period between 2 hours after sunrise to 2 hours before sunset from August 6 through September 15.

2.3.7.3 Bureau Sensitive Plants

For units where timber management is planned, a 25 to 100' no-treatment buffer would be placed around *Illiamna latibractiata* and *Bensoniella oregana,* the two species of Bureau Sensitive plants located during predisturbance surveys. Buffer size will depend on the logging method used; for instance, if a feller-buncher or other disturbance-avoiding method is used, a 25' buffer would provide adequate protection.

If the site(s) are within the stream buffers, no additional flagging is needed. For units where fuels reduction (and not timber management) is planned to occur, buffers will be 50'. Piles should not be placed less than 20 feet to actual plant site.

2.4 Description of the Alternatives

2.4.1 Alternative 1 (No Action)

The No Action Alternative provides a baseline for the comparison of the alternatives and describes the existing condition and the continuing trends within the Planning Area. Under the RMP, the majority of harvest and silvicultural activities are scheduled to occur within the matrix allocation. Selection of this alternative would not meet the purpose and need of the project (described in Chapter 1) of harvesting timber and implementing the Medford RMP at this time. Consideration of this alternative provides the answer to the question of what it would mean for the objectives not to be achieved. Selection of the No Action Alternative would not constitute a decision to reallocate these lands to non-commodity uses.

Future land management activities in this area would not be precluded and could be analyzed under a subsequent environmental document.

2.4.2 Alternative 2 (Proposed Action)

The Proposed Action emphasizes fully meeting the matrix land allocation objectives of producing a sustainable supply of timber while providing connectivity and both late-successional and early-successional habitat (RMP, p.38). See Map 2.

2.4.2.1 Timber Harvesting

The Proposed Action would commercially thin approximately 145 acres of 39 to 48 year old Douglas-fir plantations. Harvest methods include ground based yarding on approximately 101 acres and skyline cable yarding approximately 44 acres. See Silvicultural Prescriptions in Appendix 4 for specific unit treatment and Appendix 5 for proposed unit harvesting method.

Understory forest health treatments would not occur closer than 60' from the stream channel and up to 110 feet wide utilizing the ecological protection buffer (EPZ) width. Within this buffer zone only understory treatments or single disease tree felling would occur and angular canopy density would remain within 5% of existing levels to protect stream shading and temperature. No ground disturbing yarding methods would be used within the EPZ. All pre-existing coarse and large woody debris would be left on site.

Within the NWFP riparian reserve, outside the variable width EPZ, canopy closures and shade levels at breast height would remain above 50%. Ground based equipment in the riparian reserve would be allowed on designated skidtrails outside of the EPZ. The following are estimates of new skidtrails to be used in this outer portion of the riparian reserves:

Unit 9-1 = approximately 75'
Unit 9-2 = approximately 625'
Unit 17-1 = approximately 705'

All pre-existing large woody debris would be left on site.

2.4.2.2 Roads and Landings

Proposed road work associated with timber harvesting under Alternative 2 would include constructing and re-constructing six sections of temporary routes totaling 1.1 miles. Four of these routes, 9-1, 17-1, 21-6 and 21-7 would be re-constructed on previous road footprints and would be decommissioned same season of use and prior to the fall rains. Four culverts would be installed on the 9-1 road and removed after haul is completed. Two temporary routes, 9-3 (.054 mi.) and 16-1 (0.17 mi.) would be constructed with a new footprint and partially re-contoured after harvest (fills would be placed back over road surface following sub-soiling). Approximately 1.5 acres of existing temporary routes, and up to 13 acres of existing skid trails would be decommissioned. Associated log hauling activities include maintenance work on two miles of existing roads (See map 2) and the construction of four stream crossings.

A splash guard would be constructed below the existing cross drain that enters into unit 9-1 and then flows to the base of the existing road footprint that is proposed for log hauling. Additionally following harvest, the relatively flat ground between the road footprint and the splash guard would be sub-soiled during the dry season to provide better better infiltration of the culvert outflow. These Project Design Features would reduce the flow energy from the culvert, and would prevent the decommissioned 9-1 road footprint from gullying again in the future. This temporary route in unit 9-1 would only be used during one operating season before being decommissioned.

Only one existing landing would be expanded within the riparian reserve outside the EPZ to facilitate logging systems. This landing would occur within the 9-1 unit, and would be pre-designated and approved by the Authorized Officer. All other landings within

riparian reserves would occur outside the EPZ and would operate within the existing footprint.

Crossing of stream channels in units 9-1, 9-2, and 9-3 would be pre-designated using culverts and approved by the Authorized Officer.

2.4.2.3 Hazardous Fuel Treatments

One hundred and forty five acres of activity fuels created by the commercial thin units and 37 acres of activity fuels created by the pre-commercial thin unit would be considered for biomass utilization where feasible. Areas not feasible for biomass removal would be treated by the lop-and-scatter method and slash within 100' of existing roads would be treated by the slash/handpile/handpile burn method. Site specific fuels treatments would be determined following an assessment of the feasibility of biomass removal and the amount of created activity fuels. Vegetation to be cut would be between 1 and 7 inches in diameter at a prescribed spacing of 20 x 20 feet for conifers and 40 x 40 feet or closer for hardwoods.

It is estimated that underburning would be implemented on 145 acres within the commercial thin units and 37 acres of the pre-commercial thin units within 10 years of post-treatment.

Initial Fuel Reduction: Activity fuels not feasible for biomass removal would be treated using manual and mechanical techniques to the desired stand prescription. Slash would then be handpiled and burned (HP/B) or lop-and scattered.

<u>Treatment Descriptions</u>

Slashing (SL) Understory vegetation density would be reduced by cutting and spacing of conifers <7" dbh. Retained vegetation would be spaced 20 x 20 feet for conifers and 40 x 40 feet or closer for hardwoods.

Lop-and Scatter (LS) would be used when the slash (live and dead material 7 inches or less) remaining in the units after harvest is less than 12 tons per acre. All stems and branches would be cut from the central stem and scattered. Central stems 7 inches in diameter and less would be cut to 3-foot lengths. The depth of the slash would not exceed 18 inches.

Hand Piling and Burning (HP) is typically used when underburning is not recommended due to heavy fuel loads or to create hazardous fuel buffers for defensible space. Slash 1-7" diameter and longer than two feet would be piled by hand. The piles would be covered with plastic to create a dry ignition point and would be burned in the fall or winter when the risk of fire spread (scorch or mortality) to nearby residual trees and shrubs is minimized. It is expected that hand piles would be burned in the first winter or early spring following the construction of the pile unless fuels have not cured or atmospheric conditions are not conducive for adequate smoke management.

Understory Burning (underburning) (UB) is used where the objective is to maintain ≥80% of the overstory. The objective is to reduce dead and down woody material, shrubs and small trees in the understory, and live and dead branches close to the ground. Underburning is conducted throughout the year when fuel and weather conditions permit. Typically, burning occurs between fall and spring. Summer or early fall burning is less common, but can be feasible to meet resource objectives and when risk of fire escape can be mitigated.

Underburning is conducted using hand ignition methods and drip torches as the primary ignition device. Desired fire intensity is site specific based on the desired site conditions, vegetation type and size and fuel loadings and would be controlled by number and spacing of burn strips. Most underburns require a control line around the burn area. Existing natural control lines such as major streams and rocky areas or man made barriers such as roads are used as much as possible to minimize soil disturbance. In the absence of existing control lines, hand lines would be constructed using chainsaws and hand tools. Hand lines consist of the removal of all fuels down to mineral soil for a width of 1-3 feet, depending on fuel loading. Water bars would be used on slopes exceeding 10%. Hand lines would rehabilitate naturally and would likely be used during future maintenance underburn.

2.4.2.4 Biomass Removal

Biomass would be removed during commercial thinning or pre-commercial thinning treatments. Approximately 101 acres would be removed by ground based methods and 44 acres by cable based methods within commercial thin units and 37 acres in the pre-commercial unit. Two biomass process landings would be utilized on existing disturbed areas near Anaktuvuk Saddle and Cold Springs. Whole tree yarding is a method that could be applied to facilitate biomass removal.

2.4.2.5 Young Stand Management

Brushing treatment would be done by manual method, cutting all non-reserved competing vegetation that are over one foot tall and seven inches or less diameter at breast height within the entire treatment area.

Pre-commercial thinning treatment would be done by manual method, cutting excess conifer trees, leaving the understory stocking level at 220 trees per acre. Hardwood species would be cut, leaving 27 to 36 trees per acre. The largest diameter to be cut would be 7.0 inches at breast height.

Pruning in the upland units would treat approximately 70 to 100 conifer trees per acre.

2.4.3 Alternative 3

Alternative 3 was developed in response to the economic efficiency of the Proposed Action. Alternative 3 is similar to Alternative 2 but does not include biomass removal. See Map 2.

2.4.3.1 Timber Harvesting

Same as Alternative 2.

2.4.3.2 Road Work

Same as Alternative 2.

2.4.3.3 Activity Fuels Treatments

All activity slash would be either lop and scattered or slash, handpile and handpile burned.

2.4.3.4 Biomass Removal

There would be no biomass removal or proposed whole tree yarding.

2.4.3.5 Young Stand Management

Same as Alternative 2

2.5 Comparison of Alternatives

Table 2- 2. Comparison of Action Alternatives

Forest Management Activity	Alternative 2	Alternative 3
	Commercial Harvesting	
Commercial Thinning		
Units Treated	8	8
Acres Treated	145	145
Range in Unit Size (acres)	5-24	5-24
Harvest Method		
Cable (Acres)	101	101
Tractor (Acres)	44	44
Harvest Fuels Treatments		
Units Treated	8	8
Acres Treated	145	145
Biomass removal (acres)	145	0
Underburning (acres)	145	145

	Timber Stand Improvement	
Pre-commercial Thinning		
Acres Treated	37	37
Brushing		
Acres Treated	48	48
Fuels Treatments		
Biomass Removal (acres)	37	0
Underburning (acres	37	37
	Road Work	
Temp. routes (miles)	1.1	1.1
Maintenance (miles)	2	2

Table 2- 3. Summary of Consequence

	NO ACTION	**ALTERNATIVE 2**	**ALTERNATIVE 3**
Supply of timber to economy (acres)	0	145	145
Short –term increase of fire hazard	medium	low	high
Cumulative decrease in fire hazard (acres)	0	230	142
Temporary roads built and decommissioned after use	0	1.1	1.1
Loss of Soil Productivity (%)	0	<5%	<5%
Additional Compaction in Planning Area (%)	0%	4.5%	4.5%
Effects to Essential Fish Habitat (Magnuson Stevens Act call)	No Affect	No Affect	No Affect
Oregon coastal coho salmon	No Affect	No Affect	No Affect
NSO Suitable habitat	No Affect	No Affect	No Affect
Marbled murrelet habitat	No Affect	No Affect	No Affect
Economic feasibility	0	Deficit	Deficit

Chapter 3.0 Affected Environment and Environmental Consequences

3.1 Introduction

In accordance with law, regulation, executive order, policy and direction an interdisciplinary team reviewed the elements of the human environment to determine if they would be affected by the alternatives described in Chapter 2.0. Those elements of the human environment that were determined to be affected define the scope of environmental concern (**see Environmental Elements in Appendix 2 for full list of elements considered**). The Affected Environment portion of this chapter describes the current conditions in the Anaktuvuk Thin Planning Area. The relevant resources that could be potentially impacted are: fire hazard; sediment/water quality, erosion and productivity; and economic feasibility as the result of forest management activities.

As explained in the FONSI, and Sections 1.1 and 1.5 of this EA, the 2008 ROD provides options for transitional projects. The alternatives in this EA include elements that are consistent with the management direction of the 1995 RMP. Much of the analysis and drafting of this EA was completed or in process at the time the 2008 ROD was signed. Therefore, the effects analysis below will use the 1995 RMP terms such as "matrix" and "riparian reserve" land allocations rather than the 2008 ROD/RMP terms such as "Timber Management Areas" and "Riparian Management Areas." This allows previous specialist reports and analysis to be used rather than modifying the proposed action and performing a redundant analysis of effects using 2008 ROD/RMP language and terms. These previous specialist reports remain relevant because, as explained in the 2008 ROD, projects consistent with the 1995 RMP in almost all cases will "result in less change to the current condition of the affected environment than if the . . .projects were implemented consistent with the management direction" in the 2008 ROD/RMP (2008 Medford ROD/RMP, p. 4)

The Environmental Effects portion of this chapter provides the analytical basis for the comparisons of the alternatives (40 CFR § 1502.16) and the reasonably foreseeable environmental consequences to the human environment that each alternative would have on the relevant resources. Impacts can be beneficial, neutral or detrimental. This analysis considers the direct impacts (effects caused by the action and occurring at the same place and time), indirect impacts (effects caused by the action but occurring later in time and farther removed in distance but are reasonably foreseeable) and cumulative impacts (effects caused by the action when added to other past, present and reasonably foreseeable future actions on all land ownerships). The temporal and spatial scales used in this analysis may vary depending on the resource being affected.

Under 43 CFR § 46.115 it states that when considering cumulative effects analysis, it must analyze the effects in accordance with relevant guidance issued by the Council on Environmental Quality (CEQ). As the CEQ, in guidance issued on June 24, 2005, points out, the "environmental analysis required under NEPA is forward-looking," and review of past actions is required only "to the extent that this review informs agency decision-making regarding the proposed action." Use of information on the effects on past action

may be useful in two ways according to the CEQ guidance. One is for consideration of the proposed action's cumulative effects, and secondly as a basis for identifying the proposed action's direct and indirect effects.

The CEQ stated in this guidance that "[g]enerally, 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." This is because a description of the current state of the environment inherently includes the effects of past actions. The CEQ guidance specifies that the "CEQ regulations do not require the consideration of the individual effects of all past actions to determine the present effects of past actions." Our information on the current environmental condition is more comprehensive and more accurate for establishing a useful starting point for a cumulative effects analysis, than attempting to establish such a starting point by adding up the described effects of individual past actions to some environmental baseline condition in the past that, unlike current conditions, can no longer be verified by direct examination.

The second area in which the CEQ guidance states that information on past actions may be useful is in "illuminating or predicting the direct and indirect effects of a proposed action." The usefulness of such information is limited by the fact that it is anecdotal only, and extrapolation of data from such singular experiences is not generally accepted as a reliable predictor of effects.

Scoping for this project did not identify any need to exhaustively list individual past actions or analyze, compare, or describe the environmental effects of individual past actions in order to complete an analysis which would be useful for illuminating or predicting the effects of the proposed action.

When encountering a gap in information, the question implicit in the Council on Environmental Quality regulations on incomplete and unavailable information was posed: is this information "essential to a reasoned choice among the alternatives?" (40 CFR §1502.22[a]). While additional information would often add precision to estimates or better specify a relationship, the basic data and central relationships are sufficiently well established that any new information would not likely reverse or nullify understood relationships. Although new information would be welcome, no missing information was determined as essential for the decision maker to make a reasoned choice among the alternatives.

3.2 Fire Hazard

3.2.2 Affected Environment

Prior to the 20th century, low severity fires burned regularly in most dry forest ecosystems, with ignitions caused by both lightning and humans. Low severity fire influenced regeneration of fire-intolerant species, promoted fire tolerant species such as Douglas-fir and ponderosa pine, maintained an open forest structure, reduced forest biomass, decreased the impacts of insects and diseases, and maintained wildlife habitats

for many species that utilize open stand structures (Graham et al. 2004). Native Americans influenced vegetation patterns for over a thousand years by igniting fires to enhance values that were important to their cultures. Burning was done to encourage the resprouting of vegetation and to control pest populations. This practice also cleared understory vegetation under the trees, which made hunting and gathering seed and acorns easier. Burning along ridge tops helped to maintain travel corridors. Miners routinely ignited fires within the watersheds to allow for mining access.

Fires are a normal occurrence and have played a key role as a natural disturbance process throughout southwestern Oregon (Atzet and Wheeler 1982). Fuels, topography, and weather are fundamental factors influencing wildfire intensity and severity which shape the stand structure and function of forests across the landscape (Graham,et al. 2004). Fire played an important role in influencing successional processes throughout the West Fork Cow Creek and Rogue River/Horseshoe Bend 5th field watersheds.

The West Fork Cow Creek and Rogue River/Horseshoe Bend 5th field watersheds experienced a total of 167 wildfires between 1967 and 2006. Human-caused fires account for 28 percent of all fires starts in the Planning Area while 72 percent were lightning related (see Table 3-1).

Fire regime, condition class, and fuel models can be used to determine forest health (stand structure and condition) across the landscape and provide a comparison to the historical natural conditions. Stand structure and condition can be determined based on the current condition compared to the historical natural condition across the landscape

Table 3-1. Fire History in the West Fork Cow Creek and Rogue River/Horsehoe Bend 5th Field Watersheds.

	Size Classes - Natural Caused Fires							Size Classes – Human-Caused Fires						
Ownership	A	B	C	D	E	F	G	A	B	C	D	E	F	G
BLM	89	19	4	1			1	22	8	3			2	
Private	6	1						3	2	3		1		
State								1	1					

Size Class A = Less than 1 acre
Size Class B = 1 to 9 acres
Size Class C = 10 to 99 acres
Size Class D = 100 to 299 acres
Size Class E = 300 – 999 acres
Size Class F = 1,000 to 4,999
Size Class G = Greater than 5,000 acres

Approximately 91 percent of the past wildfires were suppressed at less than 10 acres, or Size Classes A and B. Less than 9 percent of the fires were greater than 10 acres; the largest fire burned 11,088 acres in 2005 and was started by lighting.

One hundred and forty nine fires out of the 167 wildfires occurred on BLM-administered lands, 18 fires (11 percent) occurred on private (other ownership).

Reference Conditions

Fire Regime

Fire regime is a general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention but includes the influence of aboriginal burning (Agee 1993; Brown 1995). The five natural fire regimes are classified based on fire return interval (frequency) and fire severity (vegetation replacement) and its effects to the dominant overstory vegetation (Hardy et al. 1999: Schmidt et al. 2002). Fire severity is the degree to which vegetation and site conditions have been altered by fire. In addition, fire regimes help to describe the difference in fuel loading (dead fuels and live in the form of increased vegetation) between historical and current conditions. These changes in vegetation and fuel conditions determine an expected change in fire behavior and fire effects. This difference in many respects is attributed to fire exclusion, but also includes all human practices that would affect the extent, severity, or frequency of fire events compared to historical accounts.

Table 3–2 summarizes the five natural (historic) fire regime groups. Fire Regime groups within the Mule Creek and West Fork Cow Creek-Gold Mountain Creek 6th field watersheds were analyzed. These fire regimes represent historic fire regimes prior to the era of fire exclusion (pre-settlement period).

Table 3-2. Fire Regime Groups – Mule Creek and West Fork Cow Creek-Gold Mountain Creek 6th Field Watershed

Fire Regime Group	Fire Frequency	Fire Severity	Acres
I	0-35 years	Low to mixed severity Surface fires <75% dominant overstory vegetation replaced	27,706
II	0-35 years	High severity Stand-replacement fires >75% dominant overstory vegetation replaced	1,308
III	35-100+ years	Mixed severity Surface to stand-replacement fires <75% dominant overstory vegetation replaced	5,332
IV	35-100+ years	High severity Stand-replacement fires >75% dominant overstory vegetation replaced	1,167
V	200+ years	High severity Stand-replacement fires >75% dominant overstory vegetation replaced	178

Data derived from Landfire National Vegetation Dynamics Models http://www.landfire.gov/index.php

Approximately 78 percent of the 6th field watersheds fall within Fire Regime 1 and 15 percent within Fire Regime III. This may indicate that historically fires burned

throughout the watershed with varying degrees of intensity and severity. Fires likely burned in a mosaic pattern with the majority of fires remaining on the surface burning with low intensities close to the ground (surface fire). On occasion, fires burned with greater intensity allowing the fire to burn into the overstory canopy, burning single trees or small groups of trees (passive crown fire). During extreme conditions such as high wind events or drought, fires burned into the crown with very high intensities and stand-replacement severity (active crown fire). These fires reduced the surface fuel loading, promoted fire-tolerant species (ponderosa pine and Douglas-fir), reduced regeneration of fire-intolerant species (plants unable to physiologically withstand high fire intensities), and maintained an open forest structure providing habitat for species which require more open stand structure (Graham et al. 2004).

In the early 1900s, suppression of all fires became a goal of land management agencies. This altered the historic fire regime. Several fire return interval cycles have been eliminated throughout southwest Oregon mixed conifer forests. As a result, fuel loading has increased and plant succession has shifted to fire-prone vegetative conditions. Many stands, which were open, are now heavily stocked with conifers and hardwoods which have changed the horizontal and vertical stand structure. Surface and ladder fuels have increased, increasing the potential for large scale crown fires which were once historically rare.

The past 20 years in southwest Oregon indicate that there has been a trend toward more large fires which burn at higher intensities in vegetation types associated with low to mixed severity fire regimes (Fire Regime I and Fire Regime III).

Fire Regime Condition Classes (FRCC)

Fire regime condition classes offer an approach to evaluating potential fire hazard conditions and are most useful at the watershed and larger scales. The Mule Creek and West Fork Cow Creek-Gold Mountain Creek 6th field watersheds were used to evaluate FRCC. Treatment effects are reflected in changes in the acreage in each FRCC. FRCC is defined in terms of the amount of departure of conditions at a given time period (such as current or future) from historical vegetation and disturbance regimes. FRCC measures the degree to which an area has departed from its natural reference conditions, possibly resulting in changes to key ecosystem components, such as vegetation characteristics (i.e., species composition, structural stage, stand age, canopy closure, and mosaic patters) and fuel composition (i.e., surface fuels loading and canopy base height). Possible causes of departure include fire suppression, timber harvest, and grazing (Hann et al. 2003).

FRCC is categorized by three condition classes: FRCC 1 – no or little departure, FRCC 2 – moderate departure, and FRCC 3 – high departure (see Table 3-3).

Table 3-3. Fire Regime Condition Class Definitions		
Condition Class	Description	Potential Risk
1	Fire regimes within the natural or historical range. Less than 33 percent departure from the historical range of variability of vegetation characteristics; fuel composition, fire frequency, severity and pattern and other associated disturbances.	Fire behavior, effects, and other associated disturbances are similar to those that occurred prior to fire exclusion (suppression) and other types of management that do not mimic the natural fire regime and associated vegetation and fuels characteristics. Vegetation structure and composition are intact and similar to natural or historical range. The ecosystem is functioning within the historical range. Risk of losing key ecosystem components is low.
2	Fire regimes have been moderately altered from their natural (historical) range. 33 to 66 percent departure from the historical range of variability (e.g. fire frequencies have either increased or decreased from range by more than one fire return interval). This departure may result in moderate changes in fire and vegetation attributes.	Fire behavior, effects, and other associated disturbances are moderately departed. Vegetation structure and composition are moderately altered. This can result in moderate changes to one or more of the following: fire size, frequency, intensity, severity, or landscape patterns. Risk of losing key ecosystem components is moderate.
3	Fire regimes have been significantly altered from their natural (historical) range. Greater than 66 percent departure from the historical range of variability (fire frequencies may have departed by multiple return intervals). Vegetation attributes (composition and structure) have been significantly altered from the historical range.	Fire behavior, effects, and other associated disturbances are highly departed. Vegetation structure and composition are highly altered. This can result in dramatic change to fire size, frequency, severity, or landscape pattern. Risk of losing key ecosystem components is high.

FRCC helps to describe the change in surface fuel loading (dead and live fuels in the form of increased vegetation), canopy base height (ladder fuels, increased understory),

and canopy closure from natural reference regimes to current conditions. These changes in vegetation and fuel conditions help to determine the expected change in fire behavior and its effects. Fire exclusion and human activities have affected the extent of severity and/or fire frequency compared to historical accounts. Human intervention including fire suppression (fire exclusion) and timber management has delayed or decreased the fire return intervals and the natural periodic thinning processes. The elimination of the natural periodic thinning processes and the increase in surface fuels from fire exclusion has contributed to increased vertical and horizontal fuels, increasing the potential for higher severity wildfire events.

The FRCCs found on BLM administered lands within the 6th field watersheds are listed in Table 3-4. This table shows the number of acres and percent associated with each FRCC by natural reference fire regime. Fire Regimes 1 and 3 accounts for approximately 93 percent BLM administered lands. Fire Regimes 1 and 3 historically had low to moderate severity fires (see Table 3-2). Approximately 69 percent of watersheds occur in FRCC 2 and FRCC 3 moderate to high departure.

Table 3-4. Current Fire Regime Condition Classes by Fire Regime on BLM-Administered Lands for Mule Creek and West Fork Cow Creek-Gold Mountain Creek 6th Field Watersheds

Fire Regime	FRCC 1		FRCC 2		FRCC 3	
	Acres	Percent	Acres	Percent	Acres	Percent
I	6,925	31	12,831	57	2,809	12
II	106	11	102	11	736	78
III	1,323	49	513	19	889	32
IV	26	5	8	1	547	94
V	29	43	0	0	38	57
Total	8,409	31	13,454	50	5,019	19

Data derived from Landfire National Vegetation Dynamics Models http://www.landfire.gov/index.php

Forest management practices that modified the stand structure and age classes and fire suppression efforts have contributed to the greater degree of departure found in Fire Regimes 1 and 3. This departure may indicate the once frequent low to moderate severity surface fires that were more common historically could burn with higher intensities and result in greater severities when they escape initial attack efforts.

3.2.3 Environmental Effects

Methodology

Fuel Models

Fuel models are the collection of various components of vegetation, live and dead, which are used to estimate fire behavior potential. Fuel models fall within four different categories: grasses, shrubs, timber and slash. Each fuel model is described by the fuel load, the depth of the fuel bed, and fuel moisture.

Fire suppression strategies are the methods that firefighting personnel use in order to contain wildland fires. The strategy employed depends on the fire behavior. There are essentially two basic fire suppression strategies, direct attack and indirect attack.

> *Direct Attack* Any treatment applied directly to burning fuels such as wetting, smothering, or chemically quenching the fire or by physically separating the burning from unburned fuel (NWCG, 2007). This can be used when a fire is exhibiting surface or passive crown fire behavior because the fire intensity is low enough to allow for safe operations by firefighters at the fire's edge.
>
> *Indirect Attack* A method of suppression in which the control line is located some considerable distance away from the fire's active edge. This method is generally done in the case of a fast-spreading or high-intensity fire and to utilize natural or constructed firebreaks or fuel breaks and favorable breaks in the topography (NWCG, 2007). This method is also usually required when dealing with active crown fires.

There are many advantages of using the direct attack method compared to indirect attack. The most important of which is that direct attack is safer for fire suppression personnel than indirect attack because firefighters can escape into the already burned area if necessary. Also, direct attack minimizes the amount of area burned because massive backfiring operations are not required, meaning fires can be contained at smaller sizes (NWCG, 2004). Currently, fire suppression is contracted with the Oregon Department of Forestry (ODF) through the BLM Master Cooperative Fire Protection Agreement. This agreement gives the responsibility for fire protection of all public lands within the Planning Area to ODF. This contract directs ODF to take immediate action to control and suppress all fires. Their primary objective is to minimize total acres burned while providing for fire fighter safety. The agreement requires ODF to control 94 percent of all fires before they exceed 10 acres in size.

Fire Behavior Threshold

Fire behavior dictates which fire suppression strategy may be effectively employed, and therefore the extent to which a fire may grow and the subsequent damage it may cause. Because fire behavior is critical in fire suppression strategy, it serves as the threshold used for this fire effects analysis. The unit of measure of the threshold is considered in terms of flame length. Table 3-5 describes the correlation between flame lengths, fire suppression strategies and tactics. Flame lengths less than 4 feet can generally be effectively managed by fire suppression personnel, such as hand crews, using the direct attack method. Flame lengths greater than 4 feet generally require specialized equipment and indirect attack methods which are inherently more expensive and dangerous due to their complexity (Andrews, 1982).

Table 3-5. Fire Behavior and Suppression Activities		
Flame Length (in feet)	Fire Suppression Strategy	Fire Suppression Tactics
0-4	Direct Attack	Hand Crews
4-8	Direct Attack	Dozers, Engines, Aircraft
8-11+	Indirect Attack	Backfiring Operations

Fire behavior fuel models are a tool used to predict fire behavior, including flame length. The Scott and Burgan fuel model set from the "Standard Fire Behavior Fuel Models" publication of 2005 are used for this analysis. These fuel models are the most current standard set used by the wildland fire community. Fuel models that are capable of producing flame lengths up to four feet are considered within the fire behavior threshold while those with flame lengths greater than four feet exceed the threshold (Table 3-6).

Table 3-6. 2005 Fire Behavior Fuels Models		
Fuel Type	Fuel Model	Fire Behavior Threshold
Timber Litter	TL3	Within
Timber Litter	TL4	Within
Timber Understory	TU5	Exceeds
Slash/Blowdown	SB1	Within/Exceeds
Slash/Blowdown	SB2	Exceeds
Slash/Blowdown	SB3	Exceeds

3.2.3.1 Effects

Weather conditions, topography, and fuels characteristics are key elements which affect the intensity and severity of a wildfire. However, fuels characteristics can be modified, affecting fire behavior, and the degree of departure from the reference fire regime.

Commercial thinning prescriptions open forest canopies. Concerns have been raised regarding the opening of forest canopies and related increases in fire hazard in the past. Opening canopies can increase wind speeds and lower fuel moistures in the stand, which tends to exacerbate fire behavior. Also, opening canopies may allow brush to grow in the understory, which has the potential to increase surface and ladder fuels, depending on stand condition prior to thinning.

The probability of these concerns occurring is heavily dependent on site-specific variables such as slope, aspect, elevation, position on slope, adjacent stand conditions, and many others. Regardless of these variables, fuels are the critical factor in influencing fire behavior. Surface fuels may be increased in the short term due to the activity created slash, but once the slash is mitigated the stand experiences an overall reduction in surface fuels. Ladder fuels are reduced when the limbs and branches are removed from the site as trees are removed during the thinning process. Aerial fuels are removed as a function of opening the canopy during thinning.

The stands proposed for commercial thinning treatments in this Planning Area are managed stands. It is expected that these stands would receive fuel treatments to mitigate the slash as well as future treatments, either silvicultural or hazardous fuel related, that would maintain the stand to prevent overstocking and future accumulation of fuels. Also, studies show that thinning followed by sufficient treatment of surface fuels reduce the overall expected fire behavior, outweighing the changes in fire weather factors such as wind speed and fuel moisture (Weatherspoon, 1996).

Alternative 1 – No Action

The No Action Alternative would continue the current trend from mixed severity fires to more intense, stand-replacing, high severity fires throughout the Planning Area.

Direct and Indirect Effects

Human activities such as fire exclusion/suppression and intensive forest management have reduced the periodic natural thinning processes and reduced surface fuels which maintained a healthy, diverse forest structure. The fire regime would continue to depart from the natural (historic) regime of mixed severity to a regime of moderated to high severity as stand densities continue to increase. Without the periodic reduction of surface fuels, the increasing stand densities would promote the influx of more shade-tolerant, fire-intolerant species. This would lead to a loss of healthy, fire-tolerant species and an increase of unhealthy, suppressed trees. In addition, without fire or forest management, shrub species, surface fuel loadings, and conifer and hardwood regeneration would continue to increase, resulting in an increase of surface fuels, mid story ladder fuels and higher canopy densities.

With these conditions, wildland fire fighters and public users would be at greater risk of loss of life, property and natural resources. Direct attack capabilities would diminish as fuel loading increases. Initial attack success would decline over time resulting in larger fire size. Aerial attack effectiveness would decrease with extreme fire behavior and, as upper and mid level canopies close, penetration of aerial applications of water or retardant would be less effective in higher canopy densities. As a result, in the event of a wildfire, many stands would experience moderated to high severity stand replacing wildfires.

Cumulative Effects

Under the No Action Alternative the proposed treatment areas would continue to depart farther from the historical reference fire regime. Risk of losing key ecosystem components increase as fire regimes will continue to be altered from their natural (historical) range.

The results from past and present fire suppression efforts have reduced or eliminated the regular occurrence of low to mix severity fires within the West Fork Cow Creek and

Rogue River/Horseshoe Bend 5th field watersheds. Within FRCC 2 and FRCC 3 several cycles of fire frequencies have been departed by one or more fire return intervals.

The exclusion of fire and forest management, especially in Fire Regime 1 and 3 areas found throughout the watershed, would result in an increase in departure, vegetation structure and composition. Surface fuels loading and ladder fuels would increase, increasing the potential risk of larger fire (size class C, D, E, F and G) with increase in fire intensity and severity over the landscape.

Present and future fire suppression will continue through the BLM Master Cooperative Fire Protection Agreement with the Oregon Department of Forestry.

Alternative 2 Proposed Action

Under the Proposed Action, biomass would be removed where feasible within the commercial thinning units and pre-commercial thin unit. Biomass removal would mitigate any increase in fire behavior within the Planning Area. Areas where biomass removal is not feasible a short-term increase in fire behavior could occur as discussed in the direct and indirect effects section.

Direct and Indirect Effects

Under alternative 2, 145 acres are proposed for commercial thinning and 37 acres are proposed for pre-commercial thin. Biomass removal is proposed for the commercial thinning and pre-commercial thin units for 182 acres (Table 3-7). The pre-commercial thin unit would have approximately 16 tons per acre whereas the commercial thinning units average approximately 9 tons per acre of biomass. Units or partial units where biomass removal are not feasible due to economics or where activities would exceed RMP soil compaction or water quality guidelines, lop and scatter and/or slashing, handpile and handpile burn methods would be implemented to meet the desired stand prescription.

Table 3-7. Fuels Treatment Alternative 2

Unit No.	Acres	Harvest RX	Harvest Type	Proposed Fuels Treatments (acres)				
				Biomass Removal	Lop & Scatter	Slashing	Handpile & Cover	Handpile & Burn
9-1	16	CT	Tractor	16	0	0	0	0
9-2	16	CT	Tractor	16	0	0	0	0
9-3	7	CT	Cable	7	0	0	0	0
16-1	11	CT	Cable	11	0	0	0	0
17-1	57	CT	Tractor	57	0	0	0	0
21-5	37	PCT	--------	37	0	0	0	0
21-6	26	CT	Cable	26	0	0	0	0
21-7	7	CT	Tractor	7	0	0	0	0
21-8	5	CT	Tractor	5	0	0	0	0

Biomass removal would be completed by ground base equipment and/or cable yarding and would remove approximately 80 percent of the material cut during harvest or treatment. Biomass removal would help reduce activity slash and decrease fuel loading and fire behavior. Biomass removal would occur concurrent with harvest/treatment activities for each unit. Whole tree yarding is the preferred harvest method to facilitate biomass removal. Biomass would be stockpiled on previously disturbed areas near Anaktuvuk Saddle and Cold Spring. Biomass landings would be used for processing and hauling biomass to a biomass facility. After use the landings would be ripped, mulch and/or planted.

Table 3-8 compares the current fire behavior fuel type with the post harvest and biomass removal. Biomass removal is effective in reducing the rates of spread and flame lengths. The commercial thinning and pre-commercial thin units after biomass removal is expected to represent the Timber Litter 3 fuel type which is within the fire behavior threshold and fire suppression tactics for direct attack strategies with hand crews (Table 3-5 and Table 3-6).

Table 3-8. 2005 Fire Behavior Fuels Models

Harvest Prescription	Current Fuel Type / Fuel Models	Post-Treatment Fuel Type / Biomass Removal
Commercial Thinning	Timber Litter (TL3 & TL4)	Timber Litter (TL3)
Pre-commercial Thin	Timber Understory (TU5)	Timber Litter (TL3)

Subsequent underburning within 10 years is proposed for 182 acres within the commercial thinning units and pre-commercial thin unit. Underburning would occur in all units where it is operationally feasible based on access and the ability to minimize the potential of an escape and limit fireline construction. Conducting a future underburn after the completion of post-harvest treatment and biomass removal would reduce any remaining surface activity fuels and ladder fuels. This would minimize the burn intensities and result in less damage to residual trees, soils and organic material if a wildfire occurred and would likely promote native forbs and grasses. Units proposed for underburning following post harvest treatment would best represent the reference fire regime and would move towards FRCC1.

Cumulative Effects

The cumulative effects on stands not identified for treatment on all lands in the Mule Creek and West Fork Cow Creek-Gold Mountain Creek 6th field watersheds would continue to be shaped by events described in the No Action Alternative.

Alternative 2 would continue to maintain (unchanged) or move slightly towards the historical reference fire regime on BLM-administered lands. Fire regime condition class would continue to represent condition characterized by FRCC 2 for the commercial thinning units and pre-commercial thin units would move from FRCC 3 to FRCC 2 (Table 3-9). Potential risk of losing key ecosystem components would decrease for each treatment area by the reduction in fuel loading, canopy closure, fuels arrangement, and

creating strategically defensible fuel breaks for suppression of wildfire. Fire suppression resources would have a higher percentage to suppress fires by direct attack methods and keeping them to a Size Class A or B.

Table 3-9. Change in FRCC acres by Alternative 2.

Fire Regime	FRCC 1		FRCC 2		FRCC 3	
	Acres	Post	Acres	Post	Acres	Post
I	6,925	6,925	12,831	12,868	2,809	2772
Total	6,925	6,925	12,831	12,868	2,809	2772
Percent	31	31	57	57	12	12

The Alternative 2 cumulative impact to the change in total FRCC 1, 2, and 3 acres across the watersheds is very minimal. FRCC 1 shows no change, with a 37 acre decrease in FRCC 3 and 37 acre increase in FRCC 2.

Alternative 3

Alternative 3 is similar to Alternative 2 with the exception of no biomass removal is proposed. All activity slash would be either lop and scattered or slash, handpile and handpile burned.

Direct and Indirect Effects

Under Alternative 3, 105 acres of commercial thinning units would be lop and scatter and 40 acres along the main travel corridors would be slashed, handpile and handpile burned (Table 3-10).

Table 3-10. Fuels Treatment Alternative 3

Unit No.	Acres	Harvest RX	Harvest Type	Proposed Fuels Treatments (acres)				
				Biomass Removal	Lop & Scatter	Slashing	Handpile & Cover	Handpile & Burn
9-1	16	CT	Tractor	0	10	6	6	6
9-2	16	CT	Tractor	0	14	2	2	2
9-3	7	CT	Cable	0	6	1	1	1
16-1	11	CT	Cable	0	8	3	3	3
17-1	57	CT	Tractor	0	35	22	22	22
21-5	37	PCT	--------	0	0	0	0	0
21-6	26	CT	Cable	0	24	2	2	2
21-7	7	CT	Tractor	0	4	3	3	3
21-8	5	CT	Tractor	0	4	1	1	1

One hundred feet adjacent to main travel corridors within the Planning Areas are proposed for slashing, handpile and handpile burn. This would create a hazardous fuels buffer and provide for defensible space. This would allow fire managers more flexibility

in fire suppression strategy and tactics in case of a wildfire starting or burning through the proposed Planning Area.

Lop and scatter is the least effective method in reducing surface fuels because the activity fuels remain in the unit. There will be an increase in fire behavior and flame lengths would occur in the short term (1-3 years) until the activity slash decomposes or treated by underburning. The Fire Behavior Fuels Models, Table 3-11 shows a potential increase from a timber fuel model to a shrub blowdown fuel models in post-treatment condition.

Table 3-11. 2005 Fire Behavior Fuels Models

Harvest Prescription	Current Fuel Type / Fuel Models	Post-Treatment Fuel Type Lop and Scatter
Commercial Thinning	Timber Litter (TL3 & TL4)	Shrub Blowdown (SB1 & SB2)
Pre-commercial Thin	Timber Understory (TU5)	Shrub Blowdown (SB2 & SB3)

The commercial thinning units' short term effects would result in an increased fire hazard because the activity slash created from thinning would potentially transition the stands from their current TL3 and TL4 to SB1 and SB2. This may translate into increased fire behavior as the current timber fuel models produce flame lengths within the 4 foot threshold while the SB2 fuel model is characterized by flame lengths greater than 4 feet which exceeds the fire behavior threshold and fire suppression tactics for direct attack strategies with hand crews (Table 3-5 and Table 3-6). The current condition of the pre-commercial thin unit is Timber Understory Fuel Type TU5 with associated flame length of more than 4 feet. A slight increase in fire behavior post-treatment is expected from the transition of the current stand of TU5 to Shrub-Blowdown Fuel Type SB2 and SB3 with flame lengths above the 4 foot direct attack threshold.

Long term impacts (3-5 years) would decrease fuel loading and fire behavior as the activity slash decomposes and would be characterized by fuel type TL3. Underburning could occur in all units where it is operationally feasible based on access and the ability to minimize the potential of an escape and limit fireline construction. After the slash decomposes and/or underburned, the potential flame lengths in these stands may generally decrease compared to their current condition. This does not necessarily translate into a considerable decrease in fire hazard however, because many stands prior to thinning are characterized by fuel models with low flame lengths as are the stands after thinning, which typically resemble fuel model Timber Litter (TL3).

Cumulative Effects

Cumulative Effects are similar to Alternative 2 except for the short term impacts would have an increase in fuel loading and fire behavior.

In summary, the short term cumulative effect would be an increase in fire hazard due to the presence of slash left on 105 acres of commercial thinning units and 37 acres of pre-commercial thin unit. Long term effects would be mitigated through decomposition of slash and underburning.

The Alternative 3 cumulative impact to the change in total FRCC 1, 2, and 3 acres across the watersheds is very minimal. FRCC 1 shows no change with a 37 acre decrease in FRCC 3 and a 37 acre increase in FRCC 2 (Table 3-9).

3.3 Economic Feasibility

3.3.1 Affected Environment

Conifer stands proposed for harvesting are 39 to 48 years of age. The BLM appraises for any proposed timber sale and accounts for all anticipated purchaser costs and values to estimate a minimum bid price. Proposed commercial thinning of these stands would be offered for bid by timber operators, generally ensuring a net profit after accounting for expenditures such as building roads, decommissioning roads, disposing of slash and replacing culverts. If anticipated costs are higher than values, a no bid sale could occur and would not meet the purpose and need of providing timber to the economy. However, the estimated values of timber of today could change positively and a potential negative sale could turn positive depending on market timing of the sale. There is a risk of a no bid sale when values of timber are low and costs are relatively high, such as the Anaktuvuk Thin Project.

Methodology. To determine the economic feasibility of each alternative, current values of timber and forest management costs were utilized to provide a relative net value. Because timing of the sale could affect the actual bid price, a risk value of either low, medium or high would be associated with the economic feasibility analysis.

3.3.2 Environmental Effects

3.3.2.1 Effects of Alternative 1 (No Action) on Economic Feasibility

Alternative 1 would not meet the purpose and need of providing "forest products that will help maintain the stability of local and regional economies, and contribute valuable resources to the national economy on a predictable and long term basis."
Under this alternative, there would be no offering of timber for sale and no associated forest management activities would occur at this time. Alternative 1 would have a low risk of not being economically feasible at this time. Foregoing all forest management activities such as pre-commercial thinning and brush removal might increase the risk of wildfire and forest insect and disease which would incur higher futures costs without offsetting revenues.

3.3.2.2 Effects of Alternative 2 (Proposed Action) on Economic Feasibility

The current value of timber per thousand board feet (industry standard for scaling timber) and current associated forest management costs were utilized to determine the economic feasibility of Alternative 2. All values are the most current estimates as of March 2009 and are used to make relative comparisons between alternatives.

Table 3-12 Alternative 2 Economic Feasibility

Units	Silviculture Prescription	Estimated Acres	Volume/acre (mbf)/ac	Total estimated mbf	Timber Value	Yarding costs	Falling Costs	Haul Costs	Total Logging Cost	Temp. Route Construction. Miles	Total Temp. Route Costs	Fuels Treatment Costs	Biomass Removal Cost	Biomass Revenue	Total Value Less Costs
9-1 9-2 9-3 16-1 17-1 21-6 21-7 21-8	CT	145	8	1,160	$365,400	$219,240	$23,200	$93,800	$336,240	1.1	$59,156	0	$29,353	$23,490	$-35,859
21-5	PCT	37											$41,625	$10,782	-$30,843
Total Estimated Revenue for Alternative 2															**$-66,702**

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3.3.2.3 Effects of Alternative 3 on Economic Feasibility

The current value of timber per thousand board feet (industry standard for scaling timber) and current associated forest management costs were utilized to determine the economic feasibility of Alternative 3. All values are the most current estimates as of March 2009 and are used to make relative comparisons between alternatives

Table 3-13 Alternative 3 Economic Feasibility

Units	Silviculture Prescription	Estimated Acres	Volume/acre (mbf)/ac	Total estimated mbf	Timber Value	Yarding costs	Falling Costs	Haul Costs	Total Logging Cost	Temp. Route Construction. Miles	Total Temp. Route Costs	Total Fuels Treatment Costs	Total Value Less Costs
9-1 9-2 9-3 16-1 17-1 21-6 21-7 21-8	CT	145	8	1,160	$365,400	$219,240	$23,200	$93,800	$336,240	0.68	$41,883	$21,671	$-34,394
Total Estimated Revenue for Alternative 3													**$-34,394**

Table 3-14 Cost Estimates (March 2009) o		
Forest Management Activity	**Cost**	**Unit**
Timber Value	$315	mbf
Tractor logging	$175	mbf
Cable logging	$250	mbf
Haul cost	$70	mbf
Falling Cost	$20	mbf
Temp Rt. Construct	$500	Station (100')
Temp Rt. Decommission	$200	mile
Road Maintenance	$4	mile
Lop & Scatter	$26	acre
Fuels Costs SL,HP,HPB)	$663	acre
Biomass removal/ton	$15.5	ton
Biomass Revenue	$11	ton

3.4 Soils

3.4.1 Affected Environment

This action is proposed within two HUC 5 watersheds. The Planning Area is comprised of three HUC 7 drainages. Approximate 2300 acres (29%) of this Planning Area is located within the 16,400 acre West Fork Cow Creek- Gold Mountain Creek HUC 6 sub-watershed. The West Fork Cow Creek-Gold Mountain Creek HUC 6 sub-watershed accounts for about 29% of the 55,900 acre West Fork Cow Creek HUC 5 watershed. The remaining 5500 acres (71%) of this Planning Area is located within the 19,500 acre Mule Creek HUC 6 sub-watershed. The Mule Creek HUC 6 sub-watershed comprises about 19% of the 104,000 acre Rogue River Horseshoe Bend HUC 5 watershed. The actual units proposed within this Planning Area total approximately 60 acres within the West Fork Cow Creek- Gold Mountain Creek HUC 6 sub-watershed and 170 acres within the Mule Creek HUC 6 sub-watershed.

Physical, chemical, and biological properties of soils determine the natural level of productivity of a soil. These properties also determine how different soils will respond to natural and anthropogenic disturbances. For soils to be productive for timber management soils must be able to acquire, maintain, and release water and nutrients needed by trees during the growing season. Soils also must be able to support the microorganisms necessary to maintain proper nutrient cycling and plant nutrition. Forest management activities can affect these soil properties by displacing and compacting soils and removing topsoil organics.

3.4.1.1 Soils and Soil Complexes

The following describes some of the important characteristics and management limitations of the soils and soil complexes found within the Planning Area. The selection of proper Best Management Practices (BMP's) and Project Design Features that would be implemented during a project are based on these characteristics and management limitations.

West Fork Cow Creek- Gold Mountain Creek sub-watershed

Based on information obtained in the Soil Survey of Douglas County Area, Or (2003), soil types found within proposed harvest units and adjacent to haul routes located within the West Fork Cow Creek- Gold Mountain Creek sub-watershed include the following.

Table 3-15: Soil Types in West Fork Cow Creek- Gold Mountain Creek sub-watershed

Soil Name	Parent Material	Landscape location	Surface Soil Texture	Soil Texture at Depth	Soil Depth	Soil drainage	soil permeability	Identified Management Limitations **
Zalea-Pyrady complex *	colluvium and residuum from metasedimentary & metavolcanic rock	ridges with slopes ranging between 15-30%	Gravelly loam to clay loam	gravelly clay loam to gravelly silty clay	20-60"	moderately well	slow to moderately slow	1, 2, 3, 5, 6
Orford gravelly silt loam	colluvium and residuum from sandstone and	ridges and side slopes with slopes	gravelly silt loam	silty clay loam	60+"	well drained	moderately slow permeability	1, 2, 3, 5, 7

	siltstone	less than 30%						
Orford-McDuff complex	colluvium and residuum from sandstone and siltstone	side slopes and ridges between 30-60% slope	gravelly silt loam to silty clay loam	silty clay loam to soft bedrock	20-60”	well drained	moderately slow permeability	1, 2, 3, 5, 7, 8

* The Zalea-Pyrady soil complex represents approximately 85% of the soils within this sub-watershed.

****** These management limitations were identified by NRCS based on the physical, chemical, and biological properties of the soil

The below management limitations correspond to representative numbers in table

1- Hazard of accelerated erosion 2- Susceptibility to soil compaction 3- Plant competition
4- Short growing season 5- Areas of moderately slow permeability 6- Shallow depth of soil in some areas
7- Low soil strength 8- Steepness of slope and slope stability 9- Low available water capacity

Mule Creek sub-watershed

The Soil Survey of Curry County, Oregon (2005), identified the following soils and soil complexes within proposed harvest units and adjacent to haul routes located within the Rogue River Horseshoe Bend-Mule Creek sub-watershed.

Table 3-16: Soil Types Rogue River Horseshoe Bend-Mule Creek sub-watershed

Soil Name	Parent Material	Landscape location	Surface Soil Texture	Soil Texture at Depth	Soil Depth	Soil drainage	soil permeability	Identified Mngmt Limitations **
Zalea-Pyrady-Yorel complex *	colluvium and residuum from metasedimentary and metavolcanic rock	nearly level to convex interdunal areas with slopes ranging from 15-30%	gravelly loam to clay loam	gravelly clay loam to gravelly silty clay	20-60”	moderately well drained	slow to moderately slow permeability	1, 2, 4, 6, 9, 10, 11, 12
Dumont-Acker-Kanid complex	mudstone and metasedimentary rock	concave, convex, and gently sloping areas of summits on slopes less than 30%	gravelly to very gravelly loam	clay loam, gravelly clay loam, or weathered sandstone	40-60”	well drained	moderately slow to moderately rapid permeability	1, 2, 9, 13, 14
Bobsgarden-Rilea-Yorel complex	metasedimentary or metavolcanic rock	concave and convex areas of summits on slopes less than 30%	gravelly to very gravelly clay loam	gravelly to very gravelly clay loam	20-60”	well drained	moderately slow permeability	1, 2, 4, 6, 9, 10, 11, 12
Bobsgarden-Rilea-Euchrand complex	metavolcanic and metasedimentary rock	shoulders, narrow summits, concave & convex areas of backslopes- on slopes from 30-60%	gravelly to very gravelly loam	very gravelly to extremely gravelly clay loam, gravelly clay loam, or sandstone	10-60”	well drained	moderately slow permeability	1, 2, 4, 6, 8, 9, 10, 11

* The Zalea-Pyrady-Yorel complex represents approximately 75% of the soils within the units in the Mule Creek sub-watershed.

****** These management limitations were identified by NRCS based on the physical, chemical, and biological properties of the soil

The below management limitations correspond to representative numbers in table

1- Hazard of accelerated erosion 2- Susceptibility to soil compaction 3- Plant competition
4- Short growing season 5- Areas of moderately slow permeability 6- Shallow depth of soil in some areas
7- Low soil strength 8- Steepness of slope and slope stability 9- Low available water capacity
10- Susceptibility of surface layer to water erosion 11- Duration of snow cover
12- Frost heave 13- Doughtiness in summer 14- Clayey textures

Table 3-17: Soils identified within Proposed Project Units

Unit #	Soil Types

9-1	Zalea-Pyrady complex
9-2	Zalea-Pyrady complex (85%)/ Orford gravelly silt loam (15%)
9-3	Zalea-Pyrady complex (75%)/ Orford gravelly silt loam (25%)
16-1	Zalea-Pyrady complex (65%)/ Orford-McDuff complex (35%)
17-1	Zalea-Pyrady complex (10%)/ Zalea-Pyrady-Yorel complex (60%)/ Dumont-Acker-Kanid complex (20%)/ Bobsgarden-Rilea-Euchrand complex (10%)
21-1	Zalea-Pyrady-Yorel complex (75%)/ Bobsgarden-Rilea-Euchrand complex (25%)
21-2	Zalea-Pyrady-Yorel complex
21-3	Zalea-Pyrady-Yorel complex (95%)/ Bobsgarden-Rilea-Yorel complex (5%)
21-4	Zalea-Pyrady-Yorel complex (80%)/ Bobsgarden-Rilea-Yorel complex (20%)
21-5	Zalea-Pyrady-Yorel complex
21-6	Bobsgarden-Rilea-Euchrand complex (90%)/ Zalea-Pyrady-Yorel complex (10%)
21-7	Zalea-Pyrady-Yorel complex (90%)/ Bobsgarden-Rilea-Euchrand complex (10%)
21-8	Zalea-Pyrady-Yorel complex

3.4.1.2 Soil Compaction

Soil compaction is defined as the packing together of soil particles by physical pressure at the soil surface that results in an increase in soil density and a decrease in pore space. A decrease in soil pore space results in restricted movement of water, nutrients, air, and plant roots, and as such generally decreases site productivity in most soil types. Reduced pore space can also result in increases in surface runoff that can result in accelerated erosion rates. In this Planning Area most soils are moderately susceptible to compaction, especially during wet periods.

Currently soil properties in both HUC 6 sub-watersheds have been altered by past timber management and road construction activities. Based on field surveys, historic aerial photos (circa1965), and current satellite imagery, the three HUC 7 watersheds that form Anaktuvuk Thin Planning Area currently have considerable existing compaction from existing road footprints, landings, and skidtrails.

- Roads

  Road acres that are presently visible on landscape occupy approximately 183 miles or 2.3% of the Planning Area. Many of these roads are system roads that will continue to be used and maintained for future management on public and private lands. As such these roads are considered to be a permanent soil resource loss. Roughly 15% of the roads in this Planning Area appear to have been used and subsequently abandoned. These roads are now in various stages of naturally decompacting and re-vegetating. Given the soil types, and climate of these watersheds, it would be expected that advanced stages of recovery on these roads will take 50-70 years if no further use or decommissioning actions occur (Wert and Thomas, 1981).

  There are existing road footprints totaling approximately 2.5% compaction per unit within the 9-1, 9-2, and 9-3 unit boundaries in the West Fork Cow Creek-Gold Mountain Creek HUC6 sub-watershed. Within the commercial harvest unit17-1 road compaction was calculated to be approximately 2%, within unit 21-

5 road compaction was calculated to be approximately 1.5%, and in units 21-6, 21-7, and 21-8 unit compaction from roads was calculated to be approximately 5-6% per unit. None of these roads have ditchlines or cross drains, but are all are still severely compacted. At the HUC 6 scale, compaction from road acres was calculated at 313 acres (1.9%) within the West Fork Cow Creek-Gold Mountain Creek, and 237 acres (1.2%) within the Mule Creek HUC 6 sub-watershed.

Research indicates that changes in runoff timing may occur when roads acres occupy 3-4% of the watershed (WPN, 1999). Road-caused changes in watershed hydrology are generally a result of reduced infiltration on compacted surfaces, more rapid routing of runoff in ditchlines, and the interception of surface and subsurface flows (Ziemer, 1981). As such, it would be expected that localized changes in infiltration and surface and subsurface flows are currently affecting runoff timing within or adjacent to some individual units, but would not be measurably affected within the Planning Area or HUC 6 sub-watersheds in this Planning Area.

Total road density within the Planning Area, including both the system roads and those roads that are presently recovering, is 6.0 mi/mi^2. Road density within the West Fork Cow Creek- Gold Mountain Creek sub-watershed is presently 5.1 mi/mi^2, and in the Mule Creek HUC 6 sub-watershed is currently 3.3 mi/mi^2.

- <u>Landings and skidtrails</u>
  Existing landings and skidtrails have been estimated to occupy approximately 1.7% of the landscape within this Planning Area. This estimate was calculated based on typical rates of compaction within past harvest units for tractor, cable, or helicopter yarding systems[1]. Estimated compaction from landings and skid tails is 134 acres within the Planning Area. At the HUC 6 scale, compaction from landings and skidtrails was calculated at 327 acres (2.0%) within the West Fork Cow Creek-Gold Mountain Creek, and 208 acres (1.1%) within the Mule Creek HUC 6 sub-watershed. Currently within the boundaries of the West Fork Cow Creek- Gold Mountain Creek commercial harvest units, compaction from existing

[1] Medford Change Detection (2002), 1965 aerial photography, and satellite imagery was used to estimate units that have been harvested in the past 43 years.. Though this does not account for all potentially affected soils, it is the extent of the data that is presently available. This lack of data is not considered to be a measurable source of error since compaction recovers naturally over time, and it is expected that those soils that may have been unaccounted for during this analysis (as a result having been harvested prior to the first available year of data) would be in an advanced stage of recovery. This is based on average natural recovery for the soil types, climate, and elevation of these HUC 7 drainages, and on the skidtrail conditions observed during field visits to units within these drainages that are known to have been harvested 40-50 years ago. Yarding systems were identified based on known data, visible landscape scar patterns, or slope steepness. Where slope steepness was used as a last resort, compaction numbers for tractor yarding were used anywhere that tractor yarding was physically possible, and cable was used for remaining areas. Tractor yarding on slopes over 35% has not been permitted on federal lands since the implementation of the Northwest Forest Plan in 1994. Units identified as having been tractor yarded prior to NWFP BMP's are calculated at 25% compaction, and at 12% following the implementation of the NWFP. All cable yarded units are calculated at 4% compaction, and helicopter units are calculated at 1% compaction. These compaction percentages are based on research by Swanston and Dryness, 1973, Adams and Froehlich, 1981, Dryness, 1967, and Clayton,[1]

skidtrails and landings was calculated to be approximately 21% of each unit, with the exception of unit 16-1 which was calculated at 12%.

For units within the Mule Creek sub-watershed, existing compaction levels vary. Within the commercial harvest unit17-1 unit compaction from skidtrails and landings was calculated to be approximately 14%; within unit 21-5 unit compaction from skidtrails and landings was calculated to be approximately 5%and in harvest units 21-6, 21-7; and 21-8 unit compaction from landings and skidtrails was calculated to be approximately 8-10%.

The combined existing conditions have resulted in 317 acres, or 4.1% total compaction within the three HUC 7 watersheds that form the Anaktuvuk Thin Planning Area. The total existing compaction for the two HUC 6 sub-watersheds that are partially occupied by this Planning Area is calculated to be 640 acres or 3.9% for the West Fork Cow Creek-Gold Mountain Creek HUC 6 sub-watershed, and 445 acres or 2.3 % for the Mule Creek HUC 6 sub-watershed. Road densities that are currently above what is considered to be Properly Functioning Conditions within a watershed by the National Marine Fisheries Service (NMFS) and the percentage of compacted acres within the Planning Area have altered subsurface flow patterns and increased surface erosion. This conclusion was substantiated during field observations where frequent rilling across compacted soils and localized high water tables upslope of skidtrails was repeatedly found.

3.4.1.3 Soil Displacement, Erosion, and Topsoil Loss

Topsoil refers to the upper horizons of the soil profile that contain organic debris critical for sustaining the essential nutrients to preserve soil productivity. Soil displacement refers to the moving of the surface soils as a result of some applied force. When soil displacement occurs soil horizons may become mixed, essential soil nutrients, water, and soil organisms may be rearranged or removed, and topsoil may become rutted. These alterations to the soil profile or soil characteristics may result in accelerated erosion and/or a reduction in productivity.

Soil displacement and erosion can occur during forest management activities when mechanized harvesting or yarding equipment drives over or yards timber across poorly vegetated, bare, or wet soils. Where logging or prescribed burning operations result in exposed soil, surface erosion can occur when rain splash or overland flow causes the detachment of soil particles during wet conditions, or when gravitational and wind movement causes detachment of particles during dry weather conditions. Vegetative cover reduces the particle detachment rate, and through the binding capacity of root masses, the sediment transport rate (NOAA Fisheries, 2004, (Larson and Sidle, 1981; Harvey et al. 1994)). Therefore surface erosion, from disturbed soils that are not compacted, is normally greatly diminished within 3-5 years, following the regrowth of vegetation. During certain conditions these activities may also lead to soil compaction, which has been accounted for and discussed above.

Erosion can also occur as a result of the blading of road surfaces, the use of inadequately rocked and natural surface roads, ditchline maintenance, an insufficient number of road cross drain culverts, undersized or poorly placed cross drain culverts, and in areas of exposed soil. Roads can cause increased channelization of hillslopes and mass wasting (Wemple and Jones, 2003). Un-vegetated ditchlines, road surfaces, and cross drains all mobilize eroded soils.

Based on field surveys, historic aerial photos (circa 1965), and current satellite imagery, the three HUC 7 watersheds that form Anaktuvuk Thin Planning Area currently have accelerated surface erosion as a result of timber management and the preserving of public access routes.

- Roads

  Within the Planning Area, there are approximately 62 miles rocked and natural surface system roads that currently used and maintained as needed. These roads are open to the public and are periodically used and maintained as haul routes for private and government timber operations. These roads contribute to accelerated erosion within the watersheds at different levels depending on the type of use and moisture levels of the road surface during the period of use. Seasonal use of these roads is implemented by the federal government to reduce erosion and protect road surface integrity.

  There are additionally 11 miles roads that appear to have been used in the past and are now naturally decommissioning within the Planning Area. These roads are located in various positions on the landscape, from ridgetop to stream valley. Based on the fieldwork that was done for this project, more than 80% of these roads are currently stabilized by ground litter and low lying ground cover vegetation, and as such are not resulting in accelerated erosion. Many of these roads are outsloped and do not have ditchlines. The remaining 20% are causing various levels of erosion as a result of poor drainage design and rutting, accelerated surface flows, and the slumping of fill slopes and cut banks. One of these roads with accelerated erosion is located within the 9-1, 9-2, and 9-3 units.

  Ditchline maintenance currently occurs as needed on approximately 50 miles of road within the Planning Area. Ditchline maintenance includes the removal of debris and vegetation where it is impeding water flow, and the digging out or "pulling" of ditchlines where they are lacking the ability to carry the volume of water that is entering them without spilling out across the road surface. This maintenance results in an increase in erosion within ditchlines for the first season until bare soils regain stability and protective vegetation growth. However, following this first season, ditchline maintenance results in an overall reduction in chronic erosion of the road surface.

  Cross drain culverts on road systems in the Planning Area are generally spaced further apart than recommended under the Oregon Administrative Rules for forest roads (OAR 629-625-0330). However, upgrading this spacing is only necessary to prevent exceeding water quality standards. In most instances ditchlines appear

to be functioning properly, having adequate movement of water and little scour. Downspouts of some cross drains could be upgraded by installing splash pads or downspouts to reduce erosion. Funding at this time is limited for this type of non-emergency work.

Roads proposed for haul and maintenance have been inventoried and currently are not in need of additional cross drains to prevent accelerated erosion or that exceed water quality standards. During field review, one cross drain culvert leading into unit 9-1 was found to have caused a considerable gully to form within the fillslope of the 32-9-16.1 road and into the existing footprint through the 9-1, 9-2, and 9-3 units. This gully appears to be stabilizing but has resulted in chronic offsite erosion in the past.

A broken pipe carrying water from a springbox to a pond was also located just outside of unit 17-1. This break is currently causing water to flow down the ditchline and through the 17-1 unit outside of the stream draw. This problem is currently being considered under a separate Title II project planned for the summer of 2009

- Landings, Skidtrails, and Yarding Corridors
  It was calculated that approximately 182 acres have had soil displacement and subsequent erosion as a result of the construction and use of landings, skidtrails, and yarding corridors during timber management operations within the past 40 years. Many of these disturbed acres are no longer visible on the ground and appear to have recovered as a result of the re-growth of vegetation.

  Based on calculations of existing tractor compaction, and soil displacement, disturbance, and compaction the past 10 years on cable and helicopter units, and those acres that are still visibly altered on the ground, 123 acres (1.6%) are still potentially exhibiting accelerated erosion. It is estimated that accelerated erosion at the HUC 6 scale are still evident on 262 acres (1.6%) within West Fork Cow Creek-Gold Mountain Creek and on 164 acres (0.8%) within the Mule Creek sub-watershed, based on recent harvest activity. Proposed brushing units 21-1, 21-2, 21-3, and 21-4 were harvested during the Cold Mule Timber Sale in 1997-2000. These units were primarily cable yarded with the exception of 9 acres in the lower portion of unit 21-3, which used ground based yarding. At present, only the portion that was yarded using ground based equipment still has any visual indications of soil disturbance. These acres have been included in the calculations for soil disturbance, given above.

- Prescribed Burning and Past Wildfire History
  Prescribed burning has the potential to reduce productivity for the first 2-5 years depending on the amount of soil organic matter that is consumed. Severe fires can increase the risk of dry ravel and rill erosion on severely burnt, steep sites by reducing the adhesive properties of water found within the organic matter, microbes, fungal filaments, woody debris, and roots in the soil matrix (Barnett,

1989). There are currently 77 acres of fuels treatments that are occurring or have occurred in the past five years within the Planning Area. All 77 acres were within the Mule Creek HUC 6 sub-watershed. These treatments were designed to limit the extent and magnitude of onsite erosion, and to protect from offsite erosion. These treatments help to reduce the probability of an intense, large scale wildfire occurring by reducing fuel loading and horizontal continuity within the stand.

Heat resulting from large scale and intense fires can damage soil biology such as mycorrhizae, nitrifying bacteria, and other soil organisms in proportion to burn intensity, adversely affecting soil productivity for up to 10 years (Barnett, 1989). GIS data indicates that there have been no uncontrolled fires reported in the Planning Area or within the West Fork Cow Creek-Gold Mountain Creek, and 5 fires within the Mule Creek HUC 6 sub-watershed in the last 10 years. Four out of five of these were less than 10 acres in size, and three were less than 0.3 acres. The extent of the loss to soil productivity of these small fires, though expected to be negligible, has not been measured.

There are presently no indications of accelerated erosion within the acres that have previously burned in these sub-watersheds, as burned areas appear to have recovered with the re-growth of vegetation and water retaining organic ground cover, such as logs, branches, and other forest debris. The 2005 Blossom Fire is the only occurrence of a large wildfire in these HUC 6 sub-watersheds. The Blossom Fire encompassed approximately 11,800 acres within the Mule Creek HUC 6 sub-watershed. Approximately 6,000 of the acres within the Mule Creek HUC 6 sub-watershed did not burn, or burned at a very low intensity, removing only fines. Another approximately 3,700 acres burnt at a low intensity, removing fines and small understory vegetation.

On approximately 1,900 acres, moderate burn intensities killed a majority of the understory vegetation and created small patch openings within the forest canopy as a result of single tree torching or the removal of young plantations. The remaining approximately 200 acres that burnt within the Mule Creek HUC 6 sub-watershed during the Blossom Fire, burned at high to extreme fire intensities resulting in small crown fires that consumed a majority of the understory vegetation, and killed nearly all the overstory trees within the stand.

In areas where high to extreme fire behavior has occurred, increased sediment, and reduced areas of productivity are common. Within the boundary of the Blossom fire, areas that burned at low intensity would have no signs of accelerated erosion, and would be expected to have improved soil productivity due to the natural thinning of the brush and competing understory vegetation. On these remaining 2,100 acres that burned at moderate to high intensity, some signs of accelerated erosion are still visible. On moderately burned site this is rare, occupying less than 10% of the affected landscape, but within the areas of high burn intensity approximately 40% of the soils are still exhibiting signs of accelerated erosion. This is primarily due to reductions in ground cover and

overstory canopy, combined with the sanitation of soil nutrients and the biological components of the soil. As such, up to 275 acres (1.4%) are still showing signs of accelerated erosion within the Mule Creek HUC 6 sub-watershed. These acres all occur outside the Planning Area.

3.4.1.4 Soil Productivity

Soil productivity, in a forested setting, is primarily the soil's capacity to support plant growth as reflected by some index of biomass accumulation. Losing a soil's plant growth capacity also means losing the site's ability to sustain timber production and other important ecological values. Soil productivity is affected by soil bulk compaction, soil displacement, and by changes and reductions in soil nutrients. Litter, humus, soil wood, and certain key properties of the surface mineral layers of forest soils are most easily and commonly disturbed by yarding activities, yet they are crucial to forest productivity. Minimizing the amount of soil displacement, compaction, and topsoil loss will generally improve stand development.

Combined, these past impacts to soils in the form of compaction, displacement, topsoil loss, and erosion, described above, have resulted in alterations to the physical, chemical, and biological properties of the soils. These alterations have reduced the productivity of the soils by up to 50% on 459 acres, or 5.9% within the three HUC 7 drainages. The total existing productivity loss for the two HUC 6 sub-watersheds that are partially occupied by this Planning Area is calculated to be 725 acres or 4.4% for the West Fork Cow Creek-Gold Mountain Creek HUC 6 sub-watershed, and 852 acres or 4.4% for the Mule Creek HUC 6 sub-watershed.

Fuels treatments and thinning treatments generally reduce the amount of vegetation competing for soil nutrients and water, thus increasing site productivity. There are currently 10 acres of fuels treatments occurring within the Planning Area. There are currently no acres that are being treated in the West Fork Cow Creek-Gold Mountain Creek sub-watershed. Within the Mule Creek HUC 6 sub-watershed, there are a total of 25 acres being treated. These treatments are occurring independent of this project proposal, to reduce fire danger, and to improve stand health.

Young stand management treatments generally reduce the amount of vegetation competing for soil nutrients and water, thus increasing site productivity. Young stand management treatments are currently being implemented in both the West Fork Cow Creek-Gold Mountain Creek and Mule Creek HUC 6 sub-watersheds, independent of this project proposal, to reduce fire danger, and to improve stand health.

3.4.2 Environmental Effects

3.4.2.1 Alternative 1 (No Action)

Direct and Indirect Effects

Under Alternative 1, soil resources on BLM lands would remain in their present condition. There would be no increase in the amount of compaction or the number of acres presently experiencing accelerated erosion as a result of this project, because there

would be no activities occurring that would result in alterations to the physical, chemical, and biological properties of the soils. As such, there would be no change in soil productivity as a result of this project. Existing compacted acres that are not associated with active road systems would continue to slowly improve over time as tree roots and other natural processes begin to break apart soil particles.

Within the West Fork Cow Creek-Gold Mountain Creek HUC 6 sub-watershed it would be expected that actions with the potential to affect soil productivity, such as timber harvest and road building, would continue to occur at current rates on non-federal lands. Additionally, it would be expected that timber harvest and road building on public lands would increase in both HUC 6 sub-watersheds, consistent with the proposed WOPR. Any future actions on federally managed lands would be analyzed under future environmental documents.

Current fuels treatments and young stand management activities within this Planning Area and the West Fork Cow Creek-Gold Mountain Creek and Mule Creek HUC 6 sub-watersheds would continue to occur. These projects were previously completed under Categorical Exclusion documents. Fuels treatments may result in minor increases in onsite soil erosion and temporary decreases in soil productivity as described above, but like young stand management activities would generally improve overall stand conditions and productivity in the long-term. Under Alternative 1, the existing road drainage problem, and related gullying of the compacted area below that was identified on the 32-9-16.1 road would remain until future funding becomes available. All stocking trends within stands would remain the same until such time that another action is analyzed in the future.

3.4.2.2 Alternative 2 (Proposed Action)

Direct and Indirect Effects

Management actions proposed under Alternative 2 would result in soil compaction, displacement, erosion, and topsoil loss that would reduce soil productivity within the Planning Area in both the West Fork Cow Creek- Gold Mountain Creek and the Mule Creek HUC 6 sub-watersheds. Field surveys were used to identify and defer all areas that have the potential to result in chronic erosion or landsliding in addition to mitigating measures and PDF's. BMP's and PDF's (Section 2.3.6) were then identified that would be implemented to address the remaining general management concerns identified for each soil type within these sub-watersheds. Components of the actions identified in the Proposed Action (Section 2.4.2) that would result in an impact to the physical, chemical, or biological properties of the soils found within this Planning Area are described below, and separated by sub-watershed.

<u>Soil Compaction</u>

- <u>Roads</u>

  West Fork Cow Creek- Gold Mountain Creek sub-watershed

  0.38 miles of temporary route would be re-constructed within units 9-1, 9-2, and

9-3. This temporary route would utilize an existing road footprint that is currently severely compacted as a result of past harvest activities. Re-construction of this route would initially eliminate any natural recovery that has occurred, and remove all existing vegetation that is growing on or within 5 feet of the road surface. Roots of this vegetation have been primarily responsible for any minor breaking up of the compacted soil that has occurred within this road footprint. Following use of this re-constructed route, it would be fully decommissioned including sub-soiling to a depth of at least 18". This would eliminate 60-90% of the compaction (Andrus and Froehlich, 1983) within this existing footprint which currently accounts for approximately 2.5% compaction within each affected harvest unit. As such, utilization of this route would result in a partial reduction in total compacted acres on 0.8 acres within the 9-1, 9-2, and 9-3 units.

Re-construction and subsequent decommissioning of this temporary route would therefore result in a minor net improvement in the total soil productivity within these units.

Two temporary routes totaling 0.31 miles would be constructed within units 9-3 and 16-1. These routes would result in 0.6 acres of new compaction within the West Fork Cow Creek- Gold Mountain Creek sub-watershed, 0.1 acres within unit 9-3 and 0.5 acres within unit 16-1. These temporary routes would also be decommissioned following use.

Mule Creek sub-watershed
Three temporary routes totaling 0.43 miles would be re-constructed within units 17-1, 21-6, and 21-7. These temporary routes would utilize existing route footprints that are currently severely compacted as a result of past harvest activities. As with the temporary routes to be reconstructed within the West Fork Cow Creek- Gold Mountain Creek sub-watershed, re-construction of these routes would initially eliminate the slight natural recovery that has occurred since these units were last harvested, and would remove all existing vegetation that is growing on or within 5 feet of the road surfaces. Following use of these re-constructed routes, they would be fully decommissioned, including sub-soiling, which would eliminate 60-90% of the compaction within footprints that currently are severely compacted.

Re-construction and subsequent decommissioning of these temporary routes would therefore result in a minor net improvement in the total soil productivity within these units.

- Landings and Skidtrails
  West Fork Cow Creek- Gold Mountain Creek sub-watershed
  Soil compaction from landings and skidtrails would occur on approximately 13.2 acres as a result of management actions within this sub-watershed. These landings and skidtrails would be utilized during the extraction of commercial timber and biomass within units 9-1, 9-2, 9-3, 16-1, and 17-1. Of these acres,

approximately 7.5 acres would be new landings. Most of these landings would be continuous landings along existing road systems, which would reduce the amount of new compaction estimated above.

All landings outside the existing permanent road prism would be rehabilitated following use. Rehabilitation includes sub-soiling and planting that would reduce the effects of this soil compaction. The remaining 5.7 acres of compaction would occur as a result of skidtrails, including turnouts, and cable yarding operations. Skidtrails would be decommissioned following use unless needed for future harvest. No more than 12% compaction would remain within each unit, as needed for future harvest, including current acres of severe compaction. Skid trial construction would result in approximately 0.2 acres of compaction within the riparian reserve, outside the EPZ. There would be approximately 0.02 acres of new skidtrails constructed within unit 9-1 and 0.17 acres within unit 9-2. There would also be one landing expanded, outside the EPZ but within the riparian reserve of unit 9-1. This landing would need to expand an existing footprint by approximately 0.15 acres. Skidtrails within riparian reserves, if left, would count toward the total amount of existing compaction that could remain within the unit.

Mule Creek sub-watershed

Soil compaction from landings and skidtrails would occur on up to 19.5 acres within the Mule Creek sub-watershed. Landings and skidtrails would be utilized during the extraction of commercial timber, pre-commercial timber, and biomass. Up to 7.0 acres would be compacted during the construction of new landings. All landings would be rehabilitated following use, greatly reducing the long term effects of soil compaction. The remaining 12.5 acres of compaction would occur as a result of skidtrails and cable yarding operations. Skid trial construction would result in approximately 0.2 acres of compaction within the riparian reserve, outside the EPZ. As with skidtrails within the Gold Mountain Creek portion of the Planning Area, no more than 12% compaction would remain within each tractor unit, including current acres of severe compaction.

Summary of Effects to Soil Compaction (Alternative 2)

The combined management actions in these sub-watersheds would result in an additional 33.3 acres of compacted soils over new footprints. An additional 1.5 acres would also be re-compacted resulting in a minor setback in the natural de-compaction of these footprints. However, due to subsequent sub-soiling on these acres, there would be a net improvement to the amount of compaction on these existing footprints. Under Best Management Practices in the RMP (p. 166) up to 12% skidtrail compaction is allowed to remain within a unit until final entry. As such, new or utilized skid trials within ground based units would be sub-soiled following use, leaving only skidtrails needed for future harvest on no more than 12% of the acres in each unit.

Existing compaction within all proposed units that would be yarded using ground based methods are at, or exceed this 12% threshold except units 21-5, 21-7 and 21-8. Therefore, ground based yarding would result in an overall reduction in severely

compacted acres within the 9-1 and 9-2 units of up to 9-21%, and within unit 17-1 up to 2-14%, depending on the number of existing skidtrails that are utilized. Though sub-soiling does not restore all essential soil properties, it does ameliorate effects of compaction by 60-90%, and allows for water, nutrient, and root infiltration to occur. As a result, effects to soil productivity on all sub-soiled acres would be similar to that which occurs during topsoil removal and soil displacement.

Under Alternative 2, total compaction within the Planning Area would increase from 317 acres to 350 acres, or 4.5%. Compacted acres within the West Fork Cow Creek-Gold Mountain Creek HUC 6 sub-watershed would increase negligibly from an estimated 640 acres or 3.9% to 654 acres or 4.0%, not including reductions in compaction from sub-soiling. Within the Mule Creek HUC 6 sub-watershed compacted acres would increase from an estimated 445 acres or 2.3% to 464.5 acres or 2.4%. However, severe compaction that is a result of past management activities that left skidtrails and roads severely compacted would be reduced in a majority of units. The decommissioning of 1.5 acres of existing temporary routes, and up to 13 acres of existing skid trials, would reduce soil recovery time on up to 14.5 acres that are currently severely compacted within this Planning Area by up to 50 years.

Soil Displacement, Erosion, and Topsoil Loss

- Roads

  West Fork Cow Creek- Gold Mountain Creek sub-watershed

  Within units 9-1, 9-2, and 9-3, 0.38 miles of temporary route would be re-constructed over an existing route footprint that has had extensive gully erosion over the first 0.15 miles. This erosion is a result of a severe compaction that vastly reduced infiltration rates, and a culvert with an unarmored outlet that is currently resulting in channelized surface flow during winter storms and spring runoff. Under Alternative 2 this temporary route would be reconstructed over the existing footprint, filling the existing gully and re-contouring the road subsurface to eliminate the depression that the route currently resides within. This would allow for proper drainage of the route during its period of use, and would provide for more efficient subsurface flow patterns to emerge following decommissioning of the route. Re-construction and use of this route would result in measurable increases in onsite erosion. This route is located in the upper portion of the slope where it crosses two perennial, and two intermittent headwater stream channels. As a result, this route would also cause minor increases in offsite erosion within these headwater stream channels during installation of the road culverts, use, and decommissioning of the route. Offsite erosion will be discussed further under stream sedimentation within the water quality section (3.5.2.2).

  Accelerated onsite erosion would likely be evident for 3-5 years following decommissioning of this route, until ground vegetation can reestablish over the route surface. This however will only result in minor reductions in site productivity that would not exceed what is presently occurring from the road compaction, and will not cause any instability or long term impacts to unit 9-1, 9-2, or 9-3, or to this sub-watershed. In addition, during decommissioning of the

road a rock splash pad would be installed on the problematic culvert above to reduce the outflow force and protect the soil. The area immediately below the culvert that is currently channelizing direct surface flows out of the culvert and chronically eroding the soil would be sub-soiled as well. This series of corrections to this system would also flow from the culvert to infiltrate into the soil and into the stream channel below, reducing chronic erosion within this unit. All actions associated with the construction of this route would be done during the dry season same year as use, including all actions related to improving the culvert and decommissioning the route.

Two temporary routes totaling 0.31 miles would be constructed within units 9-3 and 16-1. Both of these routes would be located outside the EPZ and would not cross any streams. The 9-3 route is proposed to extend the temporary route discussed above. This route would be 0.06 miles (317 feet) in length and would be located on a finger ridge within unit 9-3. Construction, use, and decommissioning of this route would result in erosion, which due to low percentage of adjacent slope and lack of transport mechanism, would remain onsite within the remaining ground litter and vegetation. This accelerated onsite erosion would be expected to become undetectable within 3-5 years as vegetation reestablishes. T

The 16-1 route would be 0.25 miles in length and located on the ridge between the two HUC 6 sub-watersheds, and would not cross any streams. Effects associated with the construction, use, and decommissioning of this route would be the same as those discussed above for the 9-3 route. Both of these routes would be decommissioned following use. This would eliminate compaction related interception and subsurface flow issues that can lead to chronic erosion, and would allow for these footprints to re-vegetate quickly.

In addition to the temporary routes above, a total of 5.2 miles of existing road would be used for hauling of project related timber and biomass within the Planning Area of this sub-watershed. Of these roads 4.8 miles would have BST surfacing, which acts like pavement in that there would be no accelerated erosion as a result of using these roads. These BST roads would not receive any additional maintenance above what occurs during scheduled maintenance independent of this project. Approximately 0.04 miles of rocked and natural surface road would receive dry season maintenance including spot rocking, road blading, and ditchline reconstruction, as necessary to protect the integrity of the road and limit the amount of offsite erosion. Because these routes would only be used during the dry season, surface erosion from hauling would be minimized. Most of this erosion from maintenance and hauling activities would filter out within the hillslope vegetation downslope of outsloped roads, or at cross drain outlets on ditched roads. Where haul roads cross streams, maintenance and hauling activities would result in minor amounts of offsite erosion. These stream crossings will be discussed within the Water Quality section (3.5.2.2).

Mule Creek sub-watershed

Three temporary routes totaling 0.43 miles would be re-constructed within units 17-1, 21-6, and 21-7. The 17-1 route would be 0.29 miles in length, and is located in the upper portion of the slope. The 21-6 route would be 0.09 miles in length. It would be reconstructed over a road footprint just off a ridge peak that separates the two HUC 7 drainages that form the Mule Creek portion of the Planning Area. The 21-7 route would also be located on this ridge. It would be 0.05 miles in length.

Construction, use, and decommissioning of these temporary routes would result in an increase in erosion; but due to the lack of stream crossings, low slopes, and sufficient ground cover, sediment would remain onsite. This accelerated onsite erosion would be expected to become undetectable within 3-5 years as vegetation re-establishes. However, this erosion would only result in minor reductions in site productivity that would not exceed what is presently occurring from the existing road compaction. Since these routes would be sub-soiled following use, none of these temporary routes would cause any instability or long term impacts to this sub-watershed.

A total of 3.9 miles of road would be used for hauling within the Planning Area portion of this sub-watershed. Of these roads 1.1 miles would be rocked and natural surface roads. Effects associated with the maintenance and dry season use of these roads would be the same as discussed above for haul roads located in the West Fork Cow Creek- Gold Mountain Creek portion of the Planning Area.

- <u>Landings, Skidtrails, and Yarding Corridors</u>

  West Fork Cow Creek- Gold Mountain Creek sub-watershed

  The construction, use, and rehabilitation of landings and skidtrails would result in up to 13.2 acres of accelerated erosion within this sub-watershed. Skid trial construction would occur within the riparian reserve, but outside the EPZ which is designed to filter out any accelerated erosion from upslope practices that are implemented using best management practices. Skidtrail construction in the riparian reserve would result in approximately 0.2 acres of erosion, approximately 0.02 acres within unit 9-1 and 0.17 acres within unit 9-2. There would also be one landing expanded, outside the EPZ in within the riparian reserve of unit 9-1. This landing would expand an existing footprint by approximately 0.15 acres. Full rehabilitation of this entire landing would reduce overall long term erosion that is presently occurring as a result of this landing.

  Mule Creek sub-watershed

  Within this sub-watershed, the construction, use, and rehabilitation of landings and skidtrails would result in up to 19.5 acres of accelerated erosion. In unit 17-1 skid trial construction would occur on 0.2 acres within the riparian reserve, but outside the EPZ which is designed to filter out any accelerated erosion from upslope practices that are implemented using best management practices.

Rehabilitation of landing and skidtrails includes sub-soiling and planting that would restore infiltration rates and subsurface flow patterns, which would greatly reduce the amount of erosion, and the time needed for these sites to recover. Because all landings, skidtrails, and yarding corridors would be subject to dry season use, would be winterized or rehabilitated prior to fall rains, and would occur outside riparian buffers (EPZ's), erosion would remain onsite within the existing vegetation and ground litter. Accelerated erosion from landings, skidtrails, and yarding corridors would not be expected to be measurable beyond the third year following the implementation of this action due to the depth of the organic layer within the soil profiles where these actions would take place.

- Prescribed Burning

  West Fork Cow Creek- Gold Mountain Creek sub-watershed

  This project proposes prescribed handpile and burn treatments on up 15 acres within this sub-watershed to reduce hazardous fuels along roads within treatment units. The remaining 45 acres of slash within these units would initially be treated by loping and scattering the slash through the unit. These initial treatments would be followed up within 10 years by a low intensity underburning treatment on up to a total of 60 acres within this sub-watershed.

  Mule Creek sub-watershed

  This project proposes prescribed handpile and burn treatments on up 40 acres within this sub-watershed to reduce hazardous fuels along roads within treatment units. The remaining 82 acres of slash within these units would initially be treated by loping and scattering the slash through the unit. As with the West Fork Cow Creek- Gold Mountain Creek sub-watershed, these initial treatments would be followed up within 10 years by a low intensity underburning treatment on up to a total of 85 acres within this sub-watershed.

  Under Alternative 2 prescribe handpile burning would occur within 100 feet of roads in commercial thinning units that are not economically feasible for biomass extraction. Handpile burning would result in accelerated onsite erosion from the soils within the extent of the handpiles, which would immediately become trapped within the organic matter of the surrounding soils. Onsite erosion on up to 20% of the soils in units that would be handpile burned would not be discernible following the first vegetative growing season due to the minor impact that this action would have on the soils and the extensive amount vegetation that would remain onsite. Underburning treatments that would follow up initial handpile burning and lop and scatter treatments would generally target the 1 hour, and 10 hour fuels, leaving a considerable portion of the larger organic debris on site. However even when burned under prescription, as much as 15% of the soils units may be affected from pockets of moderate to intense burning. These soil pockets would be subject to accelerated erosion, but as with the handpiles, erosion would become trapped within the organic matter of the surrounding soils and remain onsite. Effects from underburning may remain visible within the unit for between 3-5 years until ground vegetation reestablishes on the site.

Effects to Soil Productivity

West Fork Cow Creek- Gold Mountain Creek and Mule Creek sub-watersheds

- Soil Compaction and Disturbance

  Combined soil compaction and disturbance from the management actions proposed would result in an overall reduction in soil productivity on up to 33.3 acres within this Planning Area. This would result in an overall reduction in soil productivity of up to 4.5% within the Planning Area. Within units 9-1, 9-2, and 17-1 productivity within the riparian reserves of each unit would be reduced by up to 0.2%, 1.2% ,and 1.15% respectively due to skidtrail related compaction and disturbance. These calculations take into account that all roads, landings, and an equal number of miles of new skidtrails would be sub-soiled following use. It does not take into account sub-soiling of other existing skidtrails, as the total number of skidtrails that would be sub-soiled is unknown. The Medford RMP allows for up to 12% compaction to remain within units that are not on their final entry. Though it cannot be accurately calculated until the actual acres of sub-soiling is known, it would be expected that in nearly all ground based harvest units, the sub-soiling of skidtrails would result in a net decrease in compacted acres, and as such an overall improvement in productivity. Additionally on acres that had reductions in productivity that were not a result of compaction, or on compacted acres that were subsoiled, negative effects to productivity would be immeasurable within 3-10 years as sites revegetate and soils regain the physical, chemical, and biological components necessary for stand productivity. Acres that remain compacted following this action would be expected to exhibit a measurable decrease in productivity for up to 70 years in this soil type.

  Within the West Fork Cow Creek-Gold Mountain Creek HUC 6 sub-watershed the number of acres with reductions in productivity from soil impacts would increase from 725 acres (4.4%) to 751 acres (4.6%) as a result of actions associated with this project. Within the Mule Creek HUC 6 sub-watershed reductions in productivity would increase from 775 affected acres (4.0%) to 817 acres (4.2%).

- Commercial and Pre-Commercial Thinning

  Non-commercial and commercial thinning treatments on 182 acres within this Planning Area would result in soil compaction and disturbance as described above. However these treatments would also benefit stand productivity by effectively increasing water and nutrient availability. The even-aged dense stands within this Planning Area are a product of past timber management activities and aggressive fire suppression activities (Forest Operations Inventory database). Many of these stands are currently showing reduced growth rates as a result of overstocked conditions that are causing competition for soil nutrients and water. These treatments would reduce competition on the retained trees for light, nutrients, water and growing space.

  Thinning within 25 acres in the riparian reserves would be designed to expedite

the development of late successional, multi-story habitat conditions and restore the species composition and structural diversity of the plant communities, needed to achieve ACS and riparian reserve objectives (Medford RMP, pp. 22, 26).

Riparian reserves within the proposed units are dominated by smaller diameter stands of Douglas-fir and some hardwoods. Most riparian stands are lacking large wood debris, downed logs, and large tree structure. Thinning of dense riparian reserves would reduce competition on the retained trees for light, nutrients, water and growing space, allowing trees would develop larger canopies, display better vigor and put on diameter growth faster than if left untreated. Canopy gaps would also be created in these zones to promote multiple-layered stands and promote species diversity that is a key element in late-successional habitat. Production of wood volume is a bi-product of this treatment, but is not a primary objective. These treatments would be specifically designed to promote the development of future large woody debris and multi-story canopies. Despite minor reductions in productivity from soil compaction and disturbance during yarding operations, models indicate that these treatments would improve the overall productivity of these stands within one decade.

- Fuels Treatments
  Lop and scatter treatments on up to 127 acres would result in a neutral to positive effect on productivity within units. These treatments would not result in any measurable compaction or disturbance, but would add to the amount of organic litter on the forest floor, providing a protective cover and, as this material breaks down essential nutrients. During up to 55 acres of initial handpile burning treatments, and up to 145 acres of subsequent underburning treatments, short-term productivity losses would primarily be due to a reduction in nutrient rich topsoil organics and the overheating of soil organisms.

  Heat resulting from moderate to high intensity fires can damage soil biology such as mycorrhizae, nitrifying bacteria, and other soil organisms in proportion to burn intensity, can adversely affecting soil productivity for up to 10 years (Barnett, 1989). Underburning activities would be done in strict accordance with the burn plan for each unit, and would follow BMP's that focus heavily on maintaining a cooler burn in order to reduce losses in productivity that result from over heating the soils. Overall, underburning, and pile and burn treatments are low to moderate intensity and to not consume all organics or eliminate all soil organisms. Accounting for areas in the centers of handpiles or areas of moderately or intensely burned soils in underburning units, productivity can be reduced for between 3-10 years by up to 4.5% within fuels reduction units.

- Biomass Removal
  Biomass removal on up to 182 acres would occur in the same footprint as commercial and pre-commercial timber harvest activities, and as such would not add to the amount of compacted or disturbed soil within units. Biomass removal would result in a minor negative effect to productivity in areas that are in need of the essential nutrients such as carbon and nitrogen that the breakdown of forest

litter provides. The number and spatial arrangement of these areas is unknown. However, to help mitigate for this, biomass treatments under this alternative would leave approximately 20% of the organics onsite.

Summary of Effects to Soil Productivity (Alternative 2)
The combined management actions in these sub-watersheds that would result in soil compaction, disturbance, topsoil loss, or erosion would not exceed a reduction in productivity of more than 5%, and would be designed to maintain or improve soil productivity within the Planning Area as directed by both the Medford RMP and the proposed WOPR.

3.4.2.3 Alternative 3 (No Biomass)

Direct and Indirect Effects
Soil Compaction

- Roads
  The effects to this element would be identical to Alternative 2 within the Planning Area, the West Fork Cow Creek-Gold Mountain Creek HUC 6 sub-watershed and the Mule Creek HUC 6 sub-watershed.

- Landings and Skidtrails
  West Fork Cow Creek-Gold Mountain Creek sub-watershed
  The effects to this element would be identical to Alternative 2 within the West Fork Cow Creek-Gold Mountain Creek HUC 6 sub-watershed

  Mule Creek sub-watershed
  Under this alternative, biomass would not be removed from any units. As such, 37 acres proposed for pre-commercial thinning would have no soil compaction under this alternative. This would result in soil compaction from landings and skidtrails on up to 15.1 acres within this sub-watershed. Landings and skidtrails would be utilized during the extraction of commercial timber. Approximately 7 acres would be compacted during the construction of new landings. All landings would be rehabilitated following use, greatly reducing the long term effects of soil compaction. The remaining 8.1 acres of compaction would occur as a result of skidtrails and cable yarding operations. Skid trial construction would result in approximately 0.2 acres of compaction within the riparian reserve, outside the EPZ. As with skidtrails within the Gold Mountain Creek portion of the Planning Area, no more than 12% compaction would remain within each tractor unit, including current acres of severe compaction.

Summary of Effects to Soil Compaction (Alternative 3)
The combined management actions in these sub-watersheds would result in an additional 28.9 acres of compacted soils over new footprints within this Planning Area. An additional 1.5 acres would also be re-compacted resulting in a minor setback in the natural de-compaction of these footprints. However, due to subsequent sub-soiling on these acres, there would be a net improvement to the amount of compaction on these

existing footprints. New or utilized skid trials within ground based units would be sub-soiled following use, leaving only skidtrails needed for future harvest on no more than 12% of the acres in each unit. Existing compaction within all proposed units that would be yarded using ground based methods are at, or exceeding this 12% threshold except units 21-5, 21-7 and 21-8. Therefore, ground based yarding would result in an overall reduction in severely compacted acres within the 9-1 and 9-2 units of up to 9-21%, and within unit 17-1 up to 2-14%, depending on the number of existing skidtrails that are utilized.

Under Alternative 3, total compaction within the Planning Area would increase from 317 acres to 346 acres, or 4.5%. Compacted acres within the West Fork Cow Creek-Gold Mountain Creek HUC 6 sub-watershed would increase negligibly from an estimated 640 acres or 3.9% to 650 acres or 4.0%, not including reductions in compaction from sub-soiling. Within the Mule Creek HUC 6 sub-watershed compacted acres would increase from an estimated 445 acres or 2.3% to 460 acres or 2.4%. However, severe compaction that is a result of past management activities that left skidtrails and roads severely compacted would be reduced in a majority of units. The decommissioning of 1.5 acres of existing temporary routes, and up to 13 acres of existing skid trials, would reduce soil recovery time on up to 14.5 acres that are currently severely compacted within this Planning Area by up to 50 years.

Soil Displacement, Erosion, and Topsoil Loss

- Roads
  The effects to this element would be identical to Alternative 2 within the Planning Area, the West Fork Cow Creek-Gold Mountain Creek HUC 6 sub-watershed and the Mule Creek HUC 6 sub-watershed.

- Landings, Skidtrails, and Yarding Corridors
  West Fork Cow Creek- Gold Mountain Creek sub-watershed
  The effects to this element would be identical to Alternative 2 within the West Fork Cow Creek-Gold Mountain Creek HUC 6 sub-watershed.

  Mule Creek sub-watershed
  Within this sub-watershed, the construction, use, and rehabilitation of landings and skidtrails would result in up to 15.1 acres of accelerated erosion. In unit 17-1 skid trial construction would occur on 0.2 acres within the riparian reserve, but outside the EPZ which is designed to filter out any accelerated erosion from upslope practices that are implemented using best management practices.

  Rehabilitation of landing and skidtrails would restore infiltration rates and subsurface flow patterns, which would greatly reduce the amount of erosion, and the time needed for these sites to recover. Because all landings, skidtrails, and yarding corridors would be subject to dry season use, would be winterized or rehabilitated prior to fall rains, and would occur outside riparian buffers (EPZ's), erosion would remain onsite within the existing vegetation and ground litter. Accelerated erosion from landings, skidtrails, and yarding corridors would not be

expected to be measurable beyond the third year following the implementation of this action due to the depth of the organic layer within the soil profiles where these actions would take place.

- Prescribed Burning
  The effects to this element would be identical to Alternative 2 within the Planning Area, the West Fork Cow Creek-Gold Mountain Creek HUC 6 sub-watershed and the Mule Creek HUC 6 sub-watershed.

Effects to Soil Productivity

West Fork Cow Creek- Gold Mountain Creek and Mule Creek sub-watersheds

- Soil Compaction and Disturbance
  Combined soil compaction and disturbance from the management actions proposed would result in an overall reduction in soil productivity on up to 28.9 acres within this Planning Area. This would result in an overall reduction in soil productivity of up to 4.5% within the Planning Area. Within the West Fork Cow Creek-Gold Mountain Creek HUC 6 sub-watershed the number of acres with reductions in productivity from soil impacts would increase from 725 acres (4.4%) to 747 acres (4.6%) as a result of actions associated with this project. Within the Mule Creek HUC 6 sub-watershed reductions in productivity would increase from 775 affected acres (4.0%) to 817 acres (4.2%).

  Soil compaction, disturbance, topsoil loss, or erosion would not exceed a reduction in productivity of more than 5%. The effects would be identical to Alternative 2.

- Commercial and Pre-Commercial Thinning
  The effects to this element would be identical to Alternative 2 within the Planning Area, the West Fork Cow Creek-Gold Mountain Creek HUC 6 sub-watershed and the Mule Creek HUC 6 sub-watershed.

- Fuels Treatments
  The effects to this element would be identical to Alternative 2 within the Planning Area, the West Fork Cow Creek-Gold Mountain Creek HUC 6 sub-watershed and the Mule Creek HUC 6 sub-watershed.

- Biomass Removal
  There would be no biomass extraction under Alternative 3. Biomass extraction therefore would have no effect to soil productivity under this alternative.

Summary of Effects to Soil Productivity (Alternative 3)

The combined management actions in these sub-watersheds that would result in soil compaction, disturbance, topsoil loss, or erosion would not exceed a reduction in productivity of more than 5%, and would be designed to maintain or improve soil productivity within the Planning Area as directed by both the Medford RMP and the proposed WOPR.

Cumulative Effects to Soils

In compliance with Medford RMP, a cumulative effects analysis for this project was completed at the HUC 6 sub-watershed scale. The RMP guidance to "minimize detrimental impacts on water and soil resources resulting from the cumulative impact of land management activities within a watershed" is to delineate watersheds for cumulative effects analyses using natural drainage boundaries and third to fifth order drainages (approximately 500 to 10,000 acres)," (RMP, 153). Cumulative effects should therefore be written using a watershed delineated boundary that, as defined by acreage and stream order in the RMP, at the HUC 7 or HUC 6 scale.

This direction further states that this scale also needs to incorporate the entire project boundary to the lowest point at which a beneficial use could be affected. Therefore the cumulative effects analysis is scaled out from the project level HUC 7 scale, to the HUC 6 or HUC 5 watershed scale, until the point that any effects on water quality and other beneficial uses are no longer detectable.

If a project has no detectable effects at the HUC 6 sub-watershed scale, than the project would not have detectable effects downstream at the HUC 5 watershed scale. As such, that project cannot incrementally add to effects occurring as a result of other projects in the HUC 5 watershed, no matter what the current condition of that HUC 5 watershed. Since this project is located within several HUC 7drainages of the West Fork Cow Creek and Mule Creek HUC 6 sub-watersheds, it is analyzed using a combination of past and proposed direct and indirect effects, as well as the foreseeable effects of any other federal or non-federal project.

A combination of cable, tractor, and helicopter yarding was used within the West Fork Cow Creek-Gold Mountain Creek and Mule Creek HUC 6 sub-watersheds in past harvesting operations. Roads were also constructed to access and remove timber products from these areas. As a result of these activities about 1085 acres (3.0%) of compacted soils and the equivalent of up to 542 acres (1.5%) of lost soil productivity has occurred within these sub-watersheds in the last 48 years. Potential acres of compacted ground and soil productivity losses up to 33.3 acres and 16.7 acres respectively under Alternative 2, and 28.9 acres and 14.5 acres respectively under Alternative 3. There are no future timber management projects proposed on federally managed lands within this Planning Area that would affect soil resources.

The West Fork Cow Creek-Gold Mountain Creek HUC 6 sub-watershed is approximately 47% federally managed land. The Mule Creek HUC 6 is entirely federally managed public lands. In the foreseeable future, it is proposed that federally managed lands will be managed under the direction of the Western Oregon Plan Revision (WOPR). This plan would use "the same or improved practices that were used from 1995 to 2006 under the current resource management plan" to provide for soil productivity (WOPR pg.837).

There are no known private projects occurring within the West Fork Cow Creek-Gold Mountain Creek or Mule Creek HUC 6 sub-watersheds. Aerial photo and satellite imagery that was analyzed on ArcMap GIS indicates that, based on stand age, up to 6000

acres of timber could be available for private harvest within the 16,400 acre West Fork Cow Creek-Gold Mountain Creek HUC 6 sub-watershed in the near future. These activities would result in a decrease in the overall productivity of this sub-watershed due to harvest related disturbance and compaction. Though the amount of productivity loss that may occur on private in the near future is unknown, past trends, since the implementation of the Northwest Forest Plan, indicate that up to 744 acres of compaction could occur as a result of future harvest on private lands. This would reduce soil productivity on up to approximately 372 acres (2.3%) in the next 5-10 years. Any additional road building needed to provide access to non-federal actions would further reduce productivity. The number of potential future road miles needed to implement non-federal projects within the West Fork Cow Creek-Gold Mountain Creek HUC 6 sub-watershed is unknown, but current road patterns indicate that no more than 6 miles would be necessary to implement harvest activities within the 6000 acres of stands that could be harvested in the next 5-10 years. As a result of this road construction there would be up to 13 acres (0.1%) of compacted soil and lost soil productivity.

The past, present, and future actions would result in up to 1842 acres (5.1%) of compacted soil and the equivalent of up to 927 acres (2.6%) of lost soil productivity within these sub-watersheds under Alternative 1, and up to 1875 acres (5.2%) and 1871 acres (5.2%) of compacted soil and the equivalent of up to 944 acres (2.6%) and 942 acres (2.6%), under Alternatives 2 and 3 respectively.

Additionally, past and current timber yarding, road building, road maintenance, road reconstruction, and road use are all contributing to soil disturbance and erosion within these sub-watersheds. Harvest activities using BMP's result generally only result in onsite erosion, but in areas of past harvest or private harvest activities where riparian buffers are absent or limited, this erosion can contribute to offsite sedimentation of streams. This will be discussed in section 3.4.2.2 cumulative effects to water quality. Chronic erosion is currently ongoing at the sub-watershed scale due to road densities between 3.3 and 5.1mi/mi^2 (US Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) target of 2 mi/mi^2 for streams to be considered in properly functioning condition (USFS, et al., 2004)) and as a result of these HUC 6 watersheds having approximately 90% unpaved roads. This project would not increase the number of permanent roads within these sub-watersheds, as all roads would be decommissioned following use. Hauling and maintenance would occur on 1.5 miles of unpaved roads within these sub-watersheds as part of this project. On existing federally controlled roads that are not scheduled for routine maintenance, problems would only be resolved as emergencies occur, or additional funding becomes available. Road densities within the West Fork Cow Creek-Gold Mountain Creek and Mule Creek HUC 6 sub-watersheds would be expected to remain at approximately 5.1 mi/mi^2 and 3.3 mi/mi^{2,} respectively, as no future permanent road construction is planned on federally managed lands within these sub-watersheds.

Erosion has also been affected by 5 uncontrolled fires totaling 11,811acres, which have occurred in the within the Mule Creek HUC 6 sub-watershed in the last 10 years. Most of these were relatively small, with 3 fires being under 0.25 acres and 1fire being less than

10 acres in size. Erosion from wildfires generally is greatly reduced within 3-5 years as vegetation regrows. The extent of the loss to soil productivity, though expected to be a relatively small percentage of the acres that have burned, has not been measured. The Blossom Fire occurred in 2005 within these sub-watersheds. It burned 3,700 acres at a low intensity, removing fines and small understory vegetation, and approximately 1,900 acres, moderate burn intensities killed a majority of the understory vegetation and created small patch openings within the forest canopy as a result of single tree torching or the removal of young plantations. The most significant soil impacts related to this fire occurred on the remaining approximately 200 acres that burned at high to extreme fire intensities resulting in small crown fires that consumed a majority of the understory vegetation, and killed nearly all the overstory trees within the stand. In areas where high to extreme fire behavior has occurred, increased sediment, and reduced areas of productivity are common.

Within the boundary of the Blossom fire, areas that burned at low intensity would have no signs of accelerated erosion, and would be expected to have improved soil productivity due to the natural thinning of the brush and competing understory vegetation. On these remaining 2100 acres that burned at moderate to high intensity, some signs of accelerated erosion are still visible. On moderately burned site this is rare, occupying less than 10% of the affected landscape, but within the areas of high burn intensity approximately 40% of the soils are still exhibiting signs of accelerated erosion. This is primarily due to reductions in ground cover and overstory canopy, combined with the sanitation of soil nutrients and the biological components of the soil. As such, up to 280 acres (1.5%) are still showing signs of accelerated erosion within the Mule Creek HUC 6 sub-watershed as a result of this fire.

Short term soil erosion and productivity has also been affected by the 25 acres of fuels treatments that have occurred in the past five years within the Mule Creek HUC 6 sub-watershed. Hazardous fuels reduction and non-commercial thinning treatments that generally reduce the amount of vegetation competing for soil nutrients and water, and therefore increase stand productivity and the development of large woody debris (LWD) within riparian stands. Hazardous fuel reduction projects would still be implemented on approximately 40 acres in conjunction with other projects, and non-commercial thinning would continue to occur independent of this project on 776 acres under all alternatives within the next five years. These actions would reduce the likelihood of a higher intensity, large scale uncontrolled fire that would otherwise likely reduce productivity on some sites in the long and short term. Fuels treatments and non-commercial thinning would be under the Young Stand Management CE.

Because BMP's would be followed, short term impacts would be within the scope of the Medford District EIS, and erosion would not be expected to move off-site because large organic ground cover would remain on site and soils would not be excessively heated, thus maintaining much of their adhesive properties.

3.5 Water Resources

3.5.1 Affected Environment

West Fork Cow Creek- Gold Mountain Creek sub-watershed

The West Fork Cow Creek watershed has been designated a Tier 1 Key Watershed in the RMP and is an integral part of the Aquatic Conservation Strategy. Key watersheds are areas identified as being crucial for maintenance and recovery of habitat for "at- risk" stocks of anadromous salmonids and resident fish species. Fish distribution in this Planning Area is limited by natural barriers such as steep gradient stream channels, low summer flows, and a lack of spawning gravel. Tributary streams in this Planning Area are generally confined channels that are quite steep, with gradients in excess of 20%. These tributary streams also tend to have very low or intermittent summer flows. Channel roughness in the upper reaches of all streams within this HUC 6 sub-watershed is high.

Water quality within the West Fork Cow Creek- Gold Mountain Creek HUC 6 sub-watershed is generally in fair to good condition. The quality of aquatic habitat within this sub-watershed has been affected by stream sedimentation, summer water temperatures, and a lack of large down wood in the channel (West Fork Cow Creek WA, 1999). The only stream within this sub-watershed that has been designated as water-quality limited for temperature by the Oregon Department of Environmental Quality (ODEQ) is the main stem of West Fork Cow Creek. Streams listed for temperature do not meet the ODEQ designated criteria for anadromous fish rearing and/or anadromous fish spawning (water temperature exceeds 64 degrees F for rearing and/or 46.4 F for spawning).

Though there is currently no standard for measuring sediment, the health of aquatic macroinvertebrate communities has been used as an indicator of sedimentation effects and overall water quality conditions in aquatic systems than visual surveys. The Glendale Resource Area has monitored aquatic macroinvertebrates within this sub-watershed since 1993. Surveys generally indicate that fine sediment deposits within the substrate are reducing streambed health within this sub-watershed (West Fork Cow Creek WA, 1999). Overall, stream bed quality is in fair to poor condition. Data from surveys are available in the Glendale Resource Area files in the Fish/Hydrology work areas. The greatest factors resulting in sediment to streams are roads, tractor skidtrails, naturally unstable areas, and current timber harvest near streams (still occurring on private lands).

Designated beneficial uses for West Fork Cow Creek watershed include private domestic water supply, public domestic water supply, industrial water supply, irrigation, livestock watering, anadromous fish passage, anadromous fish rearing, anadromous fish spawning, resident fish and aquatic life, wildlife and hunting, fishing, boating, and swimming.

Road densities within the West Fork Cow Creek- Gold Mountain Creek HUC 6 sub-watershed are currently at approximately 5.1 mi/mi^2. Road densities as a result of past road construction are currently above National Marine Fisheries Service (NMFS) recommended levels for properly functioning sub-watershed condition. The NMFS target established for proper functioning condition is 2 mi/mi^2, and above 3 mi/mi^2 is considered not functioning properly (USFWS/NOAA Fisheries Table of Population and Habitat

Indicators, USDA et al. 2004). About 20 percent of the roads in this sub-watershed are unsurfaced. Many of these roads are private roads and are not maintained by the BLM. These roads are generally the largest sediment sources, especially if they are open to year round public motor vehicle use. Within the West Fork Cow Creek watershed 25 percent of all streams are within 170 feet of a road West Fork Cow Creek WA, 1999). Within West Fork Cow Creek-Gold Mountain Creek HUC 6 approximately 90% are unsurfaced. Most stream crossings occur in the upper slopes of the sub-watershed, primarily crossing first and second order headwater streams.

Mule Creek HUC 6 sub-watershed

Preliminary data indicate that the streams in the Wild Rogue North exhibit some of the best water quality and riparian habitat in the Medford District. The solid block ownership pattern, large unroaded area, along with the rugged nature of the terrain has largely deterred human access and consequent disturbance activities. The majority of smaller tributary stream reaches have remained unaltered and continue to function as they have for thousands of years. However, the larger streams within the Rogue formation do have a history of mining activities, which is still ongoing in several locations within the sub-watershed. Stream channels have been altered and riparian vegetation has been destroyed as a result of mining activities primarily along Mule Creek (Wild Rogue North WA, 1999).

Fish distribution in this Planning Area is limited by natural barriers such as high gradient stream channels, low summer flows, a lack of spawning gravel, and numerous streamside slides and bedrock falls (Wild Rogue North WA, 1999) which are a result of the geologic characteristics of this watershed. Tributary streams in this Planning Area are generally confined channels that are quite steep, with gradients in excess of 20%. These tributary streams also tend to have very low or intermittent summer flows. Channel roughness in the upper reaches of all streams within this HUC 6 sub-watershed is high. There are currently no water quality limited streams within the Mule Creek HUC 6 sub-watershed. However, stream surveys in Mule Creek indicate that sediment may be limiting aquatic productivity in some locations.

Designated beneficial uses for the Mule Creek HUC 6 include private domestic water supply, public domestic water supply, industrial water supply, irrigation, livestock watering, anadromous fish passage, anadromous fish rearing, anadromous fish spawning, resident fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation and hydro power.

Limited macroinvertebrate data has been collected in the Mule Creek HUC 6 sub-watershed. Overall, water quality is in good condition. However, it appears that the larger fish-bearing streams have higher levels of embeddedness than would be expected for a watershed of this nature. Data from surveys are available in the Glendale Resource Area files in the Fish/Hydrology work areas. The greatest factors resulting in sediment to streams are roads, tractor skidtrails, naturally unstable areas, and current timber harvest near streams (still occurring on private lands). In recent years, many of the roads in upper Mule Creek have been gated, which helps reduce motor vehicle use (Wild Rogue North

WA, Map 10). The gates also reduce maintenance needs due to problems which can arise from inappropriate use during periods of wet weather, such as increased erosion and sediment delivery, and problems which occur through heavy and prolonged use. Due to concerns regarding the high road density and the overall condition of roads in Mule Creek, an extensive inventory was conducted in recent years to determine culvert condition and replace failing culverts within the drainage.

Road densities within the Mule Creek HUC 6 sub-watershed are currently at approximately 3.3 mi/mi^2. Road densities as a result of past road construction are currently above National Marine Fisheries Service (NMFS) recommended levels for properly functioning sub-watershed condition. The NMFS target established for proper functioning condition is 2 mi/mi^2, and above 3 mi/mi^2 is considered not functioning properly (USFWS/NOAA Fisheries Table of Population and Habitat Indicators, USDA et al. 2004). About 34 percent of the roads in this sub-watershed are unsurfaced. Many of these roads are private roads and are not maintained by the BLM. These roads are generally the largest sediment sources, especially if they are open to year round public motor vehicle use or located in close proximity to streams. Within the Mule Creek HUC 6 sub-watershed, 35 percent of all roads are within 170 feet of a stream. Of these roads approximately 80% are rock or natural surfaced.

The Blossom Fire in 2005 burnt with mixed severity on 11,800 acres within this sub-watershed. On approximately 200 acres of high intensity burn sites, ground litter, understory vegetation, and overstory canopy closure losses have decreased evapotranspiration rates, increasing water availability and surface runoff, and reduced surface layer protection resulting in increased erosion rates and streams sedimentation. Approximately 9 miles of dozer firelines constructed during the Blossom Fire were rehabilitated through sub-soiling, water-barring, placement of slash, and planting of conifers, which is greatly reducing the amount of surface erosion and compaction on these lines. However, even with rehabilitation measures such as the placement of logs for sediment capture, and the spreading of slash over exposed soils, hand built firelines which cleared vegetation for approximately 50-75 feet in width within the riparian zone of Mule Creek below this Planning Area, are still resulting in reduced localized water quality and aquatic habitat until vegetation reestablishes on these sites.

Water Quality

Stream Sedimentation

- Roads

  Currently water quality in both HUC 6 sub-watersheds has been altered by past timber management and road construction activities. Roads in close proximity to streams, un-maintained or poorly maintained roads, and native surface roads used for winter haul, are the major ongoing sediment sources in these watersheds (West Fork Cow Creek WA and Wild Rogue North WA, 1999). Roads constructed within riparian zones along streams contribute sediment to the adjacent stream, reduce riparian habitat quality, and remove potential sources of large woody debris from streams. Un-vegetated ditchlines, road surfaces, and cross drains can all transport sediment. Oregon Department of Forestry

monitoring data shows approximately one-third of private and state roads deliver sediment to streams via ditchlines, especially when used during winter hauling operations. A number of issues where identified to be contributing to the problem of sediment delivery to streams from these roads including; a lack of filtering prior to road drainage entering streams; to wide of spacing between, or poor placement of, cross drainage structures; and a lack of rules to address turbidity caused by wet-weather hauling (ODF & DEQ, 2002). Most BLM roads in this watershed are BST surfaced or rocked, and when used for winter haul, are generally upgraded to provide adequate surfacing to prevent excessive erosion and road damage. Natural surface roads on BLM lands are only used for log hauling during the dry season or under dry conditions as approved by the Authorized Officer.

There are 62 miles of rocked and natural surface roads within this Planning Area. A majority of roads within the Planning Area are hydrologically connected to streams through either tributary stream crossings or by proximity with valley roads paralleling the stream. Unsurfaced valley bottom roads running adjacent to streams are chronic contributors to the reductions in streambed and aquatic health that are presently occurring within these sub-watersheds. All hydrologically connected roads contribute to accelerated erosion and stream sedimentation within the sub-watersheds at different levels depending on the type of use, and moisture levels of the road surface during the period of use.

There are additionally 11 miles roads that appear to have been used in the past and are now naturally decommissioning within the Planning Area. Of these, approximately 2.5 miles are still contributing to increases in erosion. Nearly all of these are hydrologically connected to stream channels and contributing to increases in sedimentation within tributary stream channels within this Planning Area. One of these roads with accelerated erosion is located within the 9-1, 9-2, and 9-3 units in the Anaktuvuk Planning Area. Erosion from this road has resulted in large amounts of stored sediment within the substrate of the headwater channel that this road is hydrologically connected to.

Ditchline maintenance results in an increase in erosion within ditchlines for the first season until bare soils regain stability and protective vegetation growth. Where these ditchlines are hydrologically connected to streams, ditchline maintenance can result in chronic sediment delivery to streams through the first winter, unless best management practices require a sediment filter to be in place prior to stream culverts. Following the first season, ditchline maintenance results in an overall reduction in chronic erosion of the road surface and where hydrologically connected, subsequent stream sedimentation. Proper cross drain spacing and vegetated ditchlines can greatly reduce the amount of sediment that enters streams as a result of roads. In these sub-watersheds, cross drain spacing is generally adequate expect during high flow events. Ditchlines are only “pulled” as necessary to protect road integrity. As a result most ditchlines in these sub-

watersheds have sufficient vegetation within the ditchlines to slow erosion and filter a portion of the sediment.

Roads proposed for haul and maintenance under this project have been inventoried and currently are not in need of additional cross drains to prevent accelerated erosion or the exceedence of water quality standards. However, during onsite field inspections for this project, one cross drain culvert leading into unit 9-1 was found to have caused a considerable gully to form within the fillslope of the 32-9-16.1 road and down into the footprint of the existing through the 9-1, 9-2, and 9-3 units. This gully appears to be stabilizing, but has resulted in chronic offsite erosion and excessive stream sedimentation in the past. A broken pipe carrying water from a springbox to a pond was also located just outside of unit 17-1. This break is currently causing water to flow down the ditchline and through the 17-1 unit outside of the stream draw. Where this water flow reconnects with the stream, visible increases in stream sediment within the substrate and behind woody debris can be observed within this channel. This problem will be corrected during a separate Title II project prior to summer of 2009.

- Landings, Skidtrails, and Yarding Corridors
  Within the Anaktuvuk Thin Planning Area, it was calculated that approximately 123 acres are still potentially exhibiting accelerated erosion within the Planning Area. Of these acres all but about 80 acres are on federal ground. Where poorly rehabilitated skidtrails, landings, and yarding corridors are hydrologically connected to the streams through road systems, or are adjacent to streams that have little or no riparian buffer, these areas have become chronic sources of stream sediment. It is estimated based on satellite imagery that about 18 acres that are still potentially exhibiting increases in erosion are hydrologically connected to stream tributaries. The remaining 105 acres are either located away from streams or have sufficient riparian buffers in place that would trap upslope erosion prior to reaching the stream channel. The 18 acres are contributing to the reductions in water quality and aquatic habitat discussed above.

3.5.2 Environmental Effects

3.5.2.1 Alternative 1 (No Action)
West Fork Cow Creek- Gold Mountain Creek and Mule Creek sub-watersheds

Direct and Indirect Effects
Under Alternative 1, water resources on BLM lands would remain in their present condition, since there are no other projects that are proposed in this Planning Area that would result in an increase in the amount of sediment to stream channels. Water quality that is currently being reduced as a result of the existing road drainage problem, and related gullying of the compacted area below that was identified on the 32-9-16.1 road in unit 9-1would remain until future funding becomes available. Within the West Fork Cow Creek-Gold Mountain Creek HUC 6 sub-watershed it would be expected actions with the

potential to impact water quality such as timber harvest and road building would continue to occur at current rates on non-federal lands. Additionally, it would be expected that timber harvest and road building on public lands would increase in both HUC 6 sub-watersheds, consistent with the 2008 FEIS. Any future actions on federally managed lands would be analyzed under a future document.

3.5.2.2 Alternative 2 (Proposed Action)

Direct and Indirect Effects

Management actions proposed under Alternative 2 would result in stream sedimentation in areas where accelerated erosion would not remain onsite. Within the soils section there were only a few instances where this would be the case. Offsite erosion and stream sedimentation was identified as occurring during the re-construction, use and decommissioning of the 9-1 road, and during hauling activities on roads that are hydrologically connected to streams. These actions are discussed below. All other temporary route construction, road use, route decommissioning, skid route decommissioning, yarding, and burning operations proposed under this project, would be hydrologically disconnected and would not result in stream sedimentation. No other impacts to water quantity or quality were identified during this analysis. A short discussion of unaffected water quantity and quality parameters is available in Appendix 2 of this document.

<u>Stream Sedimentation</u>

- <u>Roads</u>

  West Fork Cow Creek- Gold Mountain Creek sub-watershed

  Within units 9-1, 9-2, and 9-3, 0.38 miles of temporary route would be re-constructed over an existing road footprint that has had extensive gully erosion over the first 0.15 miles. This erosion is a result of a severe compaction that vastly reduced infiltration rates, and a culvert with an unarmored outlet that is currently resulting in channelized surface flow during winter storms and spring runoff. Under Alternative 2, this temporary route would be reconstructed over the existing footprint, filling the existing gully and re-contouring the route subsurface to eliminate the depression that the route currently resides within. This would allow for proper drainage of the route during its period of use, and would provide for more efficient subsurface flow patterns to emerge following decommissioning of the route.

  This route is located in the upper portion of the slope where it crosses two perennial, and two intermittent headwater stream channels. As a result, this route would also cause minor increases in offsite erosion within these headwater stream channels during installation of the road culverts, use, and decommissioning of the road. Offsite erosion from the installation and removal of the stream culverts would be minimized by Project Design Features. This would include installation of a sediment trapping device immediately below the sites prior to installation or removal of the culverts, and a dry season operating period for all activities. Sediment resulting from the installation of the road culverts, use, and decommissioning of the road, would not be of a magnitude that would result in a

visible increase in stream turbidity, or a measurable increase in the overall stream sediment deposition for more than 25 feet downstream within any of the stream channels. The overall effects on water quality of constructing using and decommissioning this road would be within State of Oregon water quality standards and would not result in any measurable effects on macroinvertebrates or aquatic habitat.

In addition, during decommissioning of this route a rock splash pad would be installed on the problematic culvert above to reduce the outflow force and protect the soil from eroding. The area immediately below the culvert that is currently channelizing direct surface flows out of the culvert and chronically eroding the soil would be sub-soiled as well. This series of corrections to this system would also flow from the culvert to infiltrate into the soil and into the stream channel below, reducing chronic erosion and stream sedimentation. All actions associated with the construction of this route would be done during the same dry season as use, including all actions related to improving the culvert and decommissioning the route.

A total of 5.2 miles of road would be used for hauling of project related timber and biomass within the Planning Area of this sub-watershed. Approximately 4.8 miles of these roads have BST surfacing, which acts like pavement in that there would be on accelerated erosion as a result of using these roads. These BST roads would not receive any additional maintenance above what occurs during scheduled maintenance independent of this project. There are 0.4 miles of rocked and natural surface road that would receive dry season maintenance including spot rocking, road blading, and ditchline reconstruction, as necessary to protect the integrity of the road and limit the amount of offsite erosion.

There would be a very slight increase in surface erosion and the amount of sediment within the ditchlines of haul roads where these roads receive maintenance activities that disturb the soil. Most of this erosion would filter out within the hillslope vegetation at cross drain outlets. Where these roads cross headwater tributary channels within this Planning Area, proposed haul routes where maintenance and hauling activities would result in offsite erosion. Since these roads would only be used and maintained during the dry season, sediment entering stream channels from haul roads would not be of a magnitude to result in a visible increase in stream turbidity, or a measurable increase in the overall stream sediment deposition for more than 25 feet downstream within any stream channels. Hauling and road maintenance activities would therefore not exceed State of Oregon water quality standards and would not result in any measurable effects on macroinvertebrates or aquatic habitat.

Mule Creek sub-watershed

A total of 3.9 miles of road would be used for hauling within the Planning Area portion of this sub-watershed. As with the roads within the West Fork Cow Creek- Gold Mountain Creek sub-watershed, most of these roads have BST

surfacing, which would not result in accelerated erosion. These BST roads would not receive any additional maintenance above what occurs during scheduled maintenance independent of this project. 1.1 miles of rocked and natural surface roads would receive dry season maintenance as necessary to protect the integrity of the road and limit the amount of offsite erosion. The effects of hauling and maintenance within this portion of the Planning Area are the same as those discussed above for hauling and maintenance in the West Fork Cow Creek- Gold Mountain Creek sub-watershed.

All activities would be consistent with the State of Oregon water quality standards and would not result in any measurable effects on macroinvertebrates or aquatic habitat. This action is also consistent with the standards and guidelines set forth under the Medford RMP EIS. Although the proposed action on BLM land would create a small effect to water quality at the site scale, it would not be detectable at the HUC 7 scale or larger.

3.5.2.3 Alternative 3 (No Biomass)

Direct, Indirect, and Cumulative Effects

Stream Sedimentation

The effects to this element would be identical to Alternative 2 within the Planning Area, the West Fork Cow Creek-Gold Mountain Creek HUC 6 sub-watershed and the Mule Creek HUC 6 sub-watershed.

Cumulative Effects of Water Quality

Because ODEQ water quality standards are at the project level, cumulative effects of these environmental elements have been analyzed for the Planning Area which includes three HUC 7 sub-watersheds for this project, and at the HUC 6 level as necessary to incorporate all cumulative effects. Analyzing elements of the environment, such as watershed hydrology and water quality at a larger scale would result in undetectable effects due to the larger flow capacities of these larger stream channels, and different lag-times associated with flow contributions from the various drainages that reaching a given location within the mainstem of a stream. As such, information given only at the HUC 6 scale or larger would not provide the decision maker with the best available information to assist her in reaching a decision as to whether the effects of this project, when put in context with other activities within these drainages, would exceed ODEQ water quality standards.

ACS objectives, which are measured at the HUC 5 scale, must still be considered in order to ensure that this project won't cumulatively elevate effects that are occurring within this HUC 5 watershed to a level that would result in the degradation of aquatic and riparian habitat or species. However, if there are no detectable effects found to be occurring at the HUC 7 scale, within either of the HUC 6 sub-watersheds that make up this Planning Area, then there would also be no detectable effects from this project on aquatic species at the HUC 6, and similarly if effects are not detectable at the HUC 6 scale they would also not be detectable at a larger HUC 5 scale. HUC 7 drainages within this Planning Area that are located in different HUC 6 sub-watershed have been analyzed separately for

direct and indirect effects. Cumulative effects of this project are therefore a combination of these past and proposed effects, as well as the effects of any other current or potential future, federal or non-federal projects within these three HUC 7 drainages, and where beneficial within the two HUC 6 sub-watersheds.

Past timber yarding has contributed to erosion within the Planning Area, and within the two HUC 6 sub-watersheds in which this Planning Area is located. Harvest activities using BMP's generally only result in onsite erosion. This is true with the exception of areas that were harvested prior to the implementation of the Northwest Forest Plan or in areas of non-federal harvest, where riparian buffers are absent or limited. In these instances, erosion from upslope activities may be hydrologically connected to streams and would contribute to offsite sedimentation of streams.

It is estimated, based on satellite imagery and harvest data, that about 18 acres within the Planning Area are hydrologically connected to stream tributaries, and as such are still potentially exhibiting increases in erosion and stream sedimentation. This project would be implemented using ecological protection zones and other Project Design Features that would reduce erosion and filter out sediment prior to streams. As a result, the Anaktuvuk Thin Project would not contribute to the poor streambed conditions or reduced quality of aquatic habitat that has resulted within these sub-watersheds from past harvest actions.

Future actions would be expected to continue at current rates on non-federal lands. As stated in the soils section this could result in up to 744 acres of disturbance and compaction from skidtrails and yarding corridors. Since actions on non-federal lands use less extensive riparian buffers than federal actions, it would be expected that this would further reduce water quality and streambed conditions within the West Fork Cow Creek-Gold Mountain Creek HUC 6 sub-watershed. However, since Oregon Forest Practices are intended to comply with the State of Oregon water quality standards, it would be expected that increases in fine sediment from these actions would not exceed 10% above baseline conditions, and would not result in impacts to threatened fish species.

During past projects on federal and non-federal lands in both this Planning Area and the HUC 6 sub-watersheds, road construction, maintenance, and use have all resulted in accelerated erosion, and where hydrologically connected stream sedimentation. Chronic erosion is currently ongoing at the HUC 6 sub-watershed scale due to road densities between 3.3 and 5.1mi/mi^2. The US Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) target of 2 mi/mi^2 for streams to be considered in properly functioning condition (USFS, et al., 2004). Many of these roads are unpaved and a majority are hydrologically connected to tributary stream channels within these sub-watersheds.

The Anaktuvuk Thin Project would not increase the number of permanent roads or the road densities within these drainages, as all roads would be decommissioned following use. This project does however propose to improve water quality within one tributary stream channel located below unit 9-1 within the West Fork Cow Creek- Gold Mountain Creek HUC 6 sub-watershed. This stream has been severely impacted in the past as a

result of an extensive gully that formed as a result of an unprotected culvert outlet spill onto a severely compacted road. Currently this culvert continues to channel water through this gully and into the stream below. This project proposes to repair this problem, and eliminate the compacted road surface to prevent future erosion and stream sedimentation. This would eliminate a chronic source of sediment to one headwater tributary of the West Fork Cow Creek. Re-construction of this road for use during this project would initially result in minor increases in offsite erosion within four headwater stream channels during installation of the road culverts, the use, and decommissioning of the road.

Offsite erosion from the installation and removal of the stream culverts would be minimized by Project Design Features. Sediment resulting from the installation of the road culverts, use, and decommissioning of the road, would not be of a magnitude that would result in a visible increase in stream turbidity, or a measurable increase in the overall stream sediment deposition for more than 25 feet downstream within any of the stream channels. The overall effects on water quality of constructing using and decommissioning this road would be within State of Oregon water quality standards and would not result in any measurable effects on macroinvertebrates or aquatic habitat. All other temporary routes constructed under this project would be located on ridges and would be hydrologically disconnected from stream channels. Future road building proposed on non-federal lands would continue to increase road densities within these sub-watersheds. As stated in the soils section, past trends indicate that up to 6 miles of road may be need on non-federal lands to facilitate future harvest.

Construction of 6 miles of road would increase road densities within the West Fork Cow Creek-Gold Mountain Creek HUC 6 sub-watershed to up to 5.3mi/mi^2. These actions could contribute to increases in onsite and offsite erosion depending on the location of these roads and the BMP's implemented. Within the federally managed portion of West Fork Cow Creek-Gold Mountain Creek, and the Mule Creek HUC 6 sub-watershed, there are no proposed future actions that would result in road construction. All roads built on private lands would be expected to be constructed and used in compliance with the State of Oregon water quality standards.

Past road use and hauling has resulted in increased sedimentation to streams within both the Planning Area and the two HUC 6 sub-watersheds. Roads in close proximity to streams, un-maintained or poorly maintained roads, and native surface roads used for winter haul, are the major ongoing sediment sources in these watersheds (West Fork Cow Creek WA and Wild Rogue North WA, 1999). Roads within riparian zones along streams contribute sediment to the adjacent stream, reduce riparian habitat quality, and remove potential sources of large woody debris from streams. Un-vegetated ditchlines, road surfaces, and cross drains can all transport sediment. Oregon Department of Forestry monitoring data shows approximately one-third of private and state roads deliver sediment to streams via ditchlines, especially when used during winter hauling operations.

A number of issues where identified to be contributing to the problem of sediment delivery to streams from these roads including; a lack of filtering prior to road drainage entering streams; to wide of spacing between, or poor placement of, cross drainage structures; and a lack of rules to address turbidity caused by wet-weather hauling (ODF & DEQ, 2002). Many roads within these sub-watersheds do not have adequate filtering of ditchline sediment. Most BLM roads in these sub-watersheds are BST surfaced or rocked, and when used for winter haul, are generally upgraded to provide adequate surfacing to prevent excessive erosion and road damage. To reduce sedimentation, natural surface roads on BLM lands are only used for log hauling during the dry season or under dry conditions as approved by the Authorized Officer. Hauling and maintenance would occur on 5.2 miles of roads within the West Fork Cow Creek-Gold Mountain Creek HUC 6 sub-watershed, and 3.9 miles within the Mule Creek HUC 6 sub-watershed as part of the Anaktuvuk Thin project. Hauling on 4.8 miles within the West Fork Cow Creek-Gold Mountain Creek HUC 6 sub-watershed and 2.8 miles within the Mule Creek HUC 6 sub-watershed of BST roads would not result in an increase in erosion or sedimentation.

Ditchline maintenance would occur only as scheduled under routine manintenance, or as necessary on these roads to ensure proper drainage. Where ditchlines are hydrologically connected to streams, ditchline maintenance can result in sediment delivery to streams through the first winter. Under this project, Best Management Practices would require a sediment filter to be in place prior to stream culverts if ditchline maintenance proved to be necessary at any point during this action. Following the first season, ditchline maintenance results in an overall reduction in chronic erosion of the road surface and where hydrologically connected, subsequent stream sedimentation. Hauling and maintenance activities on 0.04 miles of rocked and natural surface road within the West Fork Cow Creek-Gold Mountain Creek HUC 6 sub-watershed and 1.1 miles within the Mule Creek HUC 6 sub-watershed would result in minor increases in onsite erosion, and where hydrologically connected, stream sedimentation. These roads would receive dry season maintenance including spot rocking, road blading, and ditchline reconstruction, as necessary to protect the integrity of the road and limit the amount of offsite erosion.

There would be a very slight increase in surface erosion and the amount of sediment within the ditchlines of haul roads during use, and where these roads receive maintenance activities that disturb the soil. Most of this erosion would filter out within the hillslope vegetation at cross drain outlets. Where these roads cross headwater tributary channels within this Planning Area, proposed haul routes where maintenance and hauling activities would result in offsite erosion. Since these roads would only be used and maintained during the dry season, sediment entering stream channels from haul roads would not be of a magnitude to result in a visible increase in stream turbidity, or a measurable increase in the overall stream sediment deposition for more than 25 feet downstream within any stream channels. Hauling and road maintenance activities would therefore not exceed State of Oregon water quality standards and would not result in any measurable effects on macroinvertebrates or aquatic habitat. Rocked and natural surface roads that would be used and maintained during the Anaktuvuk Thin Project are located a minimum of 0.6 miles from fish streams within the West Fork Cow Creek-Gold Mountain Creek HUC 6 sub-watershed, and 0.5 miles from fish streams within the Mule Creek HUC 6 sub-

watershed. As such, impacts to water quality from hauling and road maintenance would not affect fish habitat.

Hauling and road use would be expected to continue to occur in the future on most roads within these sub-watersheds. This would result in continued stream sedimentation where these roads are hydrologically connected. Roads used during the dry season would be expected to have impacts consistent with those described above for the Anaktuvuk Thin Project. However, roads used during wet road and weather conditions, would need to be closely monitored to ensure compliance with State water quality standards, and would be expected to further reduce streambed condition and aquatic habitat.

Within the West Fork Cow Creek-Gold Mountain Creek HUC 6 sub-watershed surveys generally indicate that fine sediment deposits within the substrate are reducing streambed health (West Fork Cow Creek WA, 1999). Water quality in this sub-watershed is in currently in fair to good condition. However sediment deposits within the substrate indicate that overall, streambed quality is in fair to poor condition. Sediment from the Anaktuvuk thin Project would not measurably increase these conditions for more than 25 feet from haul roads and stream culvert replacements. Logically it can be concluded that negligible increases in sediment from these activities would contribute to the overall amount of sediment entering streams from past, present, and future impacts within this sub-watershed, but sediment from this action would not be distinguishable above baseline levels or have any effect on aquatic organisms outside of 25 feet from the action. Reconstruction, repair, and decommissioning of the 9-1 route, would reduce chronic sediment deposition within one headwater channel in this sub-watershed. Additionally all actions proposed under the Anaktuvuk Thin Project are more than 2300 feet (~0.45mi) from fish streams in this sub-watershed. Actions within this watershed would therefore be consistent with the Clean Water Act, State of Oregon water quality standards, and ACS objectives.

Within the Mule Creek HUC 6 sub-watershed limited macroinvertebrate surveys indicate that fine sediment deposits within the substrate are reducing streambed health (Wild Rogue North WA, 1999). However water quality in this sub-watershed is in currently good condition. Within this sub-watershed it currently appears that the larger fish-bearing streams have higher levels of embeddedness than would typically be expected for a watershed of this nature. Sediment from the Anaktuvuk Thin Project would not measurably increase these conditions for more than 25 feet from haul roads. Logically it can be concluded that negligible increases in sediment from hauling and maintenance activities would contribute to the overall amount of sediment entering streams from past, present, and future impacts within this sub-watershed, but sediment from this action would not be distinguishable above baseline levels or have any effect on aquatic organisms outside of 25 feet from the action. Additionally all actions proposed under the Anaktuvuk Thin project are more than 1700 feet (~0.3mi) from fish streams in this sub-watershed. Actions within this watershed would therefore be consistent with the Clean Water Act, State of Oregon water quality standards, and ACS objectives.

Chapter 4.0 List of Preparers

The following individuals participated on the interdisciplinary team or were consulted in the preparation of this EA:

Name	Title	Primary Responsibility
Jeff Brown	Forester	Logging Systems
Mike Crawford	Fish Biologist	Essential Fish Habitat and Fisheries
Colleen Dulin	Hydrologist	Soils, Hydrology
Martin Lew	Ecosystem Planner	NEPA, writer/editor,
Mike Main	Fuels Specialist	Fire Risk and Hazard, Air Quality
Pauline Montgomery-Borg	Silviculturist	Project lead, Silviculture
Marylou Schnoes	Wildlife Biologist	Wildlife, T/E Animals
Rachel Showalter	Botanist	Botany, Noxious Weeds, T/E Plants
Amy Sobiech	Archaeologist	Cultural Resources, Native American Coordinator
Dustin Wharton	Civil Engineering Technician	Transportation

Chapter 5.0 Public Involvement and Consultation

5.1 Public Scoping and Notification

5.1.1 Public Scoping

Public scoping included mailing the proposed Anaktuvuk Thin Scoping Report to individuals and organizations expressing interest in Glendale Resource Area projects. Public comment was available from April 27, 2007 to May 31, 2007. The BLM received three public responses from either letters or emails that are fully responded to (see Appendix 3). Comments were considered in the development of the alternatives (Appendix 1). The Glendale Resource Area also accepts public comment of proposed forest management activities through the quarterly BLM Medford Messenger publication. A brief description of proposed projects, such as Anaktuvuk Thin, a legal location and general vicinity map are provided along with a comment sheet for public responses. The Anaktuvuk Thin Project was included in these quarterly publications beginning in fall, 2005.

5.1.2 30-day Public Comment Period

The Environmental Assessment will be made available for a 30-day public review period. Notification of the comment period will include: the publication of a legal notice in the Daily Courier, newspaper of Grants Pass, Oregon; and a letter to be mailed to those individuals, organizations, and agencies that have requested to be involved in the environmental planning and decision making processes for proposed timber sales. Comments received in the Glendale Resource Area Office, 2164 NE Spalding Ave. Grants Pass, Oregon 97526 on or before the end of the 30-day comment period will be considered in making the final decision for this project.

5.2 Consultation

5.2.1 United States Fish and Wildlife Service

The Medford District Office of the Bureau of Land Management requested that the U.S. Fish and Wildlife Service concur with the effects determination that this project "may affect, not likely to adversely affect" spotted owls or marbled murrelets (Medford BLM 2008 BA, DA 08 BAFH).

5.2.2 National Marine Fisheries Service

The timber sale action, fuels treatments, road maintenance and hauling activities which would occur within the Rogue and Umpqua Basin and the range of the federally threatened Southern Oregon Northern California and Oregon Coast coho salmon were determined to have no effect on coho or critical habitat.

Consultation for the Endangered Species Act with NMFS is not needed as the Action Alternatives would not affect listed species or their habitat. No consultation as required under the Magnuson-Stevens Fishery Conservation and Management Act for adverse affects on Essential Fish Habitat as there is No Affect to EFH coho and chinook within the Rogue Basin and there is No Affect to coho and chinook within the Umpqua Basin.

5.2.3 State Historical Preservation Office

The State Historical Preservation Office approved the clearance/tracking form for the Anaktuvuk Thin Project. The form is contained within the Anaktuvuk Thin Analysis file.

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APPENDIX 1 - ALTERNATIVE DEVELOPMENT SUMMARY

Environmental Assessment Number OR-118-06-010

Pursuant to Section 102 (2) (E) of NEPA (National Environmental Policy Act of 1969, as amended), Federal agencies shall "Study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources." The CEQ (Council on Environmental Quality) regulations for implementing the procedural provisions of NEPA states, alternatives should be "reasonable" and "provide a clear basis for choice" (40 CFR 1502.14).

In light of the direction contained in both NEPA and the CEQ Regulations, the following questions were used to 1/ identify the alternatives to be analyzed in detail in this environmental assessment that are in addition to the "Proposed Action" and "No Action" alternatives, and 2/ document the rationale for eliminating alternatives from detailed study.

1. **Are there any unresolved conflicts concerning alternative uses of available resources? If yes, document and go to Question #2.** *If no, document rationale and stop evaluation.*

   Yes.
   economic viability of biomass utilization

   No. The following alternatives were considered but eliminated from further consideration**:**

   KS Wild proposed that tractor yarding should be avoided and that ground-based logging causes higher incidences of root damage and scarring of residual trees.

   <u>Tractor</u>
   As stated on page 23 of the EA "There is a risk of a no bid sale when values of timber are low and costs are relatively high, such as the Anaktuvuk Thin Project."

   An alternative without ground based (tractor) logging was not consided because it did not meet the purpose and need of this project "silvicultural systems and activities should be based on the objectives of the land allocation, ecological processes, site and stand characteristic, and economic feasibility" (RMP, p 180). The IDT estimated that the cost to skyline yard or helicopter yard 145 acres would be economically infeasible. The IDT evaluated the more economical Alternative 3 (does not include biomass removal) using current timber values and logging costs to conclude that the sale would be offered for sale at a net loss of approximately $33,000 for cable logging only and an approximate net loss of $211,000 for only helicopter logging. Log market prices have been deteriorating the past year due to lack of demand. The costs for helicopter logging are much higher than conventional harvesting systems. A small heavy helicopter such as a

K-Max can lift up to 5,000 pounds and can be used for logs less than 1,000 pound (less than 24 inches DBH). Move in costs would be approximately $10,000 per ship.

The estimated appraisal costs of helicopter yarding was $400 mbf, the cost for cable yarding was $250/mbf, and $175/mbf for tractor logging.

Root damage and scarring

The Anaktuvuk Thin EA developed several Project Design Features to minimize root damage and scarring of residual trees. These design features found in Section 2.3.2 include lateral yarding to reduce damage to residual stand; suspension of yarding if unacceptable amounts of tree damage occur; and bucking and limbing of trees if unacceptable damage is occurring.

2. **What alternatives should be considered that would lessen or eliminate the "unresolved conflicts concerning alternative uses of available resources"?** *List alternatives and go to Question #3. If no alternative is identified other than the "no action" alternative, document and stop evaluation.*

   a) *consider an alternative that does not involve biomass utilization.*

3. **Of those alternatives identified in Question #2, are there reasonable alternatives for wholly or partially satisfying the need for the Proposed Action? If so, briefly describe alternatives and go to question #4.** *If no, document rational and stop evaluation.*

   Alternative 3 would satisfy the need by not removing biomass.

4. **Of those alternatives identified in Question #3, will such alternatives have meaningful differences in environmental effects?** If so, seek line officer approval to carry alternatives forward for detailed analysis in the environmental assessment. If no, document rationale and stop evaluation.

   Alternative 3 would have a meaningful difference in environmental effects to economic efficiency.

APPENDIX 2 - ENVIRONMENTAL ELEMENTS

Environmental Assessment Number OR-118-06-010

In accordance with law, regulation, executive order and policy, the Anaktuvuk Thin interdisciplinary team reviewed the elements of the environment to determine if they would be affected by the Proposed Action (Alternative 2) and Alternative 3 as described in Environmental Assessment Number OR-118-06-010. The following three tables summarize the results of that review.

Table 1. Supplemental Authorities to be Considered (BLM Handbook 1790-1 Appendix 1). This table lists some of the other authorities that may apply if the Proposed Action (Alternative 2) or Alternative 3 described in the Environmental Assessment were implemented.

Supplemental Authorities	Status 1/ Not Present 2/ Not Affected 3/ Affected	Interdisciplinary Team Remarks 1/ If not affected, why? 2/ If affected, develop cause/effect statement, unit of measure to describe environmental impacts, and if applicable, design features not already identified in Appendix D of the RMP to reduce or avoid environmental harm
Air Quality (Clean Air Act as amended [42 USC 7401 et seq.])	Not Affected	Hazardous fuels would be burned in accordance with the Oregon Smoke Management Plan administered by the Oregon Department of Forestry and the regulations established by the Oregon Department of Environmental Quality. The Planning Area is not located within a Class I designated airshed or non-attainment area. The impact of smoke on air quality is expected to be localized and of short duration. Particulate matter would not be of a magnitude to harm human health, affect the environment, or result in property damage. Dust created from vehicle traffic on gravel or natural-surfaced roads, road construction, and logging operations would be localized and of short duration. As such, the Proposed Action is consistent with the provisions of the Federal Clean Air Act.
Areas of Critical Environmental Concern	Not Present	There are no Areas of Critical Environmental Concern located within the Planning Area.
Cultural Resources (National Historic Preservation Act)	No Effect Determination	There is one known cultural resource sites located within the Planning Area but would not be affected by any activity proposed under the Anaktuvuk Thin Project.
Essential Fish Habitat (EFH) (Magnuson-Stevens Fisheries Conservation and Management Act)	Not Affected Essential Fish Habitat (EFH) within the West Fork Cow Creek and Rogue River-Horseshoe Bend Watersheds	Streams within the planning area drain to streams containing EFH. The new temporary route construction on BLM land (1.1 miles), thinning activity, road maintenance (including installation and removal of four temporary stream crossings) and hauling activity, and fuel treatments would have no effect on Essential Fish Habitat (EFH). EFH in Mule and Walker Creek is approximately 0.39 mile (2,059 feet) and 1.92 miles (10,140 feet) respectively from the proposed project. The proposed new temporary routes and four temporary stream crossings are located on ridgetop, with few existing stream crossings. Sediment would not be transported to CCH because of dry season haul, the ridgeline location, temporary stream crossings constructed and removed in dry season, the low number of stream crossings, the location of the road outside of riparian reserves, the proximity of the road to fish habitat and the design features to reduce the transmission of fine sediment.

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Supplemental Authorities	**Status** **1/ Not Present** **2/ Not Affected** **3/ Affected**	**Interdisciplinary Team Remarks** **1/ If not affected, why?** **2/ If affected, develop cause/effect statement, unit of measure to describe environmental impacts, and if applicable, design features not already identified in Appendix D of the RMP to reduce or avoid environmental harm**
Forest and Rangelands (Healthy Forests Restoration Act)	Not Affected	This project is not a fuel reduction or forest health project, as stated in the purpose and need,
Energy (Executive Order 13212)	Fiber optic line	There is a fiber optic line buried within the road prism. However, both action alternatives would have no effect on energy development, production, supply and/or distribution.
Environmental Justice (Executive Order 12898)	Not Affected	There are no residents near or adjacent to the Planning Area. Therefore, both action alternatives would not have disproportionately high and adverse human health or environmental effects on minority populations and low-income populations.
Prime or Unique Farm Lands	Not Present	There are no Prime or Unique farmlands in or adjacent to the Planning Area.
Flood Plains (Executive Order 11988)	Not Affected	This Planning Area is located near ridgetops. It does not involve the occupancy or modification of floodplains, and therefore would not increase the risk of flood loss. As such, all alternatives proposed under this project are consistent with Executive Order 11988.
Hazardous or Solid Wastes (Resource Conservation and Recovery Act of 1976)	Not Present	There are no known hazardous or solid wastes within or adjacent to the Planning Area, nor would the proposed actions create hazardous/solid wastes.

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Invasive, Nonnative Species (Executive Order 13112)	Not Affected	The existing roadside and proposed ROW routes were surveyed for noxious weeds in the spring of 2006: 21 populations of Tansy ragwort (*Senecio jacobaea*), 6 populations of Canadian thistle (*Cirsium arvense*), 1 population of Meadow knapweed (*Centaurea pratensis*) and 2 populations of Himalayan blackberry (*Rubus discolor*) were located. Locations of these populations support the theory that openings and disturbance provide the greatest opportunity for the establishment of noxious weeds. In an effort to address the potential for project activities to increase the rate of spread of noxious weeds, Project Design Features (PDFs) have been included in the project to decrease the potential spread of weeds associated with the Proposed Actions. Project Design Features include washing equipment prior to moving it on-site, operating vehicles/equipment in the dry season, and seeding and/or planting newly created openings with native vegetation to reduce the potential establishment of noxious weeds. These PDFs are widely accepted and utilized as Best Management Practices (BMPs) in noxious weed control strategies across the nation (Thompson, 2006). In addition to the PDFs, target weed species were treated in the Spring of 2007 and 2008 under the Medford Noxious Weed Plan. Increases in individual noxious weed site occurrences and densities within the Planning Area may occur as a result of disturbance on approximately 145 acres resulting from commercial thinning. However, the mixed ownership pattern of private adjacent to BLM, existing use of reciprocal ROW's, and the cumulative effects from factors affecting weed spread (private logging, motor vehicles, recreation, rural and urban development, and natural air/water/wildlife processes) affecting the Planning Area, and the implementation of BMP's, the presence or absence, or weed density would not be altered to any detectable degree at the 6th field watershed level by the Proposed Actions.
Native American Religious Concerns (American Indian Religious Freedom Act)	Not Present	

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Threatened or Endangered Fish Species or Habitat (Endangered Species Act)	Not Affected (Southern Oregon/Northern California (SONC) coho salmon and critical habitat and Oregon Coast (OC) coho salmon and critical habitat	**SONC and OC Coho Salmon** within the Rogue River-Horseshoe Bend and the West Fork Cow Creek Watersheds respectively. Streams within the Planning Area drain to streams containing coho and coho critical habitat. The new temporary road construction on BLM land (1.1 miles), thinning activity, road maintenance and hauling activity, and fuel treatments would have no effect on Southern Oregon Northern California (SONC) and Oregon coast (OC) coho salmon (ESA-Threatened) or coho critical habitat (CCH). The closest Coho presence and CCH in Walker Creek and Mule Creek is approximately 1.92 miles (10,140feet) and 0.39 mile (2,059 feet) respectively from proposed project. Sediment would not be transported to CCH because of the dry season haul, ridgeline location, EPZs, the location of the road outside of riparian reserves, the proximity of the road to fish habitat and the design features to reduce the transmission of fine sediment. Sediment resulting from the installation of the road culverts, use, and decommissioning of the road, would not be of a magnitude that would result in a visible increase in stream turbidity, or a measurable increase in the overall stream sediment deposition for more than 25 feet downstream within any of the stream channels
Threatened or Endangered Plant Species or Habitat (Endangered Species Act)	Not Affected	Of the four federally listed plants on the Medford District (*Fritillaria gentneri, Limnanthes flocossa* ssp. *grandiflora*, *Arabis macdonaldiana*, and *Lomatium cookii)*, only *Fritillaria gentneri* has a range and habitat which extends into the Glendale Resource Area. The Planning Area is not in the range and habitat of *F. gentneri*, vascular plant surveys were conducted in the spring of 2006, and no *Fritillaria gentneri* populations were found. There would be no anticipated effect from either action alternatives on any federally listed plant.

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Threatened or Endangered Wildlife Species or Habitat (Endangered Species Act)	Not Affected Marbled Murrelet	**Threatened** – marbled murrelet. No units, landing or proposed road construction areas contain nesting habitat for the marbled murrelet. The Medford BLM BA states that there would be a daily operating restriction on the proposed actions within 360 feet of any potential habitat. There would not likely to be a negative effect of disturbance by noise to marbled murrelets within 360 feet of the stands to the south and west of Unit 17-1, and the north of Units 21-7 and 21-8. However, daily/seasonal restrictions for the marbled murrelet would be implemented, if required, in concurrence with the U.S. Fish and Wildlife Service.. The BLM requested that the U.S. Fish and Wildlife Service concur with the effects determination that this project "may affect, not likely to adversely affect" spotted owls or marbled murrelets (Medford BLM 2008 BA, DA 08 BAFH).
	Not Present	Critical Habitat—marbled murrelet. No marbled murrelet designated Critical Habitat occurs within the Planning Area.
	Not Affected	**Threatened** - spotted owl. There are no treatments units that contain spotted owl nesting, roosting, foraging (NRF) habitat and therefore there is no effect to NRF. Surveys have shown that the closest owl nest sites are well beyond potential disturbance distances and therefore no effect form loud noise to known individual owls. Units 9-1, 9-2, 9 -3, 16-1, 17-1 and 21-6 are dispersal-only habitat for the species and totals 133 acres. These units would remain dispersal habitat for the species. The BLM requested that the U.S. Fish and Wildlife Service concur with the effects determination that this project "may affect, not likely to adversely affect" spotted owls or marbled murrelets (Medford BLM 2008 BA, DA 08 BAFH).
	Not Present	Critical Habitat – spotted owl. There is no designated Critical Habitat in the Planning Area.

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Supplemental Authorities	Status 1/ Not Present 2/ Not Affected 3/ Affected	Interdisciplinary Team Remarks 1/ If not affected, why? 2/ If affected, develop cause/effect statement, unit of measure to describe environmental impacts, and if applicable, design features not already identified in Appendix D of the RMP to reduce or avoid environmental harm
Water Quality Drinking-Ground (Safe Drinking Water Act)	Not Affected Temperature	Temperature: No streams within the three HUC 7 watersheds that make up this Planning Area currently exceed ODEQ water quality standards for temperature. This project is located near ridgetops and all actions are adjacent to low volume headwater streams. These types of streams are generally well shaded on public lands by both the mid and upper canopy streamside vegetation. Within this Planning Area, the Ecological Protection Zone (EPZ, described in section 2.21) would maintain stream temperatures by reserving all trees within the primary shade zone, and a majority of the trees within the secondary shade zone (USFS and BLM, 2005) from commercial harvest. Up to 12 trees may need to be cut within the primary shade zone along 3 different stream channels in units 9-1, and 9-2 during the reconstruction of temporary road 9-1. The affected streams would be low volume, intermittent or perennial interrupted, and would only be affected in one location each where the stream crossing culverts would be installed. Where these trees are removed there would a small increase in solar radiation to the stream, but this would not be outside that which naturally occurs in this area from snow breakage and blow-down and would not be enough to result in any measurable increases to stream temperature immediately upstream or downstream of these road crossing locations.
	Not Affected Chemical/Nutrient Contamination	No herbicides or pesticides would be used in conjunction with this project. Hydraulic fluid and fuel lines on heavy mechanized equipment would be in proper working condition in order to minimize potential for leakage into streams. Due to Project Design Features it would not be expected for the proposed activities to have any effect on chemical contamination of streams or waterbodies. Fuel treatments could increase nitrogen levels within the stream and riparian zone in the short term. These would be highly localized, low level increases and would not be of a magnitude that would have any adverse affect on macroinvertebrate populations which are the most sensitive indicators of water quality conditions.
	Affected Sediment/ Water Quality	The action alternatives for this project would result in temporary road reconstruction, use, and decommissioning within units 9-1, 9-2, and 9-3 that would lead to stream sedimentation. Sedimentation would result from the installation and removal of four stream crossing culverts during the reconstruction and decommissioning of this road. There would also be a small amount of stream sedimentation from the use of this road at stream crossing locations. A small amount of sediment may also enter streams during log haul and existing road maintenance where roads are hydrologically connected. All sediment producing actions would result in measurable increases in sediment for no more than 25 feet downstream of the impact point, and would all be within the State of Oregon water quality standard of no more than a 10% increase in turbidity above and below the action.

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Water Quality Drinking-Ground (Safe Drinking Water Act)	Continued Affected Sediment/ Water Quality	Brushing treatments would be implemented using 25' stream buffers to protect streambank stability and water quality. These treatments would be done using handtools and would not result in an ground disturbance that would accelerate erosion. They also would not remove any overstory canopy. As such, there would be no mechanisms for increased erosion or subsequent stream sedimentation as a result of brushing treatments. All other soil disturbing activities are located outside the EPZ, and would be implemented using BMP's that minimize the quantity and transport of soil erosion. Since the EPZ is designed to filter out sediment produced during upslope activities that are implemented using BMP's, these activities would not result any sediment entering streams. Refer to Section 3-5 of the EA for a discussion of the affected environment and environmental effects of the Proposed Action related to this element of the environment
Migratory Birds (EO 131186)	Not Affected	There are dozens of species of migratory bird species likely to use the Glendale Resource Area. Of these, the following are listed in the USFWS' Species of Concern or Game Birds Below Desired Condition lists but not likely to use the Planning Area: flammulated owl, golden eagle, Williamson's sapsucker and wood duck, Found on the lists and likely to use the Planning Area are: black-throated gray warbler, olive-sided flycatcher, peregrine falcon, rufous hummingbird, mourning dove and band-tailed pigeon. Some individuals may be lost or displaced during project activities, but there would be no perceptible shift in species composition because of the small scale (330 acres) of habitat modifications. Adequate untreated areas in and adjacent to the project area would maintain habitat for displaced individuals. Overall, populations in the region would be unaffected due to this small amount of loss that would not be measurable at the regional scale. Partners in Flight supports the eco-regional scale as appropriate for analyzing bird populations.
Wetlands (Executive Order 11990)	Not Present	The Proposed Actions would not result in the destruction, loss or degradation of any wetland. As such, the Proposed Actions are consistent with Executive Order 11990.

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Wild and Scenic Rivers (Wild and Scenic Rivers Act)	Not Affected	The Outstandingly Remarkable Values for the Wild and Scenic Rogue River are fisheries resource, recreation opportunities, and natural scenic quality. This project would not affect recreation or scenic values of the Wild and Scenic Rogue River. The fisheries analysis found there to be no effects to fish or fish habitat in the tributaries flowing into the Rogue River from the road related activities occurring within the Rogue River basin. Based on this analysis there would be no effects from the road related activities within the Rogue River basin to the fisheries resource in the Wild and Scenic Rogue River.
Wilderness (FLPMA 1976)	Not Present	

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Fire Hazard	Affected	Hazardous fuels created in treatment units may increase fire hazard in the short term due to the presence of slash present until the time it is treated and/or partially decomposed, within six months to 3 years. Fire Regime Condition Class (FRCC) is one method for determining fire hazard. FRCC measure the amount an area has departed from its natural reference conditions. FRCC is categorized by three condition classes: FRCC 1 – no or little departure, FRCC 2 – moderate departure, and FRCC 3 – high departure (Table 3-3A, Fire Regime Condition Class definitions). Flame length is another method to determine fire hazard. Flame length is measured in feet and dictates fire suppression strategies (Table 3-5A Fire Behavior and Suppression Activities).
Fire Risk	Not Affected	Fire risk is the probability of a fire starting which is determined by the presence of ignition sources and is proportional to human presence. Two temporary routes would be constructed in the proposed action. These routes are short spurs and will be decommissioned after treatment. These routes could provide limited access for public and has the potential to increase fire risk by allowing for an increase in human presence by providing access into previously inaccessible areas. However, the distance of temporary routes and increased human presence are not necessarily statistically correlated because many factors aside from access contribute to increased human presence. The most important factor for increase human present is how appealing the areas are into which the temporary routes provide access. These are short routes that do not lead to appealing recreational areas. Also, there is no large population center near the Planning Area. With the temporary routes proposed under the action alternatives, it is not likely that fire risk would be measurably affected by a large increase in human presence.
Recreation	Not Affected	There are no developed recreation sites that would be affected by both action alternatives. The area is open to dispersed recreation use, as is most of the Glendale Resource Area. The Action Alternatives would have a neutral effect on dispersed recreation within the resource area. There may be increased logging truck traffic during the operational period. This type of activity is typical for the area because of harvesting on private and other government owned lands.
Rural Interface Areas	Not Present	The Planning Area does not contain Rural Interface Areas as designated in the Medford District Resource Management Plan (map 13).
Special Areas (not including ACEC, RMP pp. 33-35)	Not Present	There are no designated special area land allocations within the Planning Area.

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Bureau Strategic Species: Fish Species/Habitat Special Status Species (not including T/E): Fish Species/Habitat	Not Affected (Oregon Coast steelhead, and Klamath Mountains Province steelhead), Not Present (S. OR Coast/N. CA Coast Chinook Umpqua chub)	**<u>Bureau Strategic Species:</u>** Strategic species are not Special Status for management purposes. The only requirement for this group of species is if species sites are located during any survey efforts, the site information must be entered into the agency corporate database (IM OR-2008-038). Strategic Species located within the vicinity of the Planning Area include the Oregon coast steelhead in the Umpqua Basin, and Klamath Mountains Province steelhead. Oregon Coast and Klamath Steelhead Trout Bureau Sensitive Species (which do not require species management IM OR-2008-038) are present in Walker Creek and Mule Creek respectively. The new temporary road construction on BLM land (1.1 miles), thinning activity, road maintenance and hauling activity, and fuel treatments would have no effect on steelhead. Closest steelhead usage in Mule Creek is approximately 0.17 mile (898 feet) and Walker Creek is 0.84 mile (4,435 feet) from the proposed project. Sediment would not be transported to steelhead habitat because of the ridgeline location, the low number of stream crossings, the location of the road outside of riparian reserves, low haul miles (2 miles), the proximity of the road to fish habitat and the design features to reduce the transmission of fine sediment. Streams with steelhead trout are managed by the BLM as fish bearing streams as directed by the RMP. The BLM objective for fisheries management is to maintain or enhance the fisheries potential of streams and other waters (RMP p. 49). Hauling on these roads would not result in sediment entering steelhead habitat because 1) these roads are either paved or gravel and 2) the low number of haul miles, and 3) minimal number of loads to be hauled (approximately 75 loads). **<u>Sensitive):</u>** **<u>Not Present Umpqua chub (</u>** Umpqua chub are a sensitive species found in Cow Creek. No changes to Umpqua chub would occur because no measurable effects would reach Cow Creek at such a distance from the Planning Area.

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Special Status Species (not including T/E): Plant Species/Habitat	Not Affected Not Present Not Affected	**Bureau Special Status Vascular plants** Vascular plant surveys were conducted in the spring of 2006 by a professional botanist and revealed 7 new sites (6 *Bensoniella oregana* and 1 *Illiamna latibracteata*) consisting of 2 Bureau Sensitive species. However, these species would not be affected by either of the action alternatives. **Bureau Special Status Non-Vascular plants** Nonvascular surveys, completed in spring 2006, resulted in no bureau special status nonvascular plant sites. **Bureau Special Status Fungi** The Planning Area was not surveyed for fungi, as pre-disturbance surveys for Special Status fungi are not practical, nor required per BLM – Information Bulletin No. OR 2004-121, which states "If project surveys for a species were not practical under the Survey and Manage standards and guidelines (most Category B and D species), or a species' status is undetermined (Category E and F species), then surveys will not be practical or expected to occur under the Special Status/Sensitive Species policies either (USDA/USDI 2004a, p.3)." Current special status fungi were formerly in the aforementioned S&M categories which did not consider surveys practical, and are therefore exempt from survey requirements. With the recent Bureau Special Status Species policy, 18 species of fungi were designated as Sensitive, 9 of which have been documented on Medford District. As mentioned above, none of these species require surveys. District wide, the Medford BLM has 18 Bureau Sensitive (BSO) fungi species; 9 are suspected to occur here, while the remaining 9 have been documented. Of the 9 documented species, only one, *Phaeocollybia olivacea*, has been found in the Glendale Resource Area, approximately 20 air miles away from the Planning Area. While it is possible that this project is occurring within potential habitat for some species, there is very little information available describing the *exact* habitat requirements or population biology of these species (USDA,USDI 2004 (2004 Final SEIS vol.1) p. 148). Based on the above information, the likelihood of a Bureau Sensitive fungi species in this Planning Area is very low; the likelihood of a sensitive fungi occurring within the Planning Area is even lower since the area impacted by the new road construction is 1.3 acres. The likelihood of contributing toward the need to list is not probable.

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Special Status Species (not including T/E): Wildlife Species/Habitat	Habitat not present in or adjacent to Planning Area	**Bureau Sensitive** - Found on the Glendale Resource Area, but not likely to occur on the Planning Area: Oregon shoulderband, Northwestern pond turtle, Clark's grebe, trumpeter swan, white-tailed kite, bald eagle, California brown pelican, red-necked grebe, purple martin, black salamander, foothill yellow-legged frog and Northwestern pond turtle.
	Habitat not present in or adjacent to Planning Area	**Bureau Sensitive and Western BLM Bird Species of Conservation Concern—peregrine falcon**. May forage in the Planning Area and would likely continue to do so following the proposed action. Also Sensitive and possibly using the Planning Area are Townsend's big-eared bat and fringed myotis. The proposed action would not likely decrease their ability to fly through and forage in the area**.**
	Not Affected	**Fisher—Candidate species.** Alternative 2 or 3 are not likely to impact fishers because they have not been found in the Glendale Resource Area for successive years by peer-reviewed survey methods. Approximately seventy remote camera surveys were conducted to protocol (Zielinski and Kucera 1995) from 2002-2005 in the Glendale Resource Area, with no fisher detections. Fishers have not been observed by BLM field personnel over many successive years of field work within the Resource Area. Although it is possible that fisher may disperse through the project area, the absence of detections from surveys indicates use is minimal at best.
Vegetation Upland and Riparian	Not Affected	Affects to the productivity of the conifer stands being commercially thinned was modeled using Forest Vegetation Simulator. Reducing the multiplier to change the larger tree basal area increment prediction to simulate the maximum allowable 5 percent loss (.95 multiplier) of soil productivity displayed a 1 percent decrease in basal area over a 40 year period.

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Soil (productivity, erodibility, mass wasting, etc.)	Affected (Erosion & Productivity)	**Erosion & Compaction and Productivity loss u**nder the action alternatives, units 9-1, 9-2, 17-1, 21-5, 21-7, and 21-8 would be yarded using ground based equipment. Currently compaction within these units ranges between 10-24%. New and utilized skidtrails within these units would be sub-soiled, reducing total compaction within these units to a maximum of 12%. In most units this would result in an overall reduction in soil compaction and as such would improve or maintain the current productivity within these stands. Soil disturbance associated with skidtrails and yarding corridors in these units, as well as temporary route construction, use, and decommissioning, log haul and maintenance on existing rocked and natural surface roads, cable yarding corridors, landing construction and use, and prescribed burning would lead to localized erosion. This disturbance would be undetectable above current arates within 3-5 years of the action, and localized erosion would be minimal due to rehabilitation measures and PDF's. Temporary road reconstruction, use, and decommissioning within units 9-1, 9-2, and 9-3 that would lead to offsite erosion and stream sedimentation. Offsite erosion would result from the installation and removal of four stream crossing culverts during the reconstruction and decommissioning of this road. There would also be a small amount of offsite erosion from the use of this road at stream crossing locations. A small amount of offsite erosion may also enter streams during log haul and maintenance on 1.5 miles of existing rocked and natural surface roads, where roads are hydrologically connected. PDF's would limit skidtrails and temporary route construction to less than 12% of each unit, and would limit total soil disturbance from the combination of skidtrails, temporary routes, and top soil removal during yarding operations to 15%. These restrictions would keep productivity losses below 5% within each unit as required under the Medford RMP. Offsite erosion and subsequent stream sedimentation is discussed in the Water Quality section of this appendix. *Refer to Section 3.4 of the EA for a discussion of the affected environment and environmental effects of the Proposed Action related to this element of the environment*
	Not Affected (Mass Wasting)	Field surveys were used to identify and eliminate all areas from this project that would have been likely to result in chronic erosion or landsliding even after mitigating measures and PDF's were applied. Given the location of the proposed temporary road routes, proposed harvest activities, and the implemented PDF's, the proposed actions that would occur on the remaining acres would be expected to have a neutral effect on mass wasting potential.

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Visual Resources	Not Affected	The proposed Planning Area is located within the Class 4 VRM (Visual Resource Management) category which allows for major modification of the existing character of the landscape. The Action Alternatives are consistent with these visual resource management objectives.
Water Resources (not including water quality)	Not Affected	Water quantity can be affected during timber harvest by soil compaction and increased open space. Under both action alternatives, impermeable soils resulting from skidtrails, landings, and temporary route construction, would be sub-soiled. Sub-soiling would restore water infiltration and subsurface flow routes, therefore maintaining current flow patterns and relative distributions of surface and subsurface water. This project would not result in the creation of forest canopy openings that would contribute to open space within either sub-watershed. As such, the proposed action would not have measurable effects on watershed hydrology, including peak flows, base flows, runoff timing, subsurface flow, or water storage, and would not affect municipal and domestic water use.
Port-Orford cedar	Not Present	There are no of Port-Orford cedar within the Planning Area
Economic feasibility	Affected	The Medford RMP states that "It is appropriate to commercially thin these developing stands at this time in order to reduce stand density for residual tree development and provide and entry that is economical (RMP, p. 185). To determine the economic feasibility of each alternative, current values of timber and costs of forest management were utilized to provide a net value. The Proposed Action is at risk of not being economically feasible. Because timing of the sale could affect the actual bid price, a risk value of either low, medium or high would be associated with the economic feasibility analysis. See Section 3.3.

Table 3. Aquatic Conservation Strategy Summary. This table lists the four components of the Aquatic Conservation Strategy (RMP pp. 5-7) and the interdisciplinary team's predicted environmental impact per component if Alternative 2 or Alternative 3 described in the Environmental Assessment were implemented.		
Riparian Reserves	Consistent	The Action Alternatives would result in 25 acres of overstory thinning and understory treatments to promote forest health and the development of large woody debris (LWD) within Riparian Reserves outside the ecological protection zone. Thinning would be designed to expedite the development of late successional, multi-story habitat conditions and restore the species composition and structural diversity of the plant communities, needed to achieve ACS and riparian reserve objectives (Medford RMP, pg 22, pg 26 respectively). Riparian reserves within the proposed units are currently dominated by smaller diameter stands of Douglas fir and some hardwoods. Most riparian stands are lacking large wood debris, downed logs, and large tree structure. Thinning of dense riparian reserves would reduce competition on the retained trees for light, nutrients, water and growing space, allowing trees would develop larger canopies, display better vigor and put on diameter growth faster than if left untreated. To access these stands a total of up approximately 1400 feet of new skidtrails would be constructed. Existing skidtrails would also be used during extraction of timber from these stands. These treatments would be implemented in a manner consistent with riparian reserve and ACS objectives.
Key Watershed	Present	The Proposed Action is partially located in a Tier 1 Key watershed, the West Fork of Cow Creek. All actions proposed under this project would be consistent with the objectives within a Tier 1 watershed.
Watershed Analysis	Consistent	West Fork Cow Creek Watershed Analysis, 2005 Wild Rogue North Watershed Analyses, 1999 :
Watershed Restoration	Consistent	Although the Proposed Action is not a component of the resource area's watershed restoration program, it would not have an adverse effect on restoration efforts.

APPENDIX 3 - PUBLIC SCOPING COMMENTS TO ANAKTUVUK THIN AND BLM RESPONSE

The Glendale Resource Area accepts public comment of proposed forest management activities through the quarterly BLM Medford Messenger publication. A brief description of proposed projects, such as Anaktuvuk Thin, a legal location and general vicinity map are provided along with a comment sheet for public responses. The Anaktuvuk Thin was included in these quarterly publications beginning in fall, 2005.

Len Richardson

Comment 1: The EA should be developed to "Provide habitat for a variety of organisms associated with both late-successional and younger forests" (RMP, p. 38) as stated in the scoping report. There should be limited intrusions for healing and replenishing of the area and emphasize both restoration of unfragmented block connectivity for diverse corridors for flora and fauna.

Response: The EA clarifies the objectives for the Anaktuvuk Thin Project and states on page 11 that:

> The Anaktuvuk Planning Area is within O & C lands administered by the Department of the Interior, BLM National System of Public Lands "for permanent forest production… in conformity with the principles of sustained yield for the purposes of providing a permanent source of timber supply" (O&C Act).

The O & C Act prevails over the Federal Land Policy and Management Act as they relate to timber resources on O & C lands and there is no requirement in the O & C Act to provide for diversity. However, the Anaktuvuk Thin Project incorporates direction in the Northwest Forest Plan, which provided specific land allocations such as for riparian, late successional and timber emphasis areas. Included also are standards and guidelines that adequately provide for diverse habitat.

George Sexton for Klamath Siskiyou Wildlands Center (KS Wild)

Comment 2a: The scoping notice for this project indicates that the BLM intends to conduct harvest activities within riparian reserves. The forthcoming EA must explicity analyze and disclose the location of the riparian reserves, the location of proposed yarding activities and meet the objectives of the Aquatic Conservation Strategy and upon forest health and composition.

Response: The EA describes the objective of riparian thinning on page 17 of the EA, which is to "create a stand that is on a trajectory to reach a late-successional condition." It further mentions that

> To expedite the development of late-successional, multi-story habitat conditions and "restore the species composition and structural diversity of the plant communities" needed to achieve ACS and riparian reserve objectives (RMP, pp. 22, 26), portions of the riparian reserves would be treated as part of this project. Small canopy gaps would also be created outside the primary shade zones, as necessary to promote multiple-layered stands and promote species diversity that is a key element in late-successional habitat. The West Fork Cow Creek and Wild Rogue North Watershed Analyses were used in the analysis of this project.

The EA analyzes the effects of yarding activites on the objectives of the Aquatic Conservation Strategy in Chapter 3 and Appendix 2, Table 3.

Comment 2b: Tractor yarding should be avoided**.** Ground-based logging causes higher incidences of root damage and scarring of residual trees. Soil loss with respect to method of harvest is directly related to the amount of soil disturbed and bared by harvest activity.

Response: The BLM fully responded to this comment in Appendix 1of the EA titled "Alternative Development Summary."

Comment 2c: The BLM should develop, select, and implement an action alternative that reflects the intent of the Northwest Plan and the Medford LRMP by prioritizing young plantations in the planning area for treatment, avoiding ground-based yarding activities, and retaining all large-diameter conifers in the Planning Area.

Response: See response to Comment 1 above. The Northwest Forest Plan and Medford RMP provide for retaining large retention trees in regeneration harvest units, owl centers, riparian reserves and watersheds where little remains. The matrix land allocation represents 16% of the federal land within the range of the northern spotted owl and is the designated area where timber harvesting will occur (NWFP ROD, p. 7). The Anaktuvuk Thin Project would commercially thin approximately 145 acres of 39-48 year old Douglas-fir plantations and is consistent with the management direction in the 1995 RMP.

Jacob Groves for American Forest Resource Council (AFRC).

Comment 3a: AFRC would like to see all timber sales be economically viable.

Response: The Purpose and Need (EA, p. 11) identifies that "Forest Management is appropriate at this time to manage developing stands in the Anaktuvuk Thin PA in order to reduce stand density for residual tree development and provide an entry that is economical." An alternative was developed that considered the economic viability of biomass extraction and the uncertainty of log prices. An economic analysis is provided in Chapter 3 of the EA.

Comment 3b: AFRC would like to see the BLM have some flexibility for fuels treatments by not specifying a specific method to accomplish an objective.

Response: The Anaktuvuk Thin identifies current acceptable hazardous fuels treatment methods to meet the fuel hazard reduction objective (EA, pp. 15-16). That objective is to protect resource values by reducing the potential for high severity fire, reducing the time of elevated hazard and making suppression efforts safer and more effective in the event of a wildfire. The current methods identified for Anaktuvuk Thin are slashing; handpiling; pile-burning; underburning and /or lop-and-scatter and biomass removal. Identifying differences in effects from specific methods allow for those anticipated effects to be analyzed. The Anaktuvuk Thin EA also developed specific Project Design Features to reduce the effects of hazardous fuels treatments to resources such as site productivity and wildlife.

The EA (Section 2.4.2.3) allows that "Site specific fuels treatments would be determined following an assessment of the feasibility of biomass removal and the amount of created activity fuels."

Comment 3c: AFRC would like to see sales that allow for winter harvesting.

Response: The Anaktuvuk Thin EA is consistent with the Medford RMP. Specific Best Management Practices developed under the RMP, as required by the Federal Clean Water Act, were incorporated into the Anaktuvuk Thin EA. Those BMPs are repeated as Project Design Features under section 2.3 of the EA.

Comment 3d: AFRC supports thinning in riparian areas.

Response: See response to 2a above.

APPENDIX 4 - SILVICULTURAL PRESCRIPTIONS

Geology

The Analysis Area is located within the Klamath Mountains, Coastal Siskiyous Ecoregion (78f). This ecoregion is physically and biologically diverse. Highly dissected, folded mountains, foothill, terraces and flood plains occur. The soils of the area have developed from igneous, sedimentary, and some metamorphic rock.

The mild, sub-humid climate of this ecoregion is characterized by a lengthy summer drought period. Annual precipitation ranges from 70-130 inches. Air temperatures range from 50°F in the day time to 38°F at night in January and July temperatures range from 76°F in the day to 50°F at night. Compared to elsewhere in the Klamath Mountains, the Coastal Siskiyous are a wetter, milder maritime climate. Productive forests composed of tanoak, Douglas-fir, and some Port-Orford-cedar cover the dissected, mountainous landscape.

Vegetation Description

The two major plant series within Anaktuvuk Thin Analysis Area are the Douglas-fir Series *(Pseudotsuga menziesii)* and the Tanoak Series (*Lithocarpus densiflorus)* (USDA Forest Service 1996). The primary plant association within the northern portion of the analysis area is the Douglas-fir-Golden Chinquapin/Dwarf Oregongrape (*Pseudotsuga menziesii-Castanopsis chrysphylla/Berberis nervosa*). This Association is moist and cool. Total species richness is low for the Series. The overstory is dominated by Douglas-fir with a minor component of sugar pine (*Pinus lambertiana*). The understory is dominated by Douglas-fir and golden chinquapin with tanoak, Pacific madrone, canyon live oak, white fir, and sugar pine as common associates. The primary plant association in the southern portion of the analysis area is Tanoak-Douglas-fir-Canyon live Oak/Poison oak (*Lithocarpus densiflorus-Pseudotsuga menziesii-Quercus chrysolepis/Rhus diversiloba).* This association description is similar to the one above; however dominated by tanoak in the understory.

The stands within the analysis area have been modified through past timber harvest and young stand management practices. These stands are classified within two seral stages; early seral (0-10 years old) and mid-seral (45-48 years old). The early seral vegetation is comprised of planted and natural conifer seedlings mixed with 70 to 80 percent cover of tanoak, chinquapin, manzanita, and rhododendron shrub cover. The shrub component is 3 to 10 feet tall overtopping 2 foot tall conifer seedlings. The mid-seral vegetation is comprised of planted or seeded pole-size conifers dominated by Douglas-fir. These stands are in the stem exclusion stage of development; closed canopy and single layer. This has reduced the understory vegetation to sparse pockets of mature rhododendron, chinquapin, and Pacific madrone. One stand (21-5) is a portion of a partially altered stand in the late seral stage of development. The late seral vegetation is dominated by mixed conifer/hardwoods sapling/pole size trees with sparse overstory Douglas-fir and Incense-cedar. This stand is in the understory reinitiation stage of development, allowing

the establishment of understory vegetation. The following table lists the general stand characteristics of the proposed treatment areas.

Stand Description by Seral Stage

Seral Stage	Stand Age (years)	Trees Per Acre	Basal Area (square feet)	Quadratic Mean Diameter (inches)	Top Height (feet)	Canopy Closure
Early Seral	6	400-800		0.1	5	30-40%
Mid-Seral	45	208-665	152-191	7.3-12.1	85-98	59-75%
Late-Seral	300	1681	240	5.0*	107	64%

*The large number of small diameter stems within this stand pulls the QMD down.

Stand Treatment Objectives

The proposed treatment areas are within General Forest Management Area (Matrix) and Riparian Reserve (RR) land allocation. Matrix objectives are, in part, to produce a sustainable supply of timber while providing habitat for and connectivity for dispersal of a variety of organisms associated with both late-successional and younger forests. The silviculture systems selected for each individual stand are designed to meet established land use objectives and are based on the ecological process and individual site and stand characteristics. Maintenance treatments are proposed for the early seral stands to promote the survival and establishment of conifers by reducing competition from undesired plant species. Commercial thinning is proposed for the mid-seral stands to maintain stand vigor and growth by controlling stand density. Pruning would be carried out to increase wood quality through the production of clear wood. Precommercial thinning and release are proposed for the late-seral stand to control understory stand density, influence species dominance and maintain stand vigor and growth.

Stand Descriptions and Recommended Treatments

Unit 9-1 and 17-1 T.32S.R09W Section 09 and 17

Stand Description: Units 9-1 and 17-1 are pieces of a 45 year old plantation that was clearcut under Ana Saddle Salvage Sale and artificially seeded in 1963. The plantation was precommercially thinned then aerial fertilized in 1983. It received a first lift (pruning for wood quality in 2003. Currently the plantation is a three-layered stand, dominated by a Douglas-fir overstory, 8 to 22 inch DBH (11 inch average), and 60 to 95 feet in height, with 40 to 80 percent live crown ratios. The middle layer of the canopy is sparse, made up of Douglas-fir saplings and golden chinquapin 1 to 4 inch dbh, 10 to 30 feet in height with 20 to 30 percent live crown ratios. The ground cover is made up of salal, rhododendron, bracken fern, California hazel and red huckleberry. Overall canopy closure is currently at 60 percent.

Analysis and Desired Future Condition: This site is fully stocked and has moved into the developmental stage where natural attrition or mortality will start to take place. This stand will favorably respond to a heavy grade low thinning; increasing merchantable yields by distributing volume growth on fewer larger stems and provide for higher value production. The intermediate and portions of the codominant crown classes would be removed, releasing the remaining codominant trees. A second lift pruning is desired to accelerate the transition from juvenile wood to mature wood, continuing increased wood relative density and reduced taper below the point of pruning. The residual stand canopy closure has been modeled to be approximately 47 percent. Within 50 years the canopy would close to approximately 60 percent. This level of canopy closure would tend to limit the development of understory reinitiation; while maintaining appropriate stocking levels to the next commercial entry.

Avoidance Strategies: Timely stocking level control would prevent a reduction in growth and vigor. The utilization of material that would normally accumulate on the forest floor due to natural stand mortality would reduce the fuel loading. Removal of the suppressed and intermediate layer in the canopy would reduce the potential of a crown fire. Maintenance of stand vigor and growth would allow the development and retention of full crowns, reducing understory establishment. These strategies combined or in part, would reduce the stands' vulnerability to wildfire, insects and disease. Artificial acceleration of crown recession would circumvent the delay of the natural pruning process which results in large branches and knots.

Recommended Treatment: The silviculture system prescribed for units 9-1 and 17-1 is a Commercial Thin. Primary emphasis is to be given to retaining all live Douglas-fir that have received a first lift pruning. This will result with a residual basal area of approximately 120 square feet and a 47 percent canopy closure. Within the riparian reserve, desired residual basal area is 130 square feet to achieve a 50 percent canopy closure. Emphasis to retain well-formed and vigorous conifers with live crown greater than 35 percent will be given where a non-pruned tree is needed for stocking. It is desirable to maintain species diversity, favoring incense-cedar over Douglas-fir where present. A second lift pruning would be conducted outside the riparian reserve, treating approximately 109 trees per acre following commercial thin.

Silvicultural Options Considered: None

Unit 9-2, 9-3, and 16-1 T.32S.R09W Section 09 and 16

Stand Description: Units 9-2, 9-3 and 16-1 are pieces of a 47 year old plantation that was clearcut under Anaktuvuk Saddle Salvage Sale in 1960 and planted in 1961. The plantation was precommercially thinned then aerial fertilized in 1983. Currently the plantation is a three-layered stand, dominated by a Douglas-fir overstory, 9 to 20 inch DBH (12 inch average), and 50 to 96 feet in height, with 40 to 80 percent live crown ratios. The middle layer of the canopy is sparse, made up of Douglas-fir saplings and golden chinquapin 1 to 4 inch dbh, 10 to 30 feet in height with 20 to 30 percent live

crown ratios. The ground cover is made up of salal, rhododendron, bracken fern, California hazel and red huckleberry. Overall canopy closure is currently at 62 percent.

Analysis and Desired Future Condition: This site is fully stocked and has moved into the developmental stage where natural attrition or mortality will start to take place. This stand will favorably respond to a heavy grade low thinning; increasing merchantable yields by distributing volume growth on fewer larger stems and provide for higher value production. The intermediate and portions of the codominant crown classes would be removed, releasing the codominant trees. A second lift pruning is desired to accelerate the transition from juvenile wood to mature wood, continuing increased wood relative density and reduced taper below the point of pruning. The residual stand canopy closure has been modeled to approximately 40 percent. Within 50 years the canopy would close to approximately 50 percent. This level of canopy closure would tend to limit the development of understory reinitiation; while maintaining appropriate stocking levels to the next commercial entry.

Avoidance Strategies: Timely stocking level control would prevent a reduction in growth and vigor. The utilization of material that would normally accumulate on the forest floor due to natural stand mortality would reduce the fuel loading. Removal of the suppressed and intermediate layer in the canopy would reduce the potential of a crown fire. Maintenance of stand vigor and growth would allow the development and retention of full crowns, reducing understory establishment. These strategies combined or in part, would reduce the stands' vulnerability to wildfire, insects and disease. Artificial acceleration of crown recession would circumvent the delay of the natural pruning process which results in large branches and knots.

Recommended Treatment: The silviculture system prescribed for units 9-2, 9-3 and 16-1 is a Commercial Thin. The prescription is to thin from below, reducing the basal area to approximately 110-120 square feet and a 40 percent canopy closure. Within the riparian reserve, desired residual basal area is 140 square feet to achieve a 50 percent canopy closure. Emphasis is to be given to retaining vigorous, well-formed conifers with live crown greater than 35 percent. It is desirable to maintain species diversity, favoring incense-cedar over Douglas-fir where present. A first and second lift pruning would be conducted, treating approximately 109 trees per acre following commercial thin.

Silvicultural Options Considered: None

Unit 21-6, 21-7 and 21-8 T.32S.R09W Section 21

Stand Description: Units 21-6, 21-7 and 21-8 are a 48 year old plantation that was clearcut in 1960 under the Cold Springs Timber Sale and planted in 1961. The plantation was precommercially thinned then aerial fertilized in 1983. Currently the plantation is dominated by a Douglas-fir overstory, 8 to 20 inch diameter at breast height (dbh) (8 inch average), 35 to 90 feet in height, with 30 to 60 percent live crown ratios. The middle layer of the canopy is made up of Douglas-fir, golden chinquapin and Pacific madrone 2 to 8 inch dbh, 15 to 30 feet in height with 20 to 40 percent live crown ratios. The bottom

layer is patchy with Douglas-fir, Incense-cedar and Pacific yew seedlings and saplings as well as 10 to 60 percent (30 % average) ground cover of salal, Sadler oak, bracken fern, California hazel, twin flower and whipple vine. Overall canopy closure is currently at 75 percent.

Analysis and Desired Future Condition: This site is fully stocked and has moved into the developmental stage where natural attrition or mortality will start to take place. This stand will favorably respond to a medium grade low thinning; increasing merchantable yields by distributing volume growth on fewer larger stems and provide for higher value production. The suppressed, dying, and intermediate crown classes would be removed, releasing the dominant and codominant trees. The residual wide spacing would allow branches to live longer, delaying crown lift. It is desired to increase wood relative density and reduce taper by pruning lower live branches to accelerate the transition from juvenile wood to mature wood. The residual stand canopy closure has been modeled to be approximately 40 to 50 percent however within 40 years the canopy would recover, closing to approximately 60 to 65 percent. This level of canopy closure would tend to limit the development of understory reinitiation; while maintaining appropriate stocking levels to the next commercial entry.

Avoidance Strategies: Timely stocking level control would prevent a reduction in growth and vigor. The utilization of material that would normally accumulate on the forest floor due to natural stand mortality would reduce the fuel loading. Removal of the suppressed and intermediate layer in the canopy would reduce the potential of a crown fire. Maintenance of stand vigor and growth would allow the development and retention of full crowns, reducing understory establishment. These strategies combined or in part, would reduce the stands' vulnerability to wildfire, insects and disease. Artificial acceleration of crown recession would circumvent the delay of the natural pruning process which results in large branches and knots.

Recommended Treatment: The silviculture system prescribed for units 21-6, 21-7 and 21-8 is a Commercial Thin. The prescription is to thin from below, reducing the basal area to approximately 110 to 120 square feet, while maintaining a 40 percent canopy closure. Within the riparian reserve, desired residual basal area is 140 square feet to achieve a 50 percent canopy closure. Emphasis is to be given to retaining vigorous, well-formed conifers with live crown greater than 35 percent. It is desirable to maintain species diversity, favoring incense-cedar over Douglas-fir where present. A first and second lift pruning would be conducted, treating approximately 109 trees per acre following commercial thin.

Silvicultural Options Considered: None

Unit 21-5 T.32S.R09W Section 21

Stand Description: Units 21-5 is 38 acres blocked out from 132 acres of a 300 year old stand that had an overstory partial cut conducted in 1971. Unit 21-5 is currently a three

layered stand. The overstory is sparse, made up of Douglas-fir and sugar pine, 20 to 60 inch diameter at breast height (dbh), 90 to 110 feet in height; with 30 to 40 percent live crown ratios. The middle layer of the canopy is made up of tan oak, golden chinquapin and Pacific madrone 5 to 12 inch dbh, 25 to 35 feet in height. The bottom layer is dense, with Douglas-fir, golden chinquapin and tan oak seedlings and saplings as well as 30 to 40 percent ground cover of salal, rhododendron, and princess pine. Canopy closure of the dominant overstory is currently at 35 percent. When combined with the intermediate and understory layers it is currently at 64 percent.

Analysis and Desired Future Condition: This site is an over stocked stand in the understory reinitiation developmental stage where natural seeding has taken place allowing establishment of a forest floor stratum. This stand will favorably respond to a precommercial thinning; releasing desirable species from the dominance of undesirable species. This would ensure rapid dominance of the favored species on the site. Within the understory stratum, the intermediate and codominant crown classes would be removed, releasing dominate and codominant saplings. This would provide additional moisture, light, nutrients, and growing space for the desired conifers and hardwoods by cutting the competing vegetation (excess conifers, hardwoods, and shrubs). The residual stand canopy closure would be 50 percent however within 40 years the canopy would recover, closing to 55 to 60 percent. This will assist with the desire to limit the development of understory reinitiation, maintaining appropriate stocking levels to the next commercial entry.

Avoidance Strategies: Timely stocking level control would prevent a reduction in growth and vigor. Maintenance of stand vigor and growth allows the understory conifers to develop, emerging into the B-stratum. This strategy, in part, reduces the stands vulnerability to insects and disease.

Recommended Treatment: The prescribed treatment for unit 21-5 is a pre-commercial thin. The prescription is to thin the seedlings, saplings, and pole-size conifers, up to 7.0 inch dbh to a spacing of 14 ft. x 14 ft. (220 TPA) with 100 percent brushing. Emphasis is to be given to retaining vigorous, well-formed conifers with live crown greater than 40 percent. The overstory trees will be considered in the spacing. It is desirable to maintain species diversity, favoring incense-cedar over Douglas-fir where present.

Silvicultural Options Considered: None

Unit 21-1, 21-2, 21-3, and 21-4 T.32S.R09W Section 21

Stand Description: Units 21-1, 21-2, 21-3, and 21-4 are 7 year old plantations that received a partial cut in 1971 and an overstory removal in 1997 under the Cold Mule Timber Sale and planted in 2002. The plantations received a 100 percent maintenance brushing in 2007. The plantations are currently classified as unaccepted stands due to the high potential of juvenile mortality. They do, however, meet target standards for spatial distribution and density. These plantations are made up of 80 percent Douglas-fir and 20 percent sugar pine seedlings, 2 to 4 feet in height; with 40 to 80 percent live crown ratios.

The overstory shelterwood is made up of Douglas-fir, 20 to 30 inch dbh, 90 to 130 feet in height with 20 to 40 percent live crown ratios. Prior to the maintenance brushing in 2007, the shrub layer was 70 to 85 percent ground cover of salal, rhododendron, Sadler oak, tanoak and chinquapin.

Analysis and Desired Future Condition: These stands are in the establishment stage of development and have a diverse mix of species. These stands will favorably respond to an additional maintenance brushing; reducing the probability of juvenile mortality caused by vegetation competition. The maintenance brushing would reduce competition, providing additional moisture, light, nutrients, and growing space for desired conifers by cutting the competing vegetation (hardwoods and shrubs). The shelterwood overstory would remain intact.

Avoidance Strategies: Timely control of competing vegetation would promote the survival of suitable trees.

Recommended Treatment: The prescribed treatment for unit 21-1, 21-2, 21-3, and 21-4 is a maintenance brushing. The prescription is to cut 100 percent of unwanted vegetation. Hardwood species over 7.0 inches at dbh will be retained.

Silvicultural Options Considered: None

APPENDIX 5 - HARVEST UNIT TREATMENTS

Unit Number	Acres	Alternative 2			Alternative 3		
		Harvest Treatment	Logging System	Other Treatments	Harvest Treatment	Logging System	Other Treatments
9-1	16	Commercial Thin	Tractor	Pruning 20' lift Slash/Hand Pile/Burn Lop and Scatter Riparian Thin Biomass Removal	Commercial Thin	Tractor	Pruning 20' lift Slash/Hand Pile/Burn Lop and Scatter Riparian Thin
9-2	16	Commercial Thin	Tractor	Prune 20' lift Slash/Hand Pile/Burn Lop and Scatter Riparian Thin Biomass Removal	Commercial Thin	Tractor	Prune 20' lift Slash/Hand Pile/Burn Lop and Scatter Riparian Thin
9-3	7	Commercial Thin	Cable	Prune 20' lift Slash/Hand Pile/Burn Lop and Scatter stream crossing Biomass Removal	Commercial Thin	Cable	Prune 20' lift Slash/Hand Pile/Burn Lop and Scatter stream crossing
16-1	11	Commercial Thin	Cable	Prune 17 ½' lift Slash/Hand Pile/Burn Lop and Scatter Riparian thin Biomass Removal	Commercial Thin	Cable	Prune 17 ½' lift Slash/Hand Pile/Burn Lop and Scatter Riparian thin
17-1	57	Commercial Thin	Tractor	Prune 20' lift Slash/Hand Pile/Burn Lop and Scatter Riparian Thin Biomass Removal	Commercial Thin	Tractor	Prune 20' lift Slash/Hand Pile/Burn Lop and Scatter Riparian Thin
21-1	13	Brushing	Manual	No Treatment	Brushing	Manual	No Treatment
21-2	6	Brushing	Manual	No Treatment	Brushing	Manual	No Treatment
21-3	22	Brushing	Manual	No Treatment	Brushing	Manual	No Treatment
21-4	7	Brushing	Manual	No Treatment	Brushing	Manual	No Treatment
21-5	37	Pre-Commercial Thin	Tractor	No Treatment	Pre-Commercial Thin	Manual	No Treatment
21-6	26	Commercial Thin	Cable	Slash/Hand Pile/Burn Lop and Scatter	Commercial Thin	Cable	Slash/Hand Pile/Burn Lop and Scatter

Unit Number	Acres	Alternative 2			Alternative 3		
		Harvest Treatment	Logging System	Other Treatments	Harvest Treatment	Logging System	Other Treatments
				Riparian Thin Biomass Removal			Riparian Thin
21-7	7	Commercial Thin	Tractor	Prune 171/2 lift Slash/Hand Pile/Burn Lop and Scatter Biomass Removal	Commercial Thin	Tractor	Pruning Prune 171/2 lift Slash/Hand Pile/Burn Lop and Scatter
21-8	5	Commercial Thin	Tractor	Pruning Slash/Hand Pile/Burn Lop and Scatter Riparian Thin Biomass Removal	Commercial Thin	Cable	Pruning