ENVIRONMENTAL ASSESSMENT

EA # OR -104-02-09

UPPER UMPQUA WATERSHED PLAN

June 17, 2003

Bureau of Land Management, Roseburg District
Swiftwater Field Office

This Environmental Assessment (EA) has been prepared for the Roseburg Bureau of Land Management - Swiftwater Field Office's for multiple projects within the Upper Umpqua watershed. The BLM is considering a number of actions to more quickly develop late-successional habitat characteristics used by northern spotted owls and marbled murrelets, to reduce erosion and landslide risks, and to improve aquatic habitat. Another objective is to provide a commercial product for the economy. These actions are analyzed in this EA, which considers three alternatives. This EA analyzes thinning of 30 to 80 year old (mid seral) forests to develop late-successional habitat and improve riparian habitat, as well as selling wood for commercial purposes. It also analyzes improving and decommissioning roads to reduce erosion and landslide risks and soil movement into streams, removing or replacing fish barrier culverts to reconnect fish access, placing large wood and boulders into streams to improve fish habitat, and thinning hardwood dominated riparian areas so that conifers can more quickly grow there.

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Summary for the Upper Umpqua Watershed Plan Environmental Assessment

In 2002 – 2003 the BLM completed an analysis of lands in the Upper Umpqua watershed (see Locater Map A-1). This analysis revealed three major concerns: 1) Forest stands that were clearcut harvested and then replanted in the mid-to-late 1900's have grown into dense, tightly stocked 30 to 80 year old (mid seral) forest stands. These types of forestlands, if left unthinned within lands designated as Late-successional and Riparian Reserves, will not develop late-successional habitat characteristics needed for northern spotted owls and marbled murrelets in the next 150 years (see Figure 4 on page 14 for a representative picture of forest stand results after 150 years). Figure 3 on page 14 shows the types of late-successional characteristics that are desired in these forests. 2) Some of the roads built in the mid-to-late 1900's were not constructed at current standards. They currently contribute higher levels of sediment to streams and are at higher risk of causing landslides. These problem roads will continue to have elevated erosion rates and landslide risks, which will limit the ability for coho salmon and other fish species to spawn and rear. 3) Instream aquatic habitat is both limited and lacking in diversity. Some culverts have been found to be barriers to about 10 miles of fish habitat. Streams also lack the structural diversity needed by coho and other aquatic species for spawning and rearing.

Because of these concerns, the BLM is considering a number of actions to more quickly develop late-successional habitat characteristics used by northern spotted owls and marbled murrelets, to reduce erosion and landslide risks, and to improve aquatic habitat. Another objective is to provide a commercial product for the economy. These actions are analyzed in this Environmental Assessment, which considers three alternatives. One alternative, **No Action Alternative 1**, would be the continuation of present management resulting in the persistence of the conditions described above. An overview of the major activities under the two action alternatives follows.

Thinning to Develop Late-Successional Habitat and Provide a Commercial Product

Under **Alternative 2**, most of the project area (about 6,600 acres) would be thinned to a moderate residual density. About 500 acres would be thinned to low residual densities. For forest stands with trees averaging 14 inches in diameter, moderate residual density is equivalent to leaving about 90 trees per acre and low residual density is equivalent to leaving about 65 trees per acre. In the next 150 years forest stands thinned to moderate residual densities would develop some late-successional characteristics needed by northern spotted owls and marbled murrelets (see Figure 5 on page 15 for a representative picture of results in 150 years from moderate residual density thinning). With the additional 1,500 acres of harvesting on lands with the main objective of producing a commercial timber product, **Alternative 2** would harvest about 105 million board feet of timber. At 15,000 board feet per average house, this is equivalent to the amount of wood needed to construct about 7,000 average houses.

Under **Alternative 3**, moderate residual density thinning on a smaller part of the project area (about 5,000 acres) would achieve similar results as under Alternative 2. However, Alternative 3 would thin about 2,550 acres more of the project area to low residual densities. In the next 150 years the forest stands thinned to low residual densities would develop a greater amount late-successional characteristics compared to Alternative 2 (see Figure 6 on page 15 for a representative picture of results in 150 years from low residual density thinning). With the additional 1,050 acres of harvesting on lands with the main objective of producing a commercial timber product, **Alternative 3** would harvest about 125 million board feet of timber. This is equivalent to the amount of wood needed to construct about 8,300 average houses.

Reducing Sediment to Streams

Under **Alternatives 2 and 3**, sediment would be reduced in the following ways:

- For the existing 56 miles of problem roads, short-term sediment to streams would increase as the roads and culverts are fixed. However, erosion rates, landslide risks, and sedimentation would be reduced long-term by approximately 50 to 75 percent compared to the existing situation. The ability of aquatic species to spawn and rear would be increased.
- For the 240 miles of road to be used for timber haul, there would be a short-term slight increase (about one percent overall) in sediment during logging activities. Long-term, after timber haul is completed and roads are rocked/improved, sedimentation would be reduced by approximately 10 to 35 percent compared to the existing situation.

Improving Aquatic Habitat

Under **Alternatives 2 and 3**, culvert replacements would open about 10 miles of fish habitat. Log and boulder structures would be added to 15 miles of streams, creating additional gravels and pools for coho and aquatic spawning and rearing habitat.

Summary Table of Expected Outcomes by Category and by Alternative

<table>
<tr><th></th><th>Alternative 1
No Action</th><th>Alternative 2</th><th>Alternative 3</th></tr>
<tr><td>Short-term Owl and Murrelet Effects</td><td>• Mid Seral Forest Habitat – Maintain current lack of diversity
• Owl dispersal habitat – Maintain existing 90% to 100% canopy closure
• No change in predation</td><td>• Mid Seral Forest Habitat – Increase forest diversity
• Owl dispersal habitat – Reduce canopy closure to 60%
• Increase in predation</td><td>• Mid Seral Forest Habitat – Greater increase forest diversity than Alt. 2
• Owl dispersal habitat – Reduce canopy closure to 60% in high owl use areas and 40% in low owl use areas
• Increase in predation</td></tr>
<tr><td>Long-term Owl and Murrelet Effects</td><td>• No development of late-successional characteristics within 150 years.
• Delayed expansion of late-successional habitat available for spotted owls/murrelets.</td><td>• Improved late-successional characteristics within 150 years.
• Accelerated expansion of late-successional habitat available for spotted owls/murrelets.</td><td>• Improve late-successional characteristics within 150 years at a greater rate compared to Alternative 2.
• Greater expansion of late-successional habitat available for spotted owls/murrelets especially in low owl use areas compared to Alternative 2.</td></tr>
<tr><td>Short-term Sediment and Aquatic Effects</td><td>• Sediment from roads resulting from landslides and chronic erosion remain at current levels.
• Stream reaches with greatest potential would continue spawning and rearing habitat at less than optimal levels.
• Fish barriers prevent access to stream spawning and rearing habitat.</td><td colspan="2">• Slight increase in sediment from roads resulting from road improvements, decommissioning and culvert replacements.
• No consequential increase in sediment from timber haul.
• Improve spawning and rearing habitat in stream reaches with greatest potential.
• Fish barriers removed. Spawning and rearing habitat expanded.</td></tr>
<tr><td>Long-term Sediment and Aquatic Effects</td><td>• Sediment from roads resulting from landslides and chronic erosion remain at current levels, fixed as needed.
• Stream reaches with greatest potential would continue spawning and rearing habitat at less than optimal levels.
• Fish barriers prevent access to spawning and rearing habitat.</td><td colspan="2">• Overall greatly reduced sediment from all roads resulting from landslides and chronic erosion.
• Improve spawning and rearing habitat in stream reaches with greatest potential.
• Fish barriers removed, increased access to spawning and rearing habitat.</td></tr>
</table>

1 PURPOSE OF AND NEED FOR ACTION

A. Need for Action

The Roseburg District Record of Decision and Resources Management Plan (RMP, June 1995) guides and directs management on BLM lands. It 'responds to dual needs: … the need for a healthy forest ecosystem [and] the need for forest products' (RMP, pg. 15). Part of this need can be met by "Design[ing] and implement[ing] watershed restoration projects in a manner that promotes long-term ecological integrity of ecosystems … and attains Aquatic Conservation Strategy objectives" (pg. 28). Part of this need can also be met through "timber harvest and other silvicultural activities in . . . the Matrix" (pg. 33) as well as "Plan[ning] and implement[ing] silvicultural treatments inside Late-Successional Reserves that are beneficial to the creation of late-successional habitat" (pg. 29).

The South Coast-Northern Klamath Late-Successional Reserve Assessment (South Coast LSRA) provides priority and criteria for developing habitat management treatments to meet wildlife objectives within Late-Successional (LSR) and Riparian Reserves (RR). The Upper Umpqua Watershed Analysis identifies management opportunities for implementing restoration activities within the Upper Umpqua watershed. The need for the proposed action is based in part on these documents.

There is a need for forest stands within designated Late-successional and Riparian Reserves and Connectivity/Diversity Block to develop characteristics to support habitat for late-successional associated species. Forest stands were clearcut harvested and then replanted from the 1940's through the 1990's. Because the tree crowns in these dense mid seral forest stands are competing for light, tree growth rates are declining and the tree crowns are shrinking in size as lower limbs die from lack of light. Thinning would develop larger trees and more diverse forest canopies. There is a need in Connectivity/Diversity Block and General Forest Management Areas to sell wood "to maintain the stability of local and regional economies…."

There is a need to improve or decommission higher risk roads to reduce their hydrologic and sediment effects to the watershed. There is a need to remove or replace culvert barriers to provide historical stream access for anadromous fish. These legacy roads and culverts were constructed prior to current standards and need to be upgraded to improve the aquatic system.

There is a need to introduce wood and structure to simplified stream systems to maximize stream diversity and improve habitat for fish species. Past harvesting typically removed much of the large wood in and along streams. The wood in streams and the adjacent forests provide key structures within the stream system to create channel diversity and complexity. Large wood removal has resulted in simplified stream channels and has created the need to reintroduce large wood into the stream system (Upper Umpqua WA, pg. 101). Thinning mid seral forest stands in riparian areas would accelerate the natural process for creating larger trees, so that through natural processes some of these trees would become a source for instream large wood. Without active enhancement, these stream reaches would lack large wood inputs from riparian forests for the next 50 to 150 years.

Additionally. there is a need for the proposed action to be consistent with the Roseburg District programmatic biological opinions. Because funding is limited, there is a need for the proposed action to be implemented in a cost effective manner.

B. Purpose of the Proposed Action

The purpose of the proposed action is to implement multiple projects over the next five to ten years to achieve the following objectives.

1. For mid seral forests on BLM lands designated for wildlife and fish needs (Late-successional and Riparian Reserves, Connectivity/Diversity Block), accelerate stand diversity and development of late-successional characteristics such as large crown ratios, larger lateral branches, multiple canopy layers, and a greater number of larger conifers while maintaining a healthy ecosystem.
2. For mid seral forests on BLM lands designated for commercial harvest needs (General Forest Management Areas, Connectivity/Diversity Block), maintain healthy growth rates and contribute timber for the local and regional economy while protecting certain forest components for wildlife.
3. Reduce the amount of human-caused fine sediment input into streams.
4. Accelerate and enhance the development of aquatic habitat characteristics such as instream structure, increased pools and gravels, and reduced bedrock dominated streams. Increase the access to spawning and rearing habitat for anadromous fish.

The purpose of the proposed action is based on the following general goals set forth in the RMP. Practice ecosystem management:

- Improve conditions for wildlife [and fish] if they provide late-successional habitat benefits or if their effect on late-successional associated species is negligible (pg. 38, 40).
- Acquire desired vegetation characteristics needed to attain ACS objectives (pg. 25).
- Protect, enhance, and maintain a functional, interacting late-successional forest ecosystem (pg. 29).
- Accelerate the recovery of previously disturbed riparian forests (pg. 21).
- Control and prevent road-related runoff and sediment production; restore riparian vegetation and in-stream habitat complexity (pg. 21).
- Re-establish access for fish to historically available habitat (pg. 25).

Harvest timber commercially:

- Manage developing stands . . . to promote tree survival and growth and to achieve a balance between wood volume production, quality of wood, and timber value at harvest (pg. 60).
- Produce a sustainable supply of timber (pg. 33).
- Provide habitat for a variety of organisms associated with both late-successional and young forests (pg. 33).
- Provide important ecological functions such as dispersal of organisms, carryover of some species from one stand to the next, and maintenance of ecologically valuable structural components such as down logs, snags, and large trees (pg. 33).
- Manage timber stands to reduce the risk of stand loss from fires, animals, insects, and diseases" (pg. 60).

C. Issues

Issues for this analysis were developed based on public comments, interdisciplinary team discussion, and agency staff comments. Some issues were considered key because they were used to develop proposed action alternatives. Other issues as listed below are analyzed but because the Project Design Criteria (PDCs) in the proposed action alternatives would sufficiently prevent any consequences to those resources, they were not considered key.

1. Key Issues

- ➢ Are the current mid seral forest stands going to develop the types of late-successional forest structure needed for northern spotted owls and marbled murrelets without management intervention?
  - What are the effects of stand densities over time on developing late-successional forest structure for northern spotted owl and marbled murrelet habitat?
- ➢ Will the proposed management activities accelerate (compared to natural processes) the development of instream habitat (gravels and pools) and protect against detrimental sediment so that salmonid populations would be able to increase spawning and rearing in Upper Umpqua?
  - What are the temporal and spatial sedimentation effects of road, harvest, and enhancement activities on instream salmonid habitat?
  - What change will occur in stream channel complexity and fish habitat access as a result of road, harvest, and enhancement activities?

2. Non-Key Issues

Because the environmental consequences for the following issues, under all alternatives, would be inconsequential, they were considered non-key:

- ➢ What are the effects of proposed activities on cultural resources?
- ➢ What are the effects of proposed activities on soil productivity?
- ➢ What are the effects of proposed activities on Port Orford cedar?
- ➢ What are the effects of proposed activities on hydrologic peak flows, stream temperature, and water quality limited streams?
- ➢ What are the effects of proposed activities on noxious weeds?
- ➢ What are the effects of proposed activities on Kincaid's lupine?
- ➢ What are the effects of proposed activities on botanical special status species and survey and manage species?
- ➢ What are the effects of proposed activities on wildlife special status species and survey and manage species?

D. Description of the Proposed Actions

The project categories, summarized below and in Table 1 and shown on the maps in Appendix A are derived from the Upper Umpqua Watershed Analysis management opportunities section.

1. Thin Mid Seral Forests for Wildlife, Fish, and Commercial Objectives

Thinning would be accomplished with a combination of helicopter, cable and ground-based systems. Some new roads would be constructed. Mid seral forest stands in Late-Successional and Riparian Reserves would be thinned to accelerate the development of late-successional habitat for wildlife and fish species. Connectivity/Diversity Block lands would also be thinned for this purpose in Alternative 3. No-harvest buffers within Riparian Reserves would be established to minimize effects to streams. Snags and coarse woody debris (CWD) would be retained, developed, and/or added to the forest and riparian system. Mid seral forest stands in General Forest Management Areas and Connectivity/Diversity Blocks would be thinned for commercial purposes while maintaining growth rates and providing forest components for wildlife.

2. **Watershed Enhancements**
   - Roads identified with higher erosion and/or landslide risk would be improved or decommissioned.
   - Fish barrier culverts would be replaced or removed in coordination with road improvements and decommissioning.
   - Larger conifers would be felled or pulled and/or logs or boulder structures would be placed to enhance prioritized stream reaches and to create more stream diversity.
   - Some hardwood-dominated areas would be treated to encourage conifer growth.

Table 1 Upper Umpqua Watershed Plan Proposed Action Summary – Alternatives 2 and 3

Project Type/Description	Purpose
Treat Mid Seral Forests in Late-Successional and Riparian Reserves	
Approximately 7,100 acres of forest stands, ages 30 to 80 years, would be thinned to develop late-successional characteristics, snags and CWD.	Accelerate late-successional characteristics to enhance spotted owl and murrelet habitat.
Thin Mid Seral Forests in General Forest Management Area Lands, Connectivity/Diversity Block	
Approximately 1,500 acres of forest stands, ages 30 to 80 years, would be thinned lightly to reduce tree densities.	Maintain forests at free-to-grow densities while protecting residual old-growth trees, snags, and down wood and producing a commercial product.
New Road Construction Associated with Above Forest Treatments	
To conventionally cable and ground-base log the acreage identified above; **Approximately 6 miles** of **permanent** and **12 miles** of **temporary** new roads would be needed (+/-20%).	Provide balance for practical, cost efficient, and environmentally sensitive method for harvesting timber.
Road Activities to Reduce Erosion and Landslide Risk	
Approximately 50 miles of roads would be improved by adding drainage structures, pull back sidecast material and adding rock to the road.	Reduce chronic sedimentation and potential landslide risks and improve hydrologic function.
Approximately 4 miles of roads would be decommissioned by removing drainage structures and pulling back sidecast material.	Reduce chronic sedimentation and potential landslide risks and restore hydrologic function.
Fish Barrier or High Risk Culvert Replacements or Removals	
Between **22 and 30 larger culverts** would be either replaced or removed to provide fish passage or reduce risk of failure.	Improve access to approximately **10 miles** of anadromous salmonid stream habitat.
Enhance Riparian Areas and Add Instream Large Wood and Boulder Structures	
Large wood (16 to 40" diameter breast height) would either be felled or placed and/or boulders would be placed in a**pproximately 15 stream miles.**	Improve instream fish habitat, riparian habitat & hydrology.
Fell, girdle, or treat with other methods from **1 to 5 conifers per acre** to create snags and CWD.	Improve wildlife, instream fish habitat, & riparian habitat.
Within **hardwood dominated riparian** areas, conifer trees would be released or hardwoods removed for conifer development on **about 85 acres.**	Improve riparian habitat for fish & hydrology.

2 DESCRIPTION OF ALTERNATIVES

A. *Overview of the Alternatives*

There are three alternatives analyzed in detail in this environmental assessment, which address management within the Upper Umpqua watershed. Alternative 1 is the No Action Alternative, while Alternatives 2 and Alternative 3 are the Action Alternatives. The Action Alternatives provide a range of options to fulfill the purpose and need and address the issues, which are discussed in Chapter 1. Table 2 summarizes the residual density acreages for the Action Alternatives. See the glossary for definitions of high, moderate, and low residual densities.

1. Alternative 1 (No Action)

This alternative would rely on passive management of mid seral forests to attain late-successional forest characteristics within the Upper Umpqua watershed. Mid seral forests within the Upper Umpqua watershed would not be thinned for the purpose of accelerating the development of late-successional characteristics or for the benefit of the local and regional economies. These forest stands would maintain approximately 250 to 600 trees per acre.

Alternative 1 would not improve or decommission roads to reduce sedimentation, would not replace or remove culverts that are barriers to fish passage, would not do active enhancement of stream habitat through the placement of logs or boulders, and would not accelerate conifer development in riparian areas.

2. Alternative 2

This alternative would accelerate the development of late-successional forests within Late-Successonal Reserves and Riparian Reserves by thinning approximately 6,600 acres of mid seral forest stands to moderate residual density and by thinning approximately 500 acres to low residual density. For forest stands with trees averaging 14-inches in diameter, moderate residual density is equivalent to about 90 trees per acre and low residual density is equivalent to about 65 trees per acre. Unthinned areas would be provided within a set 40-foot no-harvest buffer for non-fish bearing streams and a 100-foot no-harvest buffer for fish bearing streams. In addition, Alternative 2 would thin mid seral stands on 550 acres of Connectivity/Diversity Blocks and 950 acres of General Forest Management Area to high residual density in order to achieve the commercial objectives of those land use allocations. For forest stands with trees averaging 14-inches in diameter, high residual density is equivalent to about 110 trees per acre.

Alternative 2 watershed enhancements would improve 52 miles and decommission 4 miles of road to reduce sedimentation, would remove, replace or upgrade between 22 and 30 culverts that are barriers to fish passage, would enhance approximately 15 miles of stream habitat through placement of logs or boulders, and would cut, girdle, and/or remove hardwoods to accelerate conifer development in riparian areas.

3. Alternative 3

This alternative would accelerate the development of late-successional forests within Late-Successional Reserves and Riparian Reserves by thinning approximately 5,000 acres of mid seral forest stands to moderate residual density and by thinning approximately 2,100 acres to low residual density. Unthinned areas would be provided within a variable width no-harvest buffer for non-fish bearing streams and a 100-foot no-harvest buffer for fish bearing streams with smaller patches of unthinned areas in the uplands. Within the Connectivity/Diversity Block an additional 450 acres would be thinned to low residual density for the same purpose of accelerating development of late-successional forest. One hundred acres of mid seral stands in Connectivity/Diversity Blocks, and the 950 acres in the General Forest Management Area would be thinned to high residual density to achieve the commercial objectives of those land use allocations.

Alternative 3 would enhance the Upper Umpqua watershed condition through the same actions as Alternative 2.

Table 2 Upper Umpqua Thinning Density Acreage by Alternative (See Map A-2)

	Alternative 2	Alternative 3
Late-successional & Riparian Reserves Moderate Residual Density	6,600	5,000
Late-successional & Riparian Reserves Low Residual Density	500	2,100
No-harvest buffer Unthinned Areas	1,000	700
Upland Unthinned Patch Areas	Minimal Amount	300
Connectivity/Diversity Block High Residual Density	550	100
Connectivity/Diversity Block Low Residual Density	----	450
General Forest Management Area High Residual Density	950	950

B. Detailed Description of the Action Alternatives

1. Actions Common to Both Alternatives 2 and 3

For the purpose of reducing sedimentation and enhancing aquatic habitat, Alternative 2 and Alternative 3 would accomplish watershed enhancement through the same actions described below:

a) Improve or Decommission Roads to Reduce Erosion and Landslide Risk

Table 3 summarizes the miles of road improvements and decommissioning with a more detailed summary by subwatershed in Table E-5. Tables E-6 and E-7 and Map A-3 give a more detailed list of the roads and their locations. Approximately 50 miles of road would be improved to reduce their erosion and landslide risk. Improvements would consist of removing sidecast material, installing or maintaining drainage structures (culverts and ditches), reshaping the road surface, surfacing with rock, and brushing road shoulders.

Approximately 20 miles of road were originally identified for decommissioning. Review by Right-of-Way Permittees and Douglas Forest Protection Association narrowed this down to approximately four miles that would legally be decommissioned (see Map A-3). The objective for decommissioned roads is to reduce short and long-term erosion, sedimentation to streams, and slope instability. How each road is decommissioned would depend on the needs of each road and could include removing of culverts and recontouring of stream crossings, subsoiling, recontouring of the roadbed, removal of unstable sidecast, waterbarring, blocking to traffic, seeding, mulching, and fertilization as well as bioengineering techniques. These ". . . road segment[s] . . . [would be] closed to vehicles on a long-term basis, but may be used again in the future." (Western Oregon Transportation Management Plan [TMO], pg. 15).

Table 3 Road Improvements and Decommissioning - Alternatives 2 & 3 (see Map A-3)

Total BLM Road Miles	Road Improvement Miles	Road Decommission Miles
360	52	4

b) **Replace or Remove Culverts**

Between 22 and 30 larger-size fish barrier culverts would be replaced, upgraded, or removed so that they would provide passage for aquatic species. Based on the Upper Umpqua Watershed Analysis results and further field review, 26 culverts have been verified as barriers and are included in this analysis (see Map A-3). With the road improvements listed above, some culverts (not fish barriers) that have a higher risk of failing would be replaced, upgraded, or removed. Approximately five culverts have small water impoundments (pump chances, heliponds less than one acre) behind them that are in need of maintenance. When these culverts are replaced, the water impoundments would be maintained for fire suppression use.

c) **Instream Habitat Enhancement**

Approximately 15 miles of BLM streams would be treated to enhance instream complexity through the addition of log or boulder structures (see Map A-3). About 13 stream miles on BLM were identified through the watershed analysis as the highest priority for instream restoration within Upper Umpqua. The additional 2 miles of stream would be treated because they are streams that are interconnected with priority reaches. To diversify habitat for aquatic species, approximately 50 to 150 key structures (trees, logs, and/or boulders) per stream mile (3 to 10 per 100 m) would be added utilizing either singletree or multiple-tree and boulder structures. Trees between 16 and 40 inches in diameter would be felled or pulled on about 2 miles, large wood and boulders would be mechanically placed in about 7 miles, and a combination of these methods would take place on about 6 miles of streams. These estimates would vary up to 10 percent as designs are developed in the field.

Trees within the 16 to 40 inch diameter range from future roadside blowdown, right-of-way trees or trees harvested from the Late-Successional and Riparian Reserves would be used for this instream restoration. These trees would be stockpiled to coincide with instream enhancement locations. Between 650 and 2,000 logs would be needed for use in the above listed instream enhancements. Map A-3 shows instream enhancement locations and quarry sites that would be used as boulder sources. Some blasting and minimal development in these quarries would be expected to create and use boulders for instream enhancement. Boulders along roads and from future landslides would also be used.

d) **Late-Successional and Riparian Habitat Improvement**

Within all Late-Successional and Riparian Reserves, including the no-harvest buffers for both Alternatives 2 and 3, between one and five conifers per acre would be felled, topped, girdled, and/or inoculated (as determined by the silviculturalist) to create snags and coarse woody debris. Patch openings of one-quarter acre to one acre in size would be scattered throughout these land use allocations to create diversity. This would meet short- and long-term aquatic and wildlife objectives based on the South Coast LSRA.

Throughout the project area, hardwoods dominate approximately 170 acres of the BLM riparian mid seral forest stands. Most of this occurs in the Hubbard Creek and Rader Wolf subwatersheds. To accelerate conifer dominated riparian conditions, actions on approximately 85 acres would include: releasing existing conifers by cutting or girdling surrounding hardwoods and harvesting selected hardwood patches for underplanting with conifers.

e) **Harvest Related Actions Common to Both Alternatives 2 and 3**

(1) *Harvesting Methods*

For all land use allocations, Alternatives 2 and 3 would require a mix of helicopter, skyline cable, and ground-based logging. Additional isolated minor ground-based logging up to 100 acres would likely be necessary (e.g. removal of guyline anchor trees, isolated portions of units). Helicopter landing locations would be one-half to one acre in size. Trees that are determined to be a hazard to flight operations would be cut under approval of the Authorized Officer. Table 4 and Map A-4 display the acreage and location of helicopter, skyline cable, and ground-based logging under Alternatives 2 and 3.

Table 4 Density Management Acres by Harvest Method (See Map A-4) *

Project Area	Helicopter	Cable	Ground-Based	Total Acres
	Acres	Acres	Acres	
Late-Successional Reserve	725	3026	248	3999
Riparian Reserve	855	3107	115	4077
Connectivity/Diversity Block General Forest Management Area	225	1082	182	1489
TOTAL	**1805**	**7215**	**545**	**9565**

* Acres are estimated based on computer calculated geographical information. These acres have been rounded throughout the rest of this Environmental Assessment (EA).

(2) *Road Activities Related to Harvesting*

Under Alternatives 2 and 3, timber from harvesting would be hauled on approximately 240 miles of road including 14 to 22 miles of temporary or permanent road construction. The RMP (pg 132) best management practice for locating new roads is, "Locate roads out of Riparian Reserves where practical alternatives exist." For Late-Successional Reserve treatments, the South Coast LSRA gave guidance that "new road construction should be limited to temporary roads which can be rehabilitated following use." (pg 95) In this EA the harvesting methods include a combination of helicopter, cable, and ground-based logging. Analysis indicates that other options (e.g. longer roads, downhill logging, helicopter logging, etc.) to constructing new roads within Riparian Reserves would not meet the need for implementing in a cost effective manner (see Appendix E). Therefore, approximately one mile of new road would be constructed within

200 feet of streams. Table 5 summarizes the road activities related to timber harvesting. Table E-4 and Appendix E give a more detailed summary and explanation of new road construction definitions.

Table 5 Haul Route and New Road Construction Activities - Alternatives 2 and 3*

Total Timber Haul Roads	240 miles
Total New **Permanent** Road Construction	6 miles
Total New **Temporary** Road Construction	12 miles

* Road miles are estimated based on planning from the Geographical Information System and would vary by approximately 20 percent when implemented in the field.

(3) *Other Harvest Related Activities*

Approximately two to three acres of land within the three existing developed quarries identified on Map A-3 would be used to produce approximately 250,000 cubic yards of rock for roads needing improvement for timber haul, or for newly constructed roads, or for roads that need landslide and erosion risk reduction.

For the high/moderate residual density thin areas in Alternatives 2 and 3, fuel treatments would be limited to hand-piling slash, chipping, lop & scatter and other fuel treatments to reduce fire hazards. Most of these treatments would include burning of landing and hand piled slash and would be used along roads, trails, ridge-tops, property lines and near campgrounds to lower the risk of human-caused fires from spreading. Up to 400 acres of landing and piled slash would be burned. Firewood cutting and salvaging of logging debris (slash) would occur in landing cull decks and near roads.

It is estimated that between 1,500 and 2,000 trees over a ten-year period would need to be felled prior to the signing of Decision Documents for sampling purposes. This separate action was analyzed under the 3-*P Fall, Buck and Scale Sampling* EA (EA# OR-100-00-06) and would be in compliance with the Settlement Agreement (January 31, 2003).

2. Alternative 2 – Moderate Thinning to Develop Late-Successional Habitat

Table 2 and Map A-2 summarizes the different types of harvest prescriptions for Alternatives 2 and 3 across the 9,600-acre project area. This reflects the difference in the amount and distribution of residual stand densities (numbers and sizes of trees) left after thinning mid seral forest stands.

Alternative 2 would thin approximately 6,600 acres to moderate residual densities and approximately 500 acres to low residual densities within Late-Successional and Riparian Reserves. The 1,500 acres of Connectivity/Diversity Block and General Forest Management Area lands would be thinned to high residual densities for commercial purposes. No more additional fuel treatments would be proposed in Alternative 2 than already described above.

Alternative 2 would establish an estimated 1,000 acres of unthinned areas on the landscape within a set 40-foot no-harvest buffer for non-fish bearing streams and a 100-foot no-harvest buffer for fish bearing streams. This would expand to a wider buffer width around unstable areas where appropriate. Within the uplands of Late-Successional Reserves, no unthinned patch areas would be established except around incidental species found that need protection.

3. Alternative 3 – Low Residual Thinning to Develop Late-Successional Habitat

Within Late-Successional Reserves and Riparian Reserves approximately 5,000 acres of mid seral forest stands would be thinned to moderate residual density and approximately 2,100 acres would be thinned to low residual density. Within the Connectivity/Diversity Block an additional 450 acres would be thinned to low residual density for the same purpose of accelerating development of late-successional forest. Low residual density thin prescriptions for Alternative 3 as shown on map A-2 are located in areas of low spotted owl use. This thin prescription would be placed on stable slopes and where landslides are unlikely to reach streams. The remaining 100 acres of mid seral stands in Connectivity/Diversity Blocks, and the 950 acres in the General Forest Management Area would be thinned to high residual density to achieve the commercial objectives of those land use allocations.

Alternative 3 would establish variable no-harvest buffers around all non-fish bearing streams in some cases down to one tree between the thinning and the stream. The buffer width would vary depending on the need for stream protection as determined by interdisciplinary specialists. Buffer widths would expand around unstable areas and to protect other stream attributes as needed. An estimated 700 acres of unthinned forest stands would be located within the variable width no-harvest buffers. Within Late-Successional Reserves, unthinned patch areas totaling an estimated 300 acres would be located in the uplands away from streams to meet upland wildlife needs. These unthinned areas would be designed to meet specific wildlife objectives such as transition from late-successional to mid seral forests or unthinned patch areas for upland diversity.

For Alternative 3, an additional 350 acres would be under burned in the low residual density thin areas within Late-Successional and Riparian Reserves and Connectivity/Diversity Block where tree crowns are spaced over 20 feet apart and adequate control lines are available. Under burning of these stands would generally occur on south and west aspects with slopes generally less than 45 percent. About 25 percent of under burning would be within Riparian Reserve boundaries but outside the no-harvest buffers described above. Alternative fuel treatments such as machine piling, hand piling, gross yarding, lop and scatter could be used in place of under burning. This would be determined after post-harvest slash surveys.

4. Project Design Criteria for Thinning and Watershed Enhancement

Project design criteria and best management practices have been adopted as part of implementing Alternatives 2 and 3 to reduce adverse environmental impacts. They are designed to avoid, minimize or rectify impacts on resources. These measures also help projects meet the objectives of the Aquatic Conservation Strategy. Appendix B lists project design criteria that apply to Alternatives 2 and 3. A more general list of best management practices is also given in the Roseburg District ROD in Appendix D starting on page 129.

3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

The following has been organized to analyze the affected environment and consequences by each key issue as described above. The General Environmental Setting serves to provide the context for analyzing cumulative effects. Much of the affected environment discussion is drawn from the Upper Umpqua Watershed Analysis, which is incorporated by reference.

A. General Environmental Setting

An overview of the land ownership and BLM's land use under the RMP within the Upper Umpqua fifth-field watershed is given in the Upper Umpqua Watershed Analysis on page 13. The watershed contains approximately 169,500 acres. BLM manages about a third, industrial forest owners manage about a third, and agriculture and other private landowners manage about a third of the watershed. Figure 1 shows the acreage and breakdown of 1997 vegetation categories within Upper Umpqua that have been influenced historically by fire, timber harvesting, and agriculture for all ownerships. Figure 2 shows the acreage and breakdown of the approximate 57,700 acres of BLM forested lands by seral age class.

Figure 1 Upper Umpqua 1997 Vegetation Estimations (acres), All Land Owners

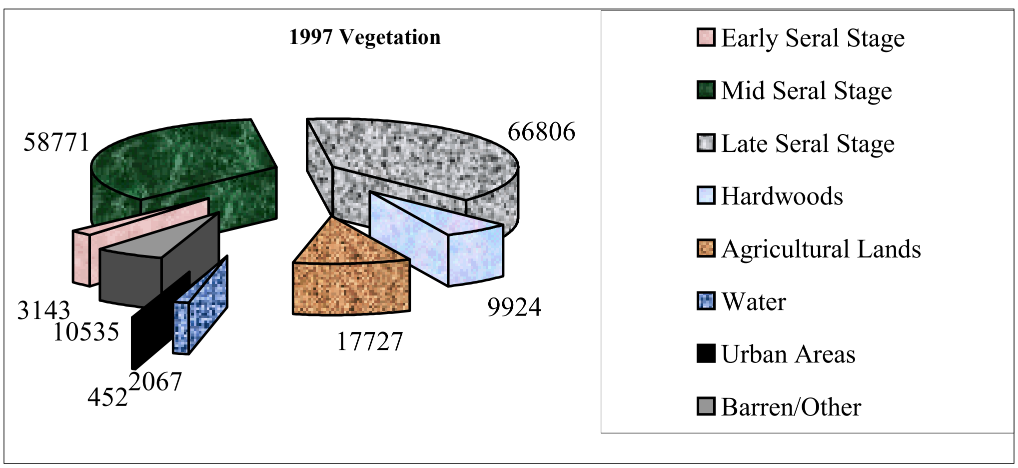
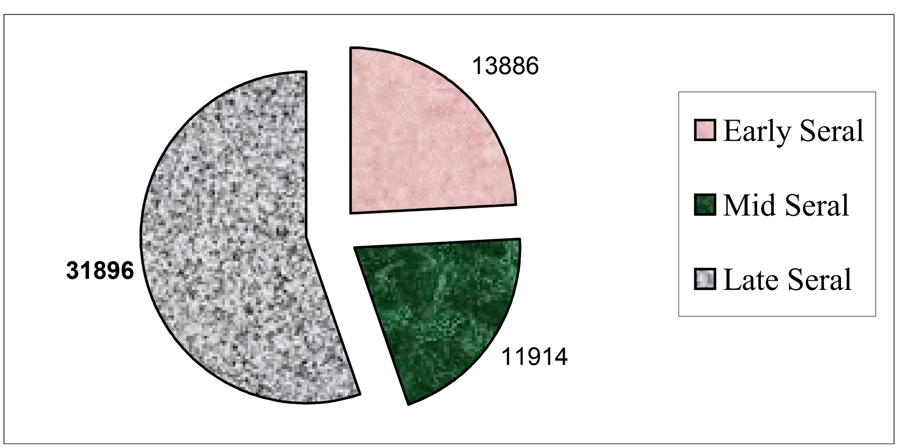


Figure 2 Upper Umpqua, BLM Forests by Seral Stage (acres)



B. Late-Successional Forest Development and Wildlife T&E Species

1. Affected Environment

The Upper Umpqua Watershed Analysis summarizes in detail the current vegetative conditions available for terrestrial Federally Threatened and Endangered (T&E) species and their occurrence and status within this watershed (pg 53-61 and Wildlife Appendix). The T&E terrestrial species present within the proposed action area include the northern spotted owl (*Strix occidentalis caurina*), marbled murrelet (*Brachyramphus marmoratus*), and bald eagle (*Halieaeetus leucocephalus*). Current population and habitat conditions for each of these species are as follows:

- Northern Spotted Owl (spotted owl)- There are 57 spotted owl sites within the watershed, of which eight sites are protected with 100 acre residual habitat area. Twenty-nine of these sites occur within one-quarter mile of the proposed action area, of which 24 of these sites are located in Late-Successional Reserves, three in Matrix, and two on private lands. Approximately 32,000 acres of late-successional forests on BLM lands provide suitable nesting, cover, and foraging habitat. An additional 12,000 acres of mid seral forest stands that provide cover and foraging habitat for dispersing spotted owls. All of the approximate 9,600 acres proposed for density management are within these mid seral stands.
- Marbled Murrelet (murrelet)- Five known occupied murrelet sites occur with 0.25 miles of the proposed project area. The 32,000 acres of late-successional forest listed above also provide nesting habitat for murrelets. This may be an underestimate of suitable habitat due to the mid seral forests that are less than 80 years old, but have residual trees with limbs greater than 4 inches or other suitable nesting platforms. Within the proposed project area, there are older residual trees within the mid seral stands, some of which have very large limbs in the lower crown that could be suitable for nesting murrelets.
- Bald Eagle- Approximately 3,360 acres are designated for bald eagle management, within the watershed, under the Umpqua River Corridor Habitat Management Plan (HMP) (USDI 1985). Approximately 420 acres of the proposed density management occurs within this designated area. Four of the nine known bald eagle territories within the watershed occur within one-quarter mile of the proposed project area.

a) **Current Vegetative Conditions within the Project Area**

From the 1950's to the 1990's late-successional forest stands with large trees ranging from 37 to 71 trees per acre were clearcut (Elkton-Umpqua WA, pg. 7-4). After harvest, the clearcut areas were often burned to reduce the amount of logging slash and competing vegetation in preparation for planting. During this era, these clearcuts were planted with conifers to about 500 trees per acre and then some stands were pre-commercially thinned to about 300 trees per acre to provide space for maximum tree growth. Most of these forest stands have since grown into the dense homogenous mid seral forest stands. Older residual trees that were not cut are still a minor component in these stands. There are varying amounts of coarse woody debris in these stands as well, composed of trees of the most recent forests that have fallen over and logs that were left after harvest.

Of the 57,700 acres of BLM forested lands within the watershed, there are currently about 12,000 acres of mid seral forest stands between 30 and 80 years of age. The bulk of these stands are the result of planting and seeding after the clearcut harvests mentioned above. On Roseburg BLM, about 2,400 acres of these stands have been pre-commercially thinned, and 1,760 acres have been fertilized. Many of the stands that have not been pre-commercially thinned are now extremely dense, often with 600 or more trees per acre, consisting of mostly small diameter trees with small live crowns.

About 2,000 acres of 60 to 80 year old forest stands were naturally regenerated presumably after a fire that occurred about 100 years ago. These stands are uniform and lacking in structures commonly found in older forests. There are older residual trees in mix with this younger forest, some of which have very large limbs in the lower crown. There are few large snags and large down logs in these stands. The oldest trees in these stands are about 200 years old, which indicates the previous forest stands were fairly open grown, probably in mix with shorter-lived hardwood and shrub species.

Some density management treatments have already occurred in this type, and data shows a positive diameter growth response in the residual trees. The Little Wolf Density Management study is located in this forest type, and has been thinned twice. As a result, a considerable amount of younger conifers have seeded and grown in the study area. The study area demonstrates how these stands would likely develop late-successional characteristics if active density management treatments are implemented. An example from the study is that the large limbs and crowns on the older open grown trees were maintained when the younger trees were thinned around them.

b) Measuring Development of Late-Successional Characteristics

Figure 3 provides a schematic of an actual late-successional forest stand found in the Rader Creek area that meets many of the characteristics desired by late-successional associated species, including the spotted owl and murrelet. Characteristics include multiple canopy layers, diverse tree and limb size, crown depth, and canopy gaps and natural openings. Characteristics adequate for murrelet nesting habitat include conifer trees having lateral branches of at least 4 inches in diameter (Pacific Seabird Group, 2003). Characteristics adequate for spotted owl habitat include: Dispersal habitat - forest stands averaging 11inches in diameter and 40 percent canopy closure; Foraging habitat – forest stands averaging at least 80 feet tall with two or more canopy layers (Thomas et. al., 1990).

Using the mid seral forest conditions within the project area as a baseline, growth of these forest stands under different thinning densities was simulated over a 150-year period using the ORGANON model. Figures 4-6 illustrate the results. Figure 4 represents no thinning. Figure 5 represents moderate residual density thinning with three entries at 50, 70 and 90 years of age. Figure 6 represents low residual density thinning at age 50 and 70. The simulations show that after 150 years none of the prescriptions develop the same characteristics as the Rader Creek forest stand (Figure 3). However the analysis shows that some prescriptions develop late-successional characteristics to a greater degree than others. Alternatives were evaluated by the degree and amount to which they developed late-successional characteristics across the project area. Aerial photos shown in Appendix E illustrate the short-term results of different residual densities and what Alternatives 1, 2, and 3 might look like within a few years after harvesting is completed. These photos were taken from the O.M. Hubbard density management study area.

Figure 3 Desired Late-Successional Structure

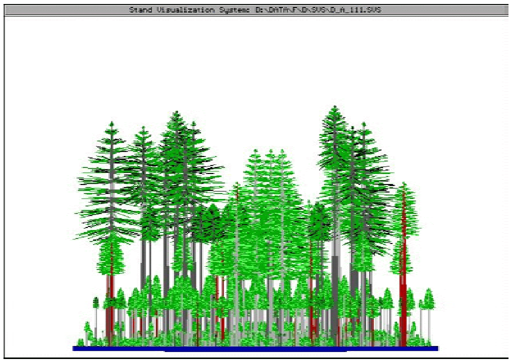
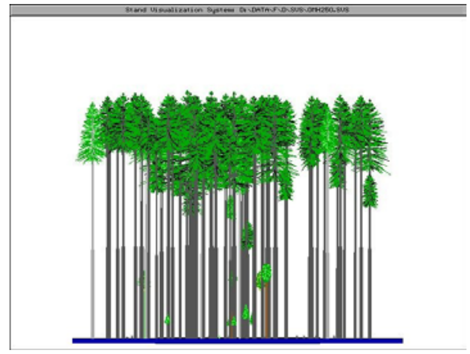


Figure 4 Alternative 1 – No Action



2. Environmental Consequences –Development of Forest Stand Characteristics

a) **Alternative 1 (No Action) – Effects on Forest Stand Characteristics**

The No Action would produce the following forest characteristics as illustrated in Figure 4:

- Single canopy layer with little understory diversity.
- Small crown depths.
- Few if any lateral branches would reach sufficient size (4") for murrelet nesting habitat.
- Canopy closure maintained at 90 to 100 percent.
- Average Tree Diameter is 25 inches.

b) **Alternative 2 – Effects on Forest Stand Characteristics**

Under Alternative 2 the majority of the project area, about 70 percent (6,600 acres), would be thinned to moderate residual densities. The resulting forest characteristics after 150 years are illustrated in Figure 5. The high residual density thinning areas (1,500 acres) represent about 15 percent of the project area and would develop characteristics somewhere between Figure 4 and 5. The unthinned areas (1,000 acres) represent about 10 percent of the project area and would develop characteristics as illustrated in Figure 4. The low residual density thin areas (500 acres) represent about 5 percent of the project area and would develop characteristics as illustrated in Figure 6. Moderate residual density thinnings would develop the following characteristics:

- Two layered canopies with some understory development.
- Small crown depths.
- Some lateral branches would reach sufficient size (4") for murrelet nesting habitat.
- Canopy closure maintained at least at 60 percent initially after harvest.
- Average Tree Diameter is 37 inches.

c) **Alternative 3 – Effects on Forest Stand Characteristics**

Under Alternative 3 about 50 percent of the project area (5,000 acres) would be thinned to moderate residual densities with similar results as the moderate residual thinning in Alternative 2. The high residual density thinning areas (1,050 acres) and unthinned areas (1,000 acres) both representing about 20 percent of the project area would develop characteristics similar to those described in Alternative 2. However, under Alternative 3, about 25 percent of the project area

(2,550 acres) would be thinned to low residual densities with the following results in forest characteristics as illustrated in Figure 6.

- Multiple layered canopies with a greater amount of understory development.
- Deeper crown depths.
- Lateral branches would reach sizes up to 5”, sufficient for murrelet nesting habitat.
- Canopy closure maintained at least at 40 percent initially after harvest.
- Average Tree Diameter is 46 inches.

Figure 5 Moderate Residual-Multiple Entry

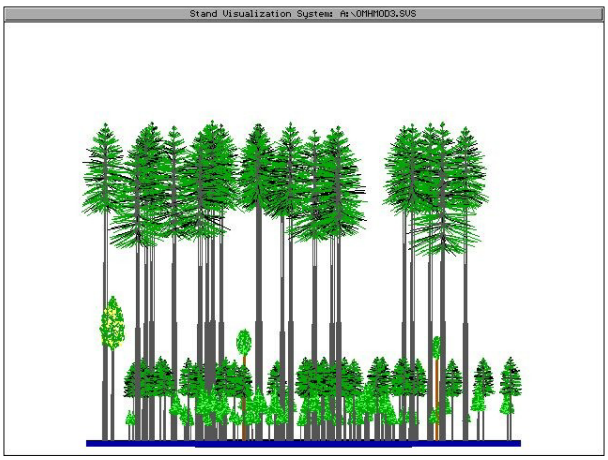
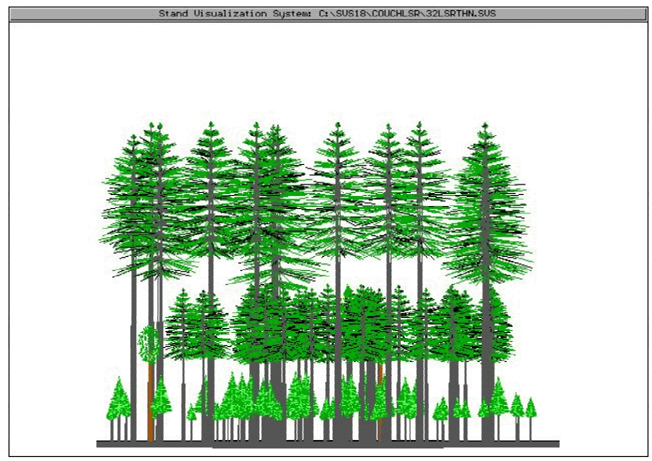


Figure 6 Low Residual-Multiple Entry



3. Environmental Consequences –Effects on T&E Wildlife Species and Habitat

Table 6 gives a brief overview of the effects on spotted owls and murrelets for all alternatives.

a) Alternative 1 (No Action) - Effects on T&E Wildlife Species and Habitat

There would be no short-term effects to spotted owls, murrelets, and bald eagles under the No Action Alternative. Approximately 9,600 acres of mid seral forest stands would be maintained at current tree densities and canopy closures. Species population trends and habitat use would continue at current levels within the watershed.

The long-term effects would be the delayed development of stand characteristics associated with late-successional forests for at least 150 years, in the absence of a major natural disturbance, such as wildfire or wind storm. As illustrated in Figure 4 and described above, the natural development of these forest stands would maintain single layered relatively homogeneous canopies, and would not develop the desired characteristics (i.e. large limbs > 4”, large crown depths, and large diameter trees) needed by spotted owls and murrelets. The ability of these stands to function as spotted owl dispersal habitat would continue to be marginal due to high tree densities, limiting the mobility of the spotted owl within these mid seral stands. Natural development of these stands would result in slower expansion of suitable habitat components for the spotted owl, murrelet, and other late-successional associated species. Late-successional habitat characteristics would not be expected to develop for at least 200 to 300 years, depending on the degree of natural disturbance from wildfire, wind storms, insects and disease. Severe natural disturbances could also destroy the existing stands, restarting the stand development process and subsequently delaying habitat development further.

No road construction, decommissioning, or improvements would occur under the No Action Alternative. Therefore barrier, effects of roads on wildlife movement would remain unchanged. Disturbance to wildlife on existing open roads within the proposed project area would continue at current levels.

Table 6 Summary of Expected Spotted Owl and Murrelet Impacts by Alternative

	No Action Alternative 1	LSRA Prescription Alternative 2	Habitat Improvement Alternative 3
Short-term Effects	• Population trends and habitat use by species would remain at current levels. • No modification of spotted owl dispersal habitat would occur.	• Modification of canopy closure to 60 percent would increase the risk of predation on spotted owls and nesting murrelets for 7,100 acres (12%) of the mid seral habitat in the watershed.	• 5,000 acres (8%) would have same effects as Alt. 2. • The other 2,550 acres, where modification of canopy closure to 40 percent, would have a higher risk of predation than Alterantive 2 on spotted owls and nesting murrelets for 4% of the mid seral habitat in the watershed.
Long-term Effects	• Delayed development of desired late-successional stand characteristics, thereby delaying expansion of late-successional habitat available for spotted owl/murrelets.	• Increased development of late-successional characteristics on 7,100 acres (12%) of mid seral forests. • Accelerated expansion of late-successional habitat available for spotted owl/murrelets.	• 5,000 acres (8%) would have same effects as Alt. 2. • The other 2,550 acres (4%) of low residual thinnings would further enhance development of late-successional habitat characteristics available for spotted owl/murrelets as compared to Alt. 2.

b) **Common to Alternatives 2 and 3 – Effects on T&E Wildlife Species and Habitat**

Alternatives 2 and 3 would not remove or degrade suitable nesting habitat for spotted owls, marbled murrelets or bald eagles. There would be no modification of federally designated Critical Habitat for the marbled murrelet. There are 57,561 acres of federally designated Critical Habitat for the spotted owl within the watershed. Alternatives 2 and 3 would modify approximately 6,300 acres of spotted owl dispersal habitat within designated Critical Habitat. Project Design Criteria, listed in the Biological Assessment for Programmatic Activities on the Roseburg District FY 2003-2008 (Ref. No. 1-15-03-F-160), would be implemented to minimize disturbance effects to federally listed species.

Because spotted owls use mid seral stands for dispersal and foraging, and there is the potential for murrelets to nest in residual trees within these stands, both species would have short-term and long-term effects under the three alternatives. Table 6 summarizes the effects of each alternative on species and habitat. Modification of mid seral stands under Alternatives 2 and 3 would not cause short-term effects to the bald eagle. Long-term effects to the bald eagle would be similar to the long-term effects for spotted owls and murrelets summarized in Table 6 for project areas along the river corridor.

Spotted Owl

Short-term effects -Under both **Alternatives 2 and 3,** approximately 12 miles of temporary and 6 miles of permanent roads would be constructed to access stands during treatment activities. The approximate 10 miles of temporary roads constructed within Late-Successional Reserves would be decommissioned after use. Between one and two miles of road would be constructed within one-quarter mile of six owl sites. Seasonal restrictions would mitigate impacts due to noise disturbance during road construction. Increased public use of new temporary roads could disturb nesting, roosting, and foraging activities during the one to three years they are open. The opened road corridors increase the possibility of predation and barrier effects on about 100 acres of habitat. Predation or barrier effects would decrease within five to twenty years as roadbeds revegetate and reconnect adjacent habitats.

Under both **Alternatives 2 and 3,** density management thinning would modify foraging and dispersal habitat for 29 spotted owl sites that have all or a portion of their home range within the proposed project area. If all the approximate 9,600 acres of the proposed density management is implemented, the remaining 34,300 acres (80 percent) of the total dispersal habitat within the watershed would continue to function in its current capacity.

Marbled Murrelet

Short-term effects –For both **Alternatives 2 and 3** none of the temporary or permanent road construction occurs within known murrelet sites. Appropriate seasonal restrictions would mitigate for disturbance during any road construction within a quarter mile of unsurveyed or known murrelet sites.

For both **Alternatives 2 and 3** density management thinning would not modify, remove, or degrade residual trees with suitable murrelet nesting habitat, including trees with limbs greater than 4 inches or other suitable platforms. The integrity of residual trees containing suitable nesting structures would be maintained by retaining mid seral trees that have interlocking limbs with the residuals.

Long-term effects - The Marbled Murrelet Recovery Plan recommends the use of silviculture techniques to increase the speed of development and recruitment of suitable murrelet nesting habitat (USFS 1997, p. 144). Both **Alternatives 2 and 3** would facilitate the development of future nesting habitat by increasing tree and limb growth rates. In addition, thinning younger trees out around the older large limbed trees would allow murrelets greater access for nesting, thus providing an opportunity for murrelets to occupy these stands earlier. Both alternatives would accelerate the expansion of suitable murrelet nesting habitat on approximately 7,100 acres within the watershed.

Bald Eagle

Short-term effects -Under both **Alternatives 2 and 3,** none of the temporary or permanent road construction occurs within one mile of the Umpqua River corridor. Density management thinning and associated roads would not remove or degrade suitable roosting or nesting habitat for the bald eagle.

Long-term effects -Under both **Alternatives 2 and 3,** density management thinning, within one mile of the Umpqua River corridor, would maintain or develop large trees and snags needed to support nesting and foraging activities on approximately 420 acres.

c) **Alternative 2 – Effects on T&E Species and Habitat**

Spotted Owl

Short-term effects – Under **Alternative 2**, about 60 percent average thinned forest canopy cover is maintained on approximately 6,600 acres and about 40 percent average is maintained on approximately 500 acres. These thinned areas would continue to function as dispersal habitat, but in a slightly degraded condition. This represents an increased risk of predation on spotted owls on about 12 percent of the mid seral habitat in the watershed compared to the No Action Alternative. Canopy cover and the development of understory vegetation layers would recover within 5-10 years post treatment.

Long-term effects – Under **Alternative 2,** thinning would increase and enhance the development of desired late-successional stand characteristics, which would increase the amount of nesting, roosting, and foraging habitat on about 6,600 acres and to a greater extent on the 500 acres of low residual density thinnings. As these characteristics develop, the habitat would continue to function as spotted owl dispersal and foraging habitat. As illustrated in Figure 5, the moderate density thinning would develop habitat having larger diameter trees and two layered canopies over the next 150 years.

Marbled Murrelet

Long-term effects – Under **Alternative 2,** the development of desired late-successional stand characteristics would increase the amount of nesting and roosting habitat on about 7,100 acres. As illustrated in Figure 5 and described above, these forest stands would develop larger diameter trees with limbs larger than 4", larger crown depths, and two canopy layers.

d) **Alternative 3 – Effects on T&E Species and Habitat**

Spotted Owl

Short-term effects – Under **Alternative 3**, thinned forest canopy cover on about 5,000 acres would have similar effects as Alternative 2. However the approximate 2,550 acres of low residual density thinning in Late-Successional Reserves and Connectivity/Diversity blocks would lower canopy cover averages to approximately 40 percent. Dispersal habitat would fall below functionality if average stand canopy closure falls below 40 percent (Thomas et al. 1990). However, with high residual thinning prescriptions adjacent to suitable habitat, buffers around residual trees, and maintaining no-harvest buffers, average canopy closure within the stand would be maintained at or above 40 percent. In addition, treatment of the units within these stands would be staggered over time in order to minimize impacts to dispersal habitat and spotted owls within a given area.

Under **Alternative 3**, the low residual density thinning by modifying dispersal habitat average canopy cover to 40 percent would impact three of twenty-nine owl sites. Analysis of 1985-1996 telemetry owl dispersal data within the watershed showed low spotted owl use within these large blocks of mid seral forest stands (Forsman, unpublished data). Low spotted owl use of these areas could be due to current stand conditions (high tree densities and canopy cover), which would limit the ability of spotted owls to move through the habitat. These three sites currently have less than 20 percent of suitable habitat available within each of their home ranges. Treatment of the mid seral stands would improve the quality of the dispersal habitat within five to ten years. Thinning would also facilitate the development of late-successional characteristics, increasing the amount of suitable habitat available within each of these three owl sites earlier than through natural stand development.

Long-term effects – Under **Alternative 3**, the overall long-term effects from the moderate residual density thinning on about 5,000 acres would be the same as discussed for Alternative 2. However on approximately 2,550 acres, the low residual density thinning would enhance the development of late-successional characteristics to a greater extent compared to the moderate residual thinnings. As illustrated in Figure 6, the moderate density thinning would develop large diameter trees with a two-layered canopy and the low density thinning would develop even larger diameter trees with multiple canopy layers over the next 150 years. Overall, this alternative would develop a greater amount of forest diversity for spotted owl use.

Marbled Murrelet

Long-term effects – Under **Alternative 3**, the overall long-term effects would be the same as discussed for Alternative 2 in the areas of moderate density thinning. However on approximately 2,550 acres, the low residual density thinning would enhance the development of late-successional characteristics to a greater extent (Figure 6) compared to the moderate residual thinnings (Figure 5). Compared to stand development after a moderate thinning, the low residual density thinning will develop even larger diameter trees with limbs up to 5", larger crown depths, and multiple canopy layers. These characteristics are more suitable for murrelets.

4. Environmental Consequences - Effects on Timber Volume

Under **Alternative 1**, no timber would be sold for commercial purposes. One of the purposes of the action alternatives is to contribute timber to the local and regional economy. Harvesting of timber under Alternatives 2 and 3 would result in the following estimated timber volume. Using an average of 10 MBF per acre for high/moderate residual density thinning and 20 MBF per acre for low residual density thinning, Table 7 shows volume estimates for Alternatives 2 and 3.

Table 7 Upper Umpqua Volume Estimates by Alternative

	Alternative 2	Alternative 3
Late-successional & Riparian Reserves	90 MMBF	105 MMBF
Connectivity/Diversity Volume	5 MMBF	10 MMBF
GFMA Volume	10 MMBF	10 MMBF
TOTAL Harvest Volume	**105 MMBF**	**125 MMBF**

5. Environmental Consequences – Watershed Enhancement Effects on T&E Species

Under **Alternative 1**, disturbance and habitat modification would not occur. The watershed enhancements under Alternatives 2 and 3 include road improvements and decommissioning, culvert replacements, structure placements in streams and riparian hardwood conversion. Because of Project Design Criteria (Appendix B) and the terms and conditions from the T&E wildlife species Programmatic Biological Opinion FY 2003-2008, the effects of these actions would be inconsequential to wildlife. These watershed enhancements would not modify or remove nesting, roosting, or foraging habitat for owls or suitable nesting habitat for murrelets.

Approximately one mile of road would be decommissioned within one-quarter mile of three owl sites. Seasonal restrictions would limit short-term disturbance to these sites and long-term habitat would be reconnected as the roads re-vegetate.

6. Cumulative Effects (10 – 150 years within Upper Umpqua Watershed)

There are no known occupied marbled murrelet sites on private land within the watershed. All or a portion of 17 known spotted owl sites within Upper Umpqua are located on state or private land. Under state regulation, spotted owl nest sites are protected for at least three years following the last year of occupation. Known spotted owl sites would be protected with 70-acre core areas on private lands. Except for these core areas, private forestlands are not expected to provide spotted owl nesting, roosting and foraging habitat or murrelet nesting habitat (FWS Programmatic Biological Opinion, February 21, 2003).

Private landowners control a little over two thirds of the Upper Umpqua watershed. Of this about half is industrial forestlands with the remainder managed by private landowners with varying agricultural and forestry objectives. Private forestlands managed for timber production are normally harvested in accordance with state forest practice standards between 40 and 60 years of age. As shown in Figure 1 (page 11), about 67,000 acres of the forested lands in 1997 were in a late-successional condition. As shown in Figure 2 (page 11) BLM manages approximately 32,000 acres of these late-successional forests, which leaves an estimated 35,000 acres on private forestlands. Based on current observed harvesting in the Upper Umpqua watershed, it is expected that ninety-five percent of the late-successional private forestlands will be harvested within the next 20 years. These forest lands will be replanted and managed for timber production on a 40 and 60 year rotation. In this watershed Roseburg BLM has approximately 200 acres planned for regeneration harvest (to be analyzed under a separate EA), and a 100-acre sold - unawarded regeneration timber sale, all of which could be harvested within the next 5 to 10 years. These BLM harvest units would also be replanted and grown on an 80-year rotation age.

Figure 1 also shows an estimated 59,000 acres of mid seral type forest stands in the Upper Umpqua watershed. The majority of these forestlands are managed forest plantations. BLM manages approximately 12,000 acres of these forest types of which about 9,600 acres are identified in this EA. Roseburg BLM is planning a separate 300-acre thinning (under separate EA) in the Yellow Creek subwatershed. Coos Bay BLM is planning approximately 500 acres of thinning within the next 5 to 10 years. On private lands, some of these types of forests would likely be thinned but the majority is expected to be clearcut within the next 40 years. Because the objectives are different for each private landowner, the timing of harvest will vary throughout the watershed. Forestlands will maintain a mosaic pattern of age classes in the watershed as different forest stands are harvested and replanted. The majority of private lands will maintain early and mid seral forest type characteristics. Any of the mid seral forest stands on private lands will add to foraging and dispersal spotted owl habitat within the watershed.

In the context of the watershed, within the next 10 years, BLM's regeneration harvest would reduce a very small percentage (one-half percent) of late-successional forests. Thinning mid seral forests in reserves Alternative 2 and 3 would develop late-successional characteristics on an additional approximate 10 percent of the watershed within the next 150 years. Harvest on private lands would reduce late-successional forests by about 50 percent within the watershed within the next 20 years. Consultation with USFWS under the 2003-2008 Biological Opinion Programmatic Assessments for activities concluded that actions on BLM lands such as those under Alternatives 2 and 3 were "not likely to jeopardize" spotted owl, marbled murrelet, or bald eagle.

C. Sedimentation and Aquatic Species

1. Affected Environment

a) Sedimentation Trends of Past Harvest and Road Landslides

The following analysis of landslide activity, interpreted from past clearcut harvesting is used as a baseline for comparing the expected outcomes of the No Action Alternative and Alternatives 2 and 3. In general under clearcut harvesting conditions, unstable sites (actively failing) have a high risk of landslide failure and the potentially unstable sites (can become unstable with changing site conditions) have a moderate risk of landslide failure. Almost all of the Upper Umpqua geology is sandstones and siltstones of the Tyee, Elkton and similar formations. These formations have a relatively high frequency of shallow-seated debris avalanches on slopes generally steeper than 65 percent and debris flows and dam-break floods, which often generate from them in stream channels. Widely scattered slumps and earth flows have occurred on the moderate slopes. The frequency and magnitude of all landslides were tied to topographic positions, precipitation levels, storm intensities, and in the case of the December 1964 storm, to rain-on-snow events in the elevations above 2000 feet. The frequency and magnitude of road-related landslides were also tied to the construction and maintenance practices of the day. Charts 5-1 and 5-2 (Upper Umpqua WA pg. 81) illustrate the changing magnitudes of landslides over the past 50 years and their relationship to management activities. The magnitude and trends of chronic erosion and sedimentation due to roads were also tied to the same factors mentioned above as well as soil depths and textures (those high in silts being most vulnerable – a high percentage of Upper Umpqua soils), road surfacing, position on landscape (lower-middle-upper slope), road grades, the levels and seasons of traffic, and proximity to streams.

The management related trends reflect the changing practices for harvest and road activities and are summarized below:

- Since the 1960's there has been an overall downward trend in landslide magnitudes even when taking into account spikes from above average precipitation and intense storms. "The main factors in the downward trend are better management practices, a decrease in clear-cutting of old-growth, and overall higher stability …" because areas that had failed will take many years of soil and debris build up before they are primed to fail again. (Upper Umpqua WA, pg. 73)
- "Harvest-related landslides have decreased to a lesser extent (about 30 percent) from the earlier periods." (Upper Umpqua WA, pg. 72) "The ODF 1996 storms study found differences in landslide frequency according to forest age groupings. [Highest frequencies were found in clearcuts but the frequencies greatly decreased in mid seral stands with tightly spaced trees.] Tree spacing could account for the differences in landslide frequencies ... (ODF Issue Paper, 2001)." (Upper Umpqua WA, pg. 72)
- "The magnitude of road-related landslides has … dropped by a factor of at least three, partly because of better road locations and better construction and maintenance practices." (Upper Umpqua WA, pg. 72)

- "However, the analysis shows that some roads from past decades were built with sidecast on steeper slopes, with inadequate drainage, and in higher landslide risk locations. As a result, these roads still have a high risk of creating landslides in the future." (Upper Umpqua WA, pg. 116)
- Continued downward trend in road-related chronic erosion and sedimentation to streams with improved management practices and overall better road locations (Upper Umpqua WA, pg. 77).

b) **Landslide Sediment Sources Within Proposed Density Management Thin Areas**

The following information is derived from soil scientist experience, the Timber Production Capability Classification, and the landslide inventory data in Upper Umpqua Watershed Analysis. About 1,900 acres of the density management areas are on slopes greater than 60 percent. Of this about 1,500 acres are estimated to be potentially unstable and less than 100 acres are estimated to be unstable. On slopes 40 to 60 percent, unstable and potentially unstable sites, where slumps and earth flows could initiate, are small and widely scattered.

Within the 9,600 acres of mid seral forests proposed for thinning, the landslide magnitudes and frequencies are greatly reduced compared to the previous period of clearcut harvesting based on the following:

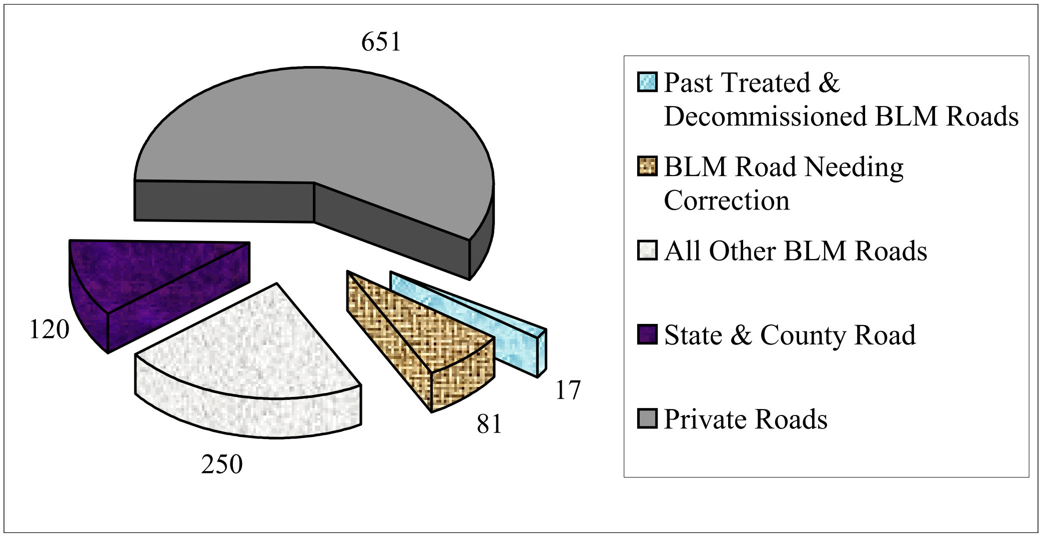
- Forest canopies for unthinned mid seral stands are typically 80 to 100 percent. Root coverage closely matches that of the canopy. The canopy intercepts rain and root mass reinforces the soil.
- Field observations by the Swiftwater soil scientist in numerous proposed thin units similar to Upper Umpqua revealed low incidences of landslides during the life of the current stands.
- Observable landslides were absent in the proposed Upper Umpqua thin units using aerial photo interpretation (from landslide inventory).
- Landslide frequencies in mid seral stands were substantially reduced during the 1996 storm events compared to young clearcuts (ODF Issue Paper, 2001).

c) **BLM Roads Identified As Erosion and Landslide Risks**

Figure 7 below shows miles of roads by ownership within the Upper Umpqua watershed as identified in the watershed analysis. Out of about 350 miles of BLM roads, approximately 81 miles (about 25 miles-Coos Bay District; 56 miles-Roseburg District) were identified as having existing erosion problems or landslide risk due to road conditions. Examples of landslide risk would be future failures of stream crossing fills due to undersized culverts becoming plugged and/or piping underneath rusted out culverts. An example of erosion problem roads is in the southern part of Hubbard Creek where a high amount of fine sediments are input into streams due to wet season OHV use by the public on natural surface roads (Upper Umpqua WA, pg 76). Three of these severely eroding roads were treated in the fall of 2002. These roads also have existing or potential slope instability with associated erosion. Conditions include, slumps in the road that disrupt drainage, tension cracks in sidecast and slump displacements in roadbeds. The aerial photo inventory showed that of the 45 road-related landslides along the 56 miles of higher risk roads, 62 percent reached streams.

Research has shown that for timber haul activities on roads, the greatest amount of fine sediment input comes from roads within 200 feet of streams (WDNR, 1995). Outside that distance there is very little sediment impact to streams due to road hauling activities. A total of about 450 miles of road are within 200 feet of streams for this watershed, including private roads (Table E-9, Appendix E). Of these, about 140 miles are BLM-controlled roads.

Figure 7 Upper Umpqua Road Miles by Category



d) **BLM Timber Haul Roads**

As described in the Upper Umpqua Watershed Analysis, sedimentation and the amount reaching streams (pg. 76) from all the watershed processes are difficult to quantify. However road related sedimentation rates can be qualitatively analyzed using a sediment model. SEDMODL, a Boise Cascade Road Erosion/Delivery Model, was used to compare the relative chronic sedimentation rates between alternatives and is described in greater detail in Appendix E. The comparison of the No Action (Alternative 1) sedimentation rates with Alternatives 2 and 3 combined are given below. The model analyzes roads within 200 feet of streams because this is the area of greatest potential sediment delivery to streams. During winter haul on rocked roads, rainwater can carry fine sediment into the streams from this 200-foot area of the road prism. Traffic on dirt roads in combination with rain can substantially add sediment to streams. For the haul roads that will be analyzed in this environmental assessment, Table 8 summarizes the miles of haul road by surface condition within 200 feet of streams.

Approximately 240 miles of roads are analyzed for timber haul. This includes about 18 miles of proposed new road construction. For this road system there are about 600 road/stream crossings of which about 46 are fish bearing. Approximately 90 miles of these roads are within 200 feet of streams. Table E-11 in Appendix E summarizes this information by road surface type.

2. Environmental Consequences – Sedimentation

a) **Alternative 1 (No Action) – Resulting Sedimentation**

Under **Alternative 1**, landslides within the dense mid seral forests would continue to be minimal. The potential for landslides and erosion problems from the 81 miles of BLM roads would continue to be high. Existing traffic on the approximately 220 miles of proposed haul roads, especially on the dirt roads, would continue to deliver elevated amounts of fine sediment to streams in the watershed.

b) **Alternatives 2 and 3 – Resulting Sedimentation**

Because there would be inconsequential differences in sedimentation rates from harvest, road, or timber haul related activities between Alternatives 2 and 3, these alternatives are analyzed together and contrasted with the No Action Alternative 1.

(1) *Sedimentation from Harvest-Related Landslides*

There would be no difference in landslide frequency between Alternative 2 and 3 because any of the low residual density thin prescriptions in Alternative 3 would be placed on stable slopes and where landslides are unlikely to reach streams. In both alternatives 2 and 3, the estimated 100 acres of unstable slopes would be removed from harvest and remain unthinned. Any future occurrences of landslides at these locations therefore would not be attributable to actions under these alternatives.

In Alternatives 2 and 3 forests thinned to moderate residual densities would have at a minimum 60 percent canopy closure. In contrast, forest canopies would remain at 90 to 100 percent in the No Action Alternative. As a result, Alternatives 2 and 3 would have a slightly elevated risk of landslides on the 1,500 acres of potentially unstable slopes compared to the No Action Alternative. This risk, however, more closely resembles what would occur in unthinned mid seral forests than the landslide frequencies from past clearcuts as discussed under the Affected Environment. Any harvest-related landslides would be few and scattered because of the following project design criteria. These would be applied where appropriate to protect slope stability and would mostly limit landslide size to less than one-tenth acre in size. Because of these project design criteria, the probability of landslides reaching streams is low:

- Seasonal yarding restrictions when appropriate.
- Extending the no-harvest buffers to protect very steep inner gorges that are prone to failing and to halt smaller landslides generated upslope.
- Prescribing moderate and high residual densities on potentially unstable areas.
- Retaining all trees in sensitive portions of headwalls, swales and hollows where there is potential for the larger landslides and flows.
- Applying Low Residual Density prescriptions only on slopes where landslides have low potential to reach streams.

A small percentage of these landslides would have a short-term impact with inputs of some fine sediments in non-fish bearing streams. However, because of the above project design criteria as well as the no-harvest buffers on fish bearing streams, harvest-related landslides would not be expected to directly affect fish bearing streams.

(2) *Sedimentation from Watershed Enhancement Road and Culvert Improvements*

Short-term Effects – Some sedimentation would result from decommissioning and improving the 56 miles of road and replacing or removing the 26 larger culverts. The project design criteria will minimize sedimentation during project work. On average each culvert represents approximately one cubic yard of short-term sedimentation (Upper and Middle Smith River II Restoration and Rehabilitation EA, pg. 27).

Long-term Effects - The road drainage system is important for preventing fine sediment from reaching streams. A recent study of sediment production from forest roads in Oregon determined most road segments produce little sediment, while a few produce a substantial amount, implying that managing sediment production from the highest risk segments would be the most effective (Luce and Black 1999). As indicated in the Upper Umpqua Watershed Analysis, the 56 miles of identified roads in part are highly eroding and in part have sections that have high potential for gullies and landslides because of undersized culverts and lack of drainage. Under Alternatives 2 and 3, the long-term landslide and chronic sediment risks would be reduced by 50 to 75 percent (Upper and Middle Smith River II Restoration and Rehabilitation EA, Table 7, pg. 26) on those roads that are decommissioned or improved.

(3) *Sedimentation from Haul Roads*

The following analysis uses SEDMODL to qualitatively compare relative chronic sedimentation rates between the No Action Alternative 1 and Alternatives 2 and 3 together (Appendix E). The model simulates sedimentation rates for each subwatershed within the project area and its predictions only approximate on-the-ground effects. SEDMODL only considers delivery of sediment coming from haul roads within 200 feet of streams. Table 8 shows approximate miles of the haul roads within 200 feet of streams by surface type and traffic levels as they change from the No Action to Alternatives 2 and 3.

Short-term Effects – Under **Alternatives 2 and 3** the SEDMODL predicts haul road improvements would decrease sedimentation rates by approximately 10 to 35 percent within the Upper Umpqua Watershed. During timber haul on these same roads sedimentation rates would increase by approximately 10 to 35 percent, resulting in an overall net short-term increase in sediment delivery for the watershed as a whole of about one percent compared to the No Action Alternative. The increased level of sediment production is a temporary condition and would only be expected during timber haul activity. When hauling activity is completed, sediment delivery levels would be reduced back to pre-timber haul conditions (10 to 35 percent reduced).

Most of the sedimentation changes occur in five subwatersheds. Short-term sediment rates are increased approximately 5 to 25 percent in the Rader Wolf, McGee Creek, and Cougar subwatersheds and reduced approximately 5 to 20 percent in the Hubbard Creek and Lost Canyon subwatersheds. Differences in sedimentation rates between subwatersheds depend on the amount of haul road improvement and timber haul within each subwatershed.

The SEDMODL helps identify how timber haul effects will be distributed across subwatersheds. Areas predicted for higher short-term sedimentation rates would receive closer review for mitigating measures prior to haul. The following project design criteria as listed in Appendix B would be implemented where appropriate as a result of the pre-haul review:

- Proposed haul roads would be inspected prior to haul and evaluated on depth and quality of road surfacing, cross drain condition and location, and off-road filtering capacity. Erosion controls such as straw bales in the ditch line, additional cross drains, and additional lifts of rock would be implemented where appropriate.
- Seasonal restrictions will be implemented when appropriate.

It is expected there would be less short-term delivery from road segments than the model predicts. Haul road-related sediment delivery could temporarily increase due to log hauling in some cases, however based on these model results and implementing the project design criteria in Appendix B, sediment delivery to streams is unlikely to exceed amounts that would be distinguishable from background levels.

Long-term Effects – Under **Alternatives 2 and 3** SEDMODL predicts that sediment delivery after timber haul is completed would be reduced by approximately 10 to 35 percent because existing natural surface roads would be upgraded to rocked roads. Road improvements that are not part of the predictive model (eg. additional drainage improvements, erosion control) would result in a further long-term reduction in chronic sediment delivery to stream systems. This would result in improved aquatic habitat conditions from reduced fine sediment inputs.

Table 8 Comparison of Miles of Haul Road Within 200 Feet of Streams

Miles by Surface Type	No Action	Alternatives 2 and 3
Natural	13	0
Pitrun Sandstone	9	10 (Includes about 1 mile of new road construction)
Rocked	60	73
Asphalt	10	10
Miles by Traffic Level	**No Action**	**Alternatives 2 and 3**
High Use	0	16
Moderate Use	0	51
Low Use	0	26
Occasional Use	92	0

3. Environmental Consequences – Sedimentation Effects on Aquatic Species

a) Alternative 1 (No Action) – Effects on Aquatic Species

Under **Alternative 1**, because fine sediment input into streams would continue at elevated levels compared to Alternatives 2 and 3, rearing and migration efficiency would continue to be reduced. Spawning habitat would continue to experience increased embedment within the stream substrate and pools.

b) Alternatives 2 and 3 – Effects on Aquatic Species

Short-term: Road decommissioning/improvements and culvert replacements associated with watershed enhancement would contribute some fine sediment to the stream channels in the short-term. Fine sediments would effect rearing and migration by reducing respiration efficiency due to gill irritation, and feeding efficiency due to poor visibility. Spawning habitat would experience increased embedment within the stream substrate and pools. The proposed project design criteria (dry season activities, turbidity limiting measures, etc.) will limit the amount of fine sediment entering stream channels. In most cases, the sediment delivery would be during the first few storm events of the wet season (first flush) and would not be measurable above background sediment levels. However, the short-term effects of the activities would cause some temporary change in migration away from the impacted areas but would not be expected to result in serious injury or death.

For harvest activities, a small amount of fine sediments would be input into non-fish bearing streams from landslides and a slight amount during timber hauling. Because the natural rates of sedimentation are greatly variable, because instream substrates are dynamic and change year to year, and because sediment inputs from the proposed projects in Alternatives 2 and 3 will be limited through project design criteria (e.g. no-harvest buffers filtering sediment, erosion control measures on roads), their effects to fish and aquatic habitat would be within the range of natural variation.

Long-term: As discussed above for watershed enhancements, overall sediment delivery would decline between 50 and 75 percent for the roads and associated higher risk culverts identified for decommissioning or improvements compared to Alternative 1. Additionally, the improvements on timber haul roads would reduce sedimentation by 10 to 35 percent. Thus associated embedment within the stream substrate would decrease, which would improve spawning habitat and increase substrate quality over time. Additional placement of large wood and boulders within Riparian Reserves and no-harvest buffers would create additional capacity for sediment to be sorted and stored. This would cause accumulation of spawning gravels and cobble within the stream system.

4. Cumulative Effects – Sediment and Aquatics 10 to 100 Years within Upper Umpqua

As described above, an estimated 35,000 acres of forests greater than 80 years of age on private lands are likely to be harvested within the next 20 years with the addition of about 300 acres of planned BLM regeneration harvest within the next 5 to 10 years. Some of the mid seral type forest stands on private lands are also expected to be clearcut harvested within the next 20 years. As these areas are replanted they will maintain a mosaic pattern of forest stand ages. The majority of private lands will maintain early and mid seral forest type characteristics on a 40 to 60 year rotation. The following describes expected sedimentation resulting from these activities and their associated roads as well as changes to stream channel morphology.

The Upper Umpqua WA showed that past land management from the 1960's increased landslide activities above natural levels. Since that time, the general trend has been decreasing as best management practices for road construction and forest practices have been implemented (Upper Umpqua WA, pg 68-72, 81). Landslides contribute the greatest amount of sediment to stream systems usually in large pulses during periods of high precipitation (Ibid, 72). Because mid seral forest canopies would be maintained and because best management practices would be applied to help maintain stable slopes, occurrence of landslides on BLM lands would remain low. Private forest practices are regulated under the Oregon Forest Practices Act, which provide protection to riparian and aquatic habitat. Landslide frequencies and effects from private clearcutting of the 35,000 acres of 80 year old forests would be lower than the average levels experienced on similar ground over the past 50 years. Thus, the overall sedimentation rates from harvest-related landslides would be expected to decrease compared to levels from the last 50 years.

Sedimentation rates from road-related landslides would have a slight downward trend over the next 50 years compared to the past. Based on observed practices to accomplish harvesting on private lands, BLM staff estimate that an additional 1.2 miles of new road per square mile will be constructed for a total of approximately 6 miles of road per square mile. Thus private road construction would add an estimated 60 to 100 road miles on forestry managed private lands within the watershed. Based on the projected trends, landslide rates from these new roads and existing roads would decline due to management practices regulated under the Oregon Forest Practices Act. Under both **Alternatives 2 and 3**, approximately 18 miles of new roads would be placed on stable ground and landslide risks would be reduced on approximately 56 miles of existing road. Combined harvest and road-related landslides and their sedimentation rates in the short-term would be maintained at current levels over the next 20 years as forest stands greater than 80 years of age are harvested. Over the next 100 years, a slight downward trend is expected especially as forest stands reach mid seral age classes and roads are improved and stabilized. This trend includes periods of increased landslide activities during high intensity storm events.

Sedimentation rates from agriculture practices in the watershed would be expected to remain the same. It is estimated that over 2 billion board feet of timber will be hauled across the road system from private lands in this watershed within the next 10 to 20 years. The Oregon Forest Practices Act will regulate any winter hauling and resulting elevated sedimentation rates. Analysis has shown that these regulations are sufficient to maintain water quality within legally acceptable levels (Oregon Department of Forestry and Department of Environmental Quality Sufficiency Analysis, 2002). In the short-term, as shown in this analysis, sediment levels would be increased slightly above current sediment levels during winter haul on BLM harvest units. Over the long-term, sediment input would be reduced as roads are improved under **Alternatives 2 and 3**. For the entire Upper Umpqua watershed, sedimentation and landslides from activities on both private and public lands would decrease in the long-term compared to the past 50 years. As a result, associated embedment within the stream substrate would decrease resulting in improved spawning habitat and substrate quality.

D. Aquatic Species and Habitat

1. Affected Environment

a) Fish Distribution, Low Gradient Streams, and Prioritized Enhancement

There are approximately 21 species of fish located within the main-stem Umpqua River and its tributaries within the Upper Umpqua watershed (Upper Umpqua WA, pages 95, 106). The tributaries to the Main Umpqua (e.g. Wolf, Rader, Cougar, Hubbard, Yellow and Lost Creeks) contain spawning and rearing habitat for low to mid water velocity dependant fish species. These include coho salmon, chinook salmon, steelhead trout, cutthroat trout, pacific lamprey, Oregon chub, and resident non-game fish species (dace and sculpin). The mainstem Umpqua River is important for salmonid migration, as well as some spawning and rearing. However, due to habitat conditions (cover, pool/riffle complex, cobble/gravel conditions, etc.) the majority of salmonid spawning and rearing is within the tributary systems. The most important fish rearing and spawning habitat within the Upper Umpqua watershed tributaries are the low gradient (<6 percent) streams (Appendix E).

Table 9 shows the estimated total amount of likely rearing and spawning habitat stream miles based on stream gradient as well as the stream miles prioritized for enhancement. Of the approximate 265 miles of 3rd to 6th order streams within the Upper Umpqua, 156 miles are considered potential salmonid habitat (6 percent gradient). The approximate 30 stream miles prioritized for enhancement would address coarse woody debris, pool/riffle complex, channel conditions and the adjacent riparian (ibid, page 100).

Table 9 Fish Spawning and Rearing Habitat in Tributary Streams (Miles)

	3rd - 6th Order Stream Miles	3rd - 6th Order Stream Miles with <=6% Gradient	BLM Stream Miles Prioritized for Enhancement	Private Stream Miles Prioritized for Enhancement
TOTAL	265	156	15	16

b) **Instream Habitat Conditions**

A description of anadromous salmonid typical life cycle with habitat needs at various stages is given in Appendix E . Adults require spawning gravel and cover from predators; eggs and alevins require stable gravel and cool, oxygenated water; and rearing juveniles require food and cover.

In the watershed analysis, reference reaches in the coast range of the Umpqua Basin were used to compare against all surveyed streams. These relatively unmanaged reaches represent characteristics desirable for a variety of fish species (including salmonid habitat).
Table 10 compares the reference stream reaches with current instream habitat conditions (No Action) for the prioritized 30 miles of stream enhancement reaches within the project area. This comparison provides a general context for what the prioritized enhancement stream reaches need for spawning and rearing habitat. Comparisons with the reference reaches show that project stream reaches generally lack stream complexity, have a higher percentage of bedrock, and have limited spawning and rearing habitat. Many of the low gradient streams have a low percentage of gravel and are now simplified. This means they lack structure, complexity, and are generally wider and shallower (higher width to depth ratio) than reference type reaches. Reach-by-reach descriptions are given in Appendix E.

Table 10 Comparison of Reference and Enhancement Stream Reaches

	Percent Bedrock Dominated Habitat	Average Percent Gravels	Average Volume of Wood (m^3) per 100 m	Number of Key Pieces of Wood	
				Per 100m	Per Mile
Reference Stream Reaches	Average 19%	34%	46 m^3	20	320
Prioritized Enhancement Stream Reaches	Between 25% and 50%	21%	13 m^3	6	100

c) **Culvert Barriers to Aquatic Species and Upstream Habitat**

Table 11 gives an estimate of the number of culvert barriers and the amount of potential low gradient habitat miles available above those barriers. The number of culverts identified in Upper Umpqua WA has been updated based on more intensive field reviews and will continue to be further refined. Additionally, three culverts, covered under a separate EA, have been replaced for fish passage since the time the WA was completed.

Table 11 Number of Culvert Barriers and Miles of Potential Habitat by Subwatershed

Subwatersheds	Number of Culvert Barriers	Stream Miles Potential Habitat
Cougar	3	0.1
Hubbard Creek	6	5.0
Lost Canyon	4	1.8
McGee Creek	3	0.6
Mehl Creek	2	0.3
Rader Wolf	6	2.5
Umpqua Frontal	1	0.0
Yellow Creek	1	0.0
TOTAL	**26**	**10.3**

d) **Riparian Habitat Conditions**

Mid Seral Forest Riparian Habitat:

Within the proposed harvest units, riparian vegetation near non-fish bearing streams is dominated with dense conifer stands. Aerial photo analysis showed that conifers were dominant in 93 percent of mid seral forest types within 40 feet of non-fish bearing streams (Table E-14 Appendix E).

Hardwood Riparian Habitat:

Analysis of older riparian forests (greater than 80 years old) near fish bearing streams prioritized for instream enhancement showed that 18 percent (46 acres) is dominated by hardwood and 82 percent (205 acres) by conifer forests. In contrast, 75 percent (117 acres) of mid seral forests in the riparian along prioritized streams are dominated by hardwood and 25 percent (38 acres) are dominated by conifer forests.

2. Environmental Consequences – Aquatic Habitat Development and Access

a) **Alternatives 1 (No Action) – Effects on Aquatic Habitat and Access**

Under the No Action Alternative, enhancement of the prioritized stream reaches would not occur. Lack of instream structure would continue to be a limiting factor for existing salmonid habitat and instream complexity. Therefore, beneficial substrate (e.g. gravel, cobble, wood debris) would continue to move through the system and spawning and rearing habitat would not be enhanced.

Culvert barriers would continue to restrict passage for anadromous fish as well as limit habitat for resident populations of fish and other aquatic species (i.e. salamanders, mollusks). Salmonid habitat would not be increased beyond the existing barriers as identified in Table 11.

The dense conifer mid seral forests around non-fish bearing streams would continue their slow growth rates and would lack diversity. The hardwood dominated riparian areas would not be enhanced into conifer forests. The lack of recruitment potential for coarse woody debris would continue to be a limiting factor in stream complexity and aquatic habitat development.

b) **Alternatives 2 and 3 – Effects on Aquatic Habitat and Access**

Because watershed enhancements are the same for Alternatives 2 and 3, their effects are analyzed together and contrasted with the No Action Alternative 1. The impacts from the following enhancement categories have been covered under the Programmatic Biological Opinion received from NOAA-Fish on October 18, 2002.

(1) *Instream Habitat Enhancement*

Instream habitat enhancement would include large wood and boulder placement and the pulling or felling of large trees. Placing structure in streams effects channel morphology, the routing and storage of water and sediment, and provides structure and complexity to stream systems. Effects of large wood in streams have been well documented. Large wood is often the most important pool-forming agent in smaller streams, (Bisson et al. 1987); it stores gravel, fine sediment, and organic matter (Beschta 1979); and it dissipates the energy of flowing water (Heede 1976). The use of boulder clusters with large wood placement would help hold log structures in place and provide additional structure. The results of wood and boulder placement would improve habitat conditions for aquatic species including coho salmon and terrestrial organisms.

Instream enhancement projects have been implemented within the Upper Smith River Watershed of the Swiftwater Resource Area. Monitoring data has shown measurable changes to stream geomorphology two years after log placement. Surveys were done in 1998 immediately following the placement of eighteen logs along a 2500-foot segment of the South Fork Smith River. Surveys were repeated on the same segment of stream in 2000. Survey data found that after two years, stream length increased by four percent (implies increased stream sinuosity), bankfull area has decreased by 13 percent (implies a decrease in width to depth ratio), the area of channel dominated by gravel has increased by 105 percent and the area in sand has increased by 26 percent. Other observed improvements include increased side channel development and improved flood plain connectivity. These results indicate this reach of stream now has more complexity and improved aquatic habitat conditions as a result of large wood placement. Effects of proposed large wood placement in the Upper Umpqua Watershed would be similar to the results observed in Upper Smith River.

Based on the above monitoring data and ODF&W Aquatic Habitat data for streams within Upper Umpqua, Table 12 shows the types of aquatic habitat that would be improved from the 15 miles of stream enhancement:

Table 12 Types of Aquatic Habitat Improvements within Prioritized Stream Reaches

	Spawning Habitat Only	Rearing Habitat Only	Spawning and Rearing Habitat	Migratory Passage	Total Habitat Improvement
Stream Miles	0.7	1.8	13.1	1.4	17.0

(2) *Culvert Improvements*

By replacing or removing the 26 culverts identified in Table 11, approximately 10 miles of low gradient stream habitat would become available for aquatic species that are currently not available under the No Action Alternative. The project design criteria would minimize sedimentation during replacement or removal.

(3) *Riparian Habitat Enhancement*

Under **Alternative 2 and 3**, riparian habitat enhancements consist of a variety of treatments ranging from density management prescriptions to conifer re-establishment within the riparian areas. In general, the habitat benefits associated to the density management prescribed for the Riparian Reserves were evaluated in the above section, “Environmental Consequences - Development of Forest Stand Characteristics”. In addition, density management in the Riparian Reserves will enhance the species composition and structural diversity of plant communities in riparian areas. The increase in individual tree growth rates in the treatment area would enhance the development of late-successional characteristics, such as large live trees, snags, and down wood in the long-term.

Alternative 3 would thin approximately 300 acres more of the no-harvest buffers compared to **Alternative 2** because of the variable no-harvest buffers. This would result in additional aquatic diversity in the long-term. The 85 acres of hardwood dominated mid seral riparian forest would be treated. This represents about 50 percent of the total hardwood dominated riparian acres. By treating these stands, they would be converted to conifer dominated riparian forests 50 to 150 years faster than the No Action Alternative 1 (pers. comm., Craig Kintop, Roseburg District Silviculturist). The overall riparian system would thus be more representative of late-successional riparian habitat in a shorter period of time.

3. Cumulative Effects – Aquatic Habitat 10 to 100 Years within Upper Umpqua

Since 1994, approximately 17 miles of Roseburg BLM roads have been either decommissioned or improved to reduce the risk of landslides and erosion. An additional 56 miles would be improved or decommissioned under Alternative 2 or 3. Table E-10 shows the net changes that would take place in the watershed under Alternatives 2 and 3. Approximately 1 mile of road has been improved on Coos Bay BLM lands through Roseburg Resources Company. Coos Bay BLM has also identified approximately 10 miles of road for decommissioning.

The Upper Umpqua WA identified prioritized culverts for replacement and stream reaches for enhancement needs. Since the 1990’s three culverts on Roseburg BLM and five culverts on Coos Bay BLM have been either replaced or removed to provide fish passage within this watershed. Based on work with the Umpqua Basin Watershed Council in other watersheds, additional fish barrier culverts are likely to be found on private lands. For the 30 miles of prioritized enhancement stream reaches, approximately 15 of those miles occur on private lands. In partnership with Umpqua Basin Watershed Council and private landowners, additional fish passage culvert replacements and instream enhancement work would occur over the next 20 years. These additional fish passage culverts would be replaced or removed as well as the 26 culverts identified under Alternatives 2 and 3. Thus their risk of failure would be reduced and more stream habitat would be opened to aquatic species with private contributions. About 30 high priority stream miles out of approximately 270 miles would receive active enhancement under Alternatives 2 and 3, increasing their capacity for aquatic species.

Over the long-term within the entire watershed the quality and quantity of aquatic habitat would improve compared to current conditions. The reasons for this conclusion are sedimentation rates will be reduced on BLM lands and minimized on private lands, aquatic habitat and access will be improved, and these activities will be targeted in the highest priority areas in the watershed.

E. Non-Key Issues

The following summarized issues are pertinent to this project but not considered key because, under all alternatives, environmental consequences would be inconsequential. No further analysis was deemed necessary because with the mitigations specified below, effects between alternatives would be negligible. Analysis or rationale for this conclusion is provided.

1. Cultural resources

Cultural resources include both prehistoric and historic sites within the Upper Umpqua watershed; associated with riverside terraces and broad flats that are found in the central watershed area. Additional historic resources are found in smaller tributaries of the Umpqua River. Many of these prehistoric and historic sites are recorded, but there are a number of unrecorded sites as well as the potential for undiscovered sites. (Upper Umpqua WA, pages 14-15). Cultural resource clearances would be conducted for all ground-disturbing projects. Appropriate mitigation or evaluation measures would be implemented on known cultural resource sites. Stipulations would be placed in contracts to halt operations in the event of inadvertent discoveries of new cultural resource sites (e.g. historical or prehistorical ruins, graves, fossils or artifacts). Because of these clearances and mitigations under all alternatives, there would be no adverse effects to cultural resources.

2. Soil productivity

Table 4, earlier in this analysis, showed the approximate amount of acres of helicopter, cable and ground-based yarding which would occur under Alternatives 2 and 3. Yarding has the potential to cause soil compaction, mechanical soil displacement and erosion and therefore reduce soil productivity and water quality. These effects, however, would be inconsequential under Alternatives 2 and 3 for helicopter, cable and ground-based yarding because of the implementation of RMP management action/direction, Project Design Criteria (Appendix E) and Best Management Practices (Roseburg District Record of Decision and Resource Management Plan, Appendix D). RMP management action/direction regarding soil productivity has been clarified and refined through plan maintenance (Roseburg District Annual Program Summary (pp. 70-71). The Project Design Criteria of Alternatives 2 and 3 are based on, and add additional specificity to the Best Management Practices. By implementing RMP management action/direction, ground-based yarding would have insignificant (less than one-percent) growth loss effect (Roseburg District PRMP/EIS p. 4-15). All yarding and amelioration of yarding effects under all Alternatives would be in accordance with Roseburg District RMP management action/direction and Best Management Practices. Therefore, as the result of their implementation ground-based yarding would cause negligible adverse effects on soil productivity and soil organic matter due to compaction, soil displacement and erosion (Roseburg District PRMP/EIS pp. 4-14 through 4-17). For individual units, the growth loss effect due to ground-based yarding would be reduced to less than one percent in the short-term or long-term depending on the timing of amelioration (at the time of thinning or at final harvest).

Extensive ground-based yarding occurred in many Upper Umpqua units in the past, resulting in considerable soil productivity loss. This lost soil productivity is being recovered very slowly through natural processes. The action alternatives would augment the healing through some amelioration of the residual compaction, in conformance with the RMP (pages 37, 62 and 131). Much of the attainable amelioration would need to be deferred to final harvest primarily because of the logistic obstacles to equipment posed by the residual trees.

Because all timber harvest activities would be conducted in accordance with RMP direction, Best Management Practices and Project Design Criteria, there would be insignificant loss of soil productivity under all alternatives.

3. Port Orford Cedar on potential haul routes

A small population of Port Orford Cedar occurs within the Upper Umpqua Watershed. The Port Orford Cedar is on private land in T26S-R8W-Sec 11, along portions of road 26-8-1.0 and road 25-8-1.0. Road 26-8-1.0 is a potential haul route for BLM timber coming out of Section 13, and since Port Orford Cedar root disease can spread from haul traffic there could be an impact from BLM timber haul. During the haul analysis done for Upper Umpqua, alternate routes were identified under all alternatives that avoid timber haul in the Port Orford Cedar area. Therefore, there would be no impact on Port Orford Cedar.

4. Hydrologic peak flows and stream temperature

The Oregon Department of Environmental Quality has listed Little Wolf Creek, Miner Creek, Rader Creek, Wolf Creek, and the Umpqua River as water quality limited for temperature. The Umpqua River is also listed for fecal coliform (Oregon's Final 2002 303(d) List). No long-term direct impacts to stream temperature or water quality would occur under either action alternative due to the maintenance of a no-harvest buffer along all streambanks. Some girdling/felling (1-5 trees per acre could be girdled/felled for snag or CWD creation) could occur within this buffer area. Some minor short-term impacts, such as reduction in shade and sedimentation released from felling trees adjacent to streams, could occur. These activities are designed to enhance aquatic and riparian habitat and will only occur where effects improve the aquatic resources in the long-term. Trees selected for girdling/felling within the buffer area would be considered for shade. Any tree providing critical shade to perennial or fish bearing streams would not be selected. Stream temperatures would not be adversely affected under Alternatives 2 and 3. The actions under Alternatives 2 and 3 would have no influence on fecal coliform bacteria levels in the Umpqua River.

Indirect impacts of density management within the Riparian Reserves under Alternatives 2 and 3 would result in a small but temporary increase in peak flows and summer low flows. Any increase, however, would be within the range of natural variability. Increases in soil moisture, which could result from less interception and evapotransportation from reduced vegetative cover, would be consumed by the stimulated growth of the residual stand (Satterlund and Adams 1992, p. 253). Minor increases in summer flow would occur as less soil moisture is taken up by thinned residual stands. This would benefit riparian areas, which are often moisture limited during the summer. Under Alternatives 2 and 3 only partial cutting in a small percentage of the Upper Umpqua watershed would occur. An even smaller percentage of the Transient Snow Zone would be affected (there is very little Transient Snow Zone in the whole watershed). No measurable increase in water yield or peak flows as a result of rain-on-snow events is expected from activities under all alternatives.

5. Noxious weeds

The prevention and control of noxious weeds associated with Alternatives 2 and 3 was not considered a primary issue in this document for the following reasons:

- Noxious weeds are currently found throughout the analysis area, and inventory and control efforts are already underway, and would continue under all alternatives as prescribed by the Roseburg District Noxious Weed EA.
- Project Design Criteria for the prevention and control of noxious weeds have been incorporated into the operating procedures for Alternatives 2 and 3.

Therefore, there would be no effects from noxious weeds beyond those anticipated in the Roseburg District Noxious Weed EA under all alternatives.

6. Kincaid's lupine

Kincaid's lupine, a federally threatened plant species, is not currently known to occur within the project area; however, it could occur due to the presence of potential habitat for the species and the proximity of known populations. The presence of Kincaid's lupine was not considered a primary issue in this analysis because of compliance with the Programmatic Biological Opinion dated February 21, 2003. There would be no effect to Kincaid's lupine under all Alternatives. See Appendix B for Project Design Criteria to avoid impacts to Kincaid's lupine.

7. Wildlife and Botany- Special Status Species and Survey and Manage Species

The management of Special Status Species in relation to Alternatives 2 and 3 was not considered a primary issue in this document because pre-disturbance surveys would be in accordance with guidelines set forth in Bureau Manual 6840, and the Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (USDA/USDI, 2001). See Tables E-16 and E-17 for a list of Special Status Species and Survey and Manage Species. Known sites discovered as a result of clearances or pre-disturbance surveys would be managed so as not to contribute to the need to list Special Status Species under ESA or to provide a reasonable assurance of persistence for Survey and Manage Species.

Special status species include federally endangered, threatened, proposed, and candidate species, and state listed species, as well as BLM Sensitive, Assessment, and Tracking species. Tables E-16 and E-17 are lists of species documented to occur or expected to occur in or around the project areas as analyzed in this Environmental Assessment. Within the framework of this assessment, species expected to occur would include those whose historic or current range overlaps the watershed in which the project area occur, and for which suitable habitat is present in or around the project area. The species listed in these tables would change over the life of this Assessment. Additions or changes to this list will be managed under the guidance of the Special Status Species or the Survey and Manage programs. Survey and Manage species are listed in the January 2001 Record of Decision for the Supplemental Environmental Impact Statement for Amendments to the Survey and Manage Standards and Guidelines. The list of Survey and Manage species has been modified through the Annual Species Review process of 2001 and 2002.

The habitat for species which are closely associated with late-successional and old-growth forests would be enhanced in the long-term under Alternatives 2 and 3 because actions under these alternatives would improve watershed conditions, improve terrestrial and aquatic ecosystem health, and hasten the acquisition of late-successional and old-growth characteristics in the present mid seral forest stands. The amount of forest stands that would be enhanced under the action alternatives is shown in Table 2. Under Alternative 1, these ecosystem improvements would not occur.

Short-term effects to the mid seral forest stands, which would be subject to density management under the action alternatives, are described above. These effects to the habitat would include short-term changes in micro-climate and soil and vegetation disturbance. Under all alternatives, for threatened and endangered species, projects would comply with recovery plans, conservation plans, biological evaluations and biological opinions. These instruments are designed to preclude impacts to the species, which would prevent their recovery. Because all projects would be implemented consistent with recovery plans, conservation plans, biological evaluations and biological opinions, under all alternatives, there would be no adverse impacts to threatened and endangered species that would prevent their recovery.

Under all alternatives, required clearances for BLM Sensitive and Assessment species and pre-disturbance surveys for Survey and Manage species would be conducted prior to implementation of projects. When such clearances and pre-disturbance surveys indicate the presence of these species, required mitigation under the Special Status Species program and the Survey and Manage Standards and Guidelines would be implemented. Such required mitigation involves a variety of strategies including the management of species' sites, avoidance of sites, seasonal restrictions, etc. Under the Special Status Species program, the required clearances and site management are designed to be consistent with the conservation needs of the Special Status Species and ensure that actions do not contribute to the need to list any species under the provisions of the Endangered Species Act. Because of this mitigation, under all alternatives, there would be no adverse impacts to BLM sensitive or assessment species that would contribute to the need to list a species under the provisions of the Endangered Species Act. Under the Survey and Manage Standards and Guidelines, pre-disturbance surveys, management of known sites and other strategies are designed to provide for the persistence of late-successional and old-growth associated species. Because of implementation of the Survey and Manage standards and guidelines, under all alternatives there would be no adverse impacts that would preclude the persistence of these species.

4 CONTACTS, CONSULTATIONS, AND PREPARERS

A. Agencies, Organizations, and Persons Consulted

The Agency is required by law to consult with the following federal and state agencies (40 CFR 1502.25):

1. Threatened and Endangered (T&E) Species Section 7 Consultation

The Endangered Species Act of 1973 (ESA) requires consultation to ensure that any action that an Agency authorizes, funds, or carries out is not likely to jeopardize the existence of any listed species or destroy or adversely modify critical habitat. US Fish and Wildlife Service (FWS) and National Oceanic Atmospheric Administration - Fish (NOAA-Fish) were involved early on in this project particularly with meetings in June of 2002 and February of 2003. As a result, FWS and NOAA-Fish gave input and helped develop project design criteria for this EA. These meetings helped guide the planning process which is the intent of early involvement.

a. The required ESA consultation for T&E wildlife species was completed with the FWS, which resulted in the Programmatic Biological Opinion received on February 21, 2003 (Ref. no. 1-15-03-F-160). The Biological Opinion concurred that the FY2003-2008 Programmatic Assessments for Activities is "not likely to jeopardize" spotted owl, marbled murrelet, or bald eagle. For the next 5 years or until certain thresholds are reached, all the activities and their project design criteria described in this EA fall under the Biological Opinion. Incidental Take is not expected to occur. Consultation will be reinitiated after 5 years or when those thresholds have been reached.

b. For the Watershed Enhancement Projects described in this EA*:*
The required ESA consultation for T&E aquatic species was accomplished with the NOAA-Fish and a Programmatic Biological Opinion was received on October 18, 2002 (Ref. no. 2002/00879). The Biological Opinion concurred that the FY2003-2008 Programmatic Assessments for Activities is "not likely to jeopardize" coho. Among other things this Biological Opinion covers Road Maintenance and Aquatic and Riparian Habitat Projects. All the Watershed Enhancement Projects and their project design criteria described in this EA fall under this Biological Opinion and the effects of their actions are not expected to be above the effects described in the Biological Opinion. Consultation will be reinitiated after 5 years.

For the Mid Seral Forest Treatments described in this EA*:*
A separate Biological Assessment for T&E aquatic species consultation will be submitted to the NOAA-Fish to cover the Mid Seral Forest Treatment projects in this EA. No decisions will be made for these projects prior to receiving a Biological Opinion.

2. Cultural Resource Section 106 Compliance

Section 106 of the National Historic Preservation Act requires that Federal agencies take into account the effect of their activities on historic properties. This requirement is carried out through the 1997 Programmatic Agreement and the associated 1998 Oregon Protocol. As noted in the PDC section, clearances will be conducted on ground-disturbing activities. The Protocol specifies which of those activities require case-by-case consultation and review with the State Historic Preservation Office (SHPO). Activities of the types considered in Alternatives 2 and 3 generally do not require SHPO review. Consultation with SHPO would be initiated in the event that a particular project falls into the review category.

B. Public Notification

1. Notification was provided to affected Tribal Governments (Confederated Tribes of the Coos, Lower Umpqua and Siuslaw; Grande Ronde; Siletz; and the Cow Creek Band of Umpqua Tribe of Indians). No comments were received.

2. Notification letters were sent to adjacent landowners and private organizations to inform the general public and private commercial industry of the Upper Umpqua Watershed Plan project initiation. Comments were received by electronic mail, letter, and by telephone. These comments were considered in the development of this Environmental Assessment and are kept in the project file (Appendix H).

3. Letters were sent to Right-of-Way Permittees and Douglas Fire Protection Association (DFPA) proposing to decommission approximately 20 miles of road. They provided feedback of roads they wanted kept open for access to private lands and for fire protection concerns. This narrowed the amount of roads for decommissioning to about four miles. Comments were received by electronic mail, letter, and by telephone. These comments were considered in the development of this Environmental Assessment and are kept in the project file (Appendix H).

4. On June 18, 2002, the conclusions from the Upper Umpqua Watershed Analysis was presented to the Umpqua Basin Watershed Council. They were informed that this EA would be developed and projects would result that generally follow the watershed analysis recommendations.

5. The general public was notified via the *Roseburg District Quarterly Planning Update* (Summer, 2001) going to approximately 150 addressees. These addressees consist of members of the public that have expressed an interest in Roseburg District BLM projects. One request for additional information was received (road decommissioning candidates).

6. Notification will also be provided to certain state, county and local government offices.

7. A 30-day public comment period will be established for review of this EA. A Notice of Availability will be published in the *News Review*. This EA and its associated documents will be sent to all parties who request them. When decisions are made to implement the various aspects of this project, a notice will be published in the *News Review* for each decision.

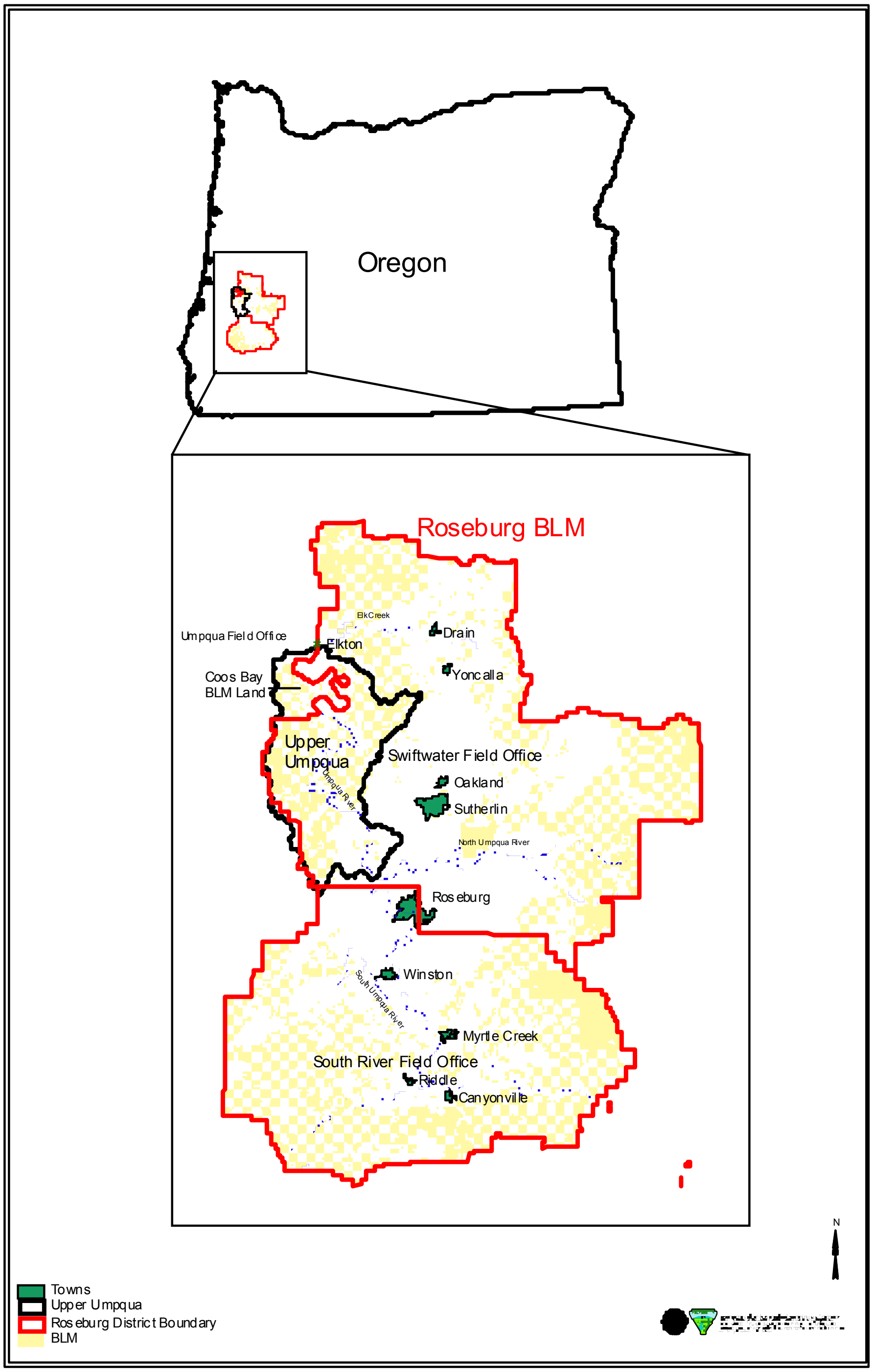
C. List of Preparers

Core Team		***Expanded Team - Consulted***	
Larry Brooks	Timber Planner	Isaac Barner	Archaeology
AC Clough	Fish Biologist	Kirk Casavan	Port Orford Cedar
Dan Couch	Team Lead	Kevin Cleary	Fire
Dan Cressy	Soils	Craig Kintop	District Silviculture
Dan Dammann	Hydrology	Ron Murphy	Recreation
Craig Ericson	GIS	Sam Dunnavant	ODFW
Elizabeth Gayner	Wildlife	Jim Brick	ODFW
Al James	Silviculture	Bob Kinyon	Umpqua Basin Watershed Coord.
Glenn Lahti	Mgt Rep	Lynn Gemlo	USFWS
Pete Howe	Engineering	Ken Phippen	NOAA- Fish
James Luse	NEPA		
Evan Olson	Botany		
Jeff Wall	EA Editor		

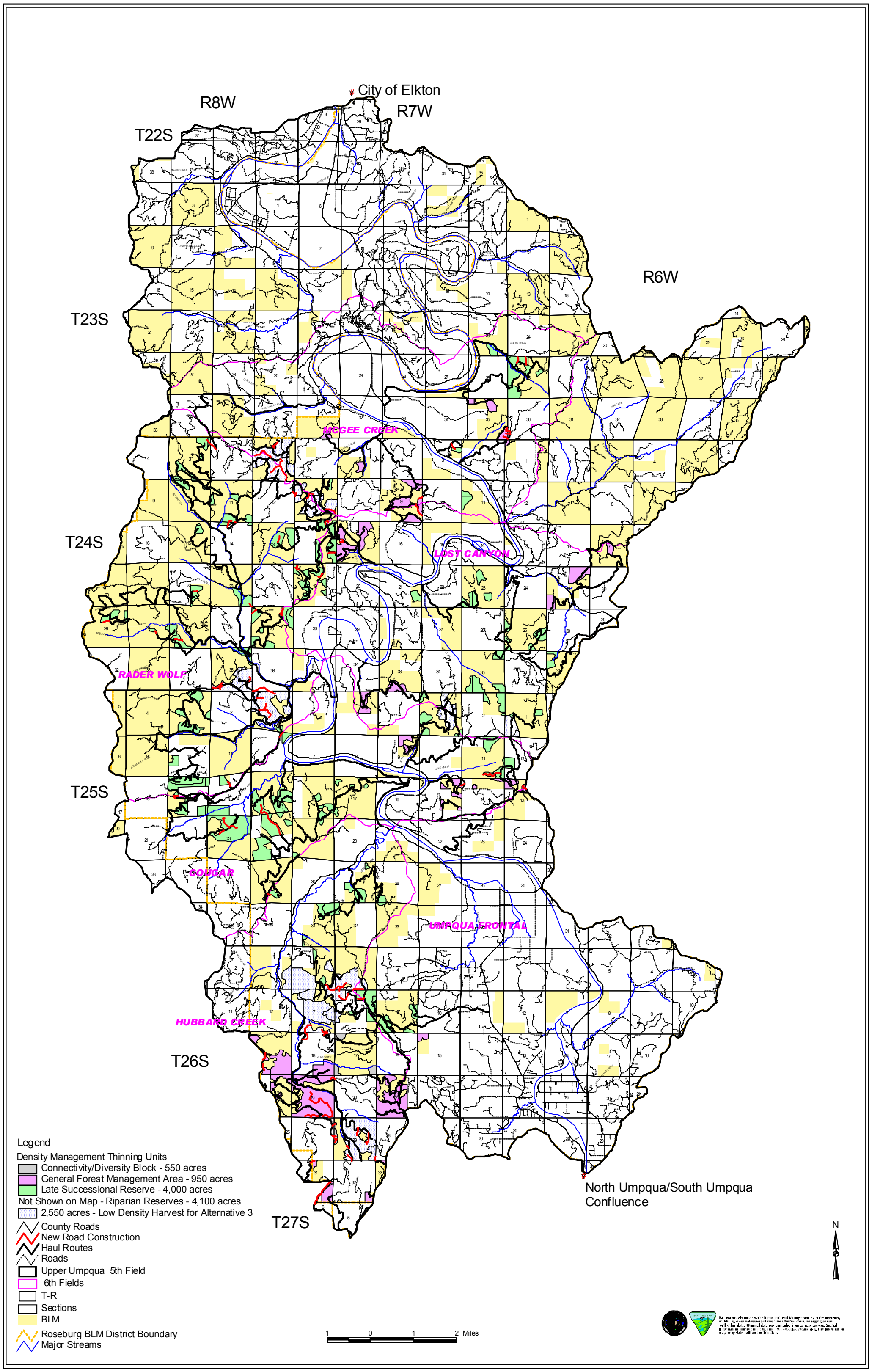
5 APPENDICES

A. APPENDIX A Maps

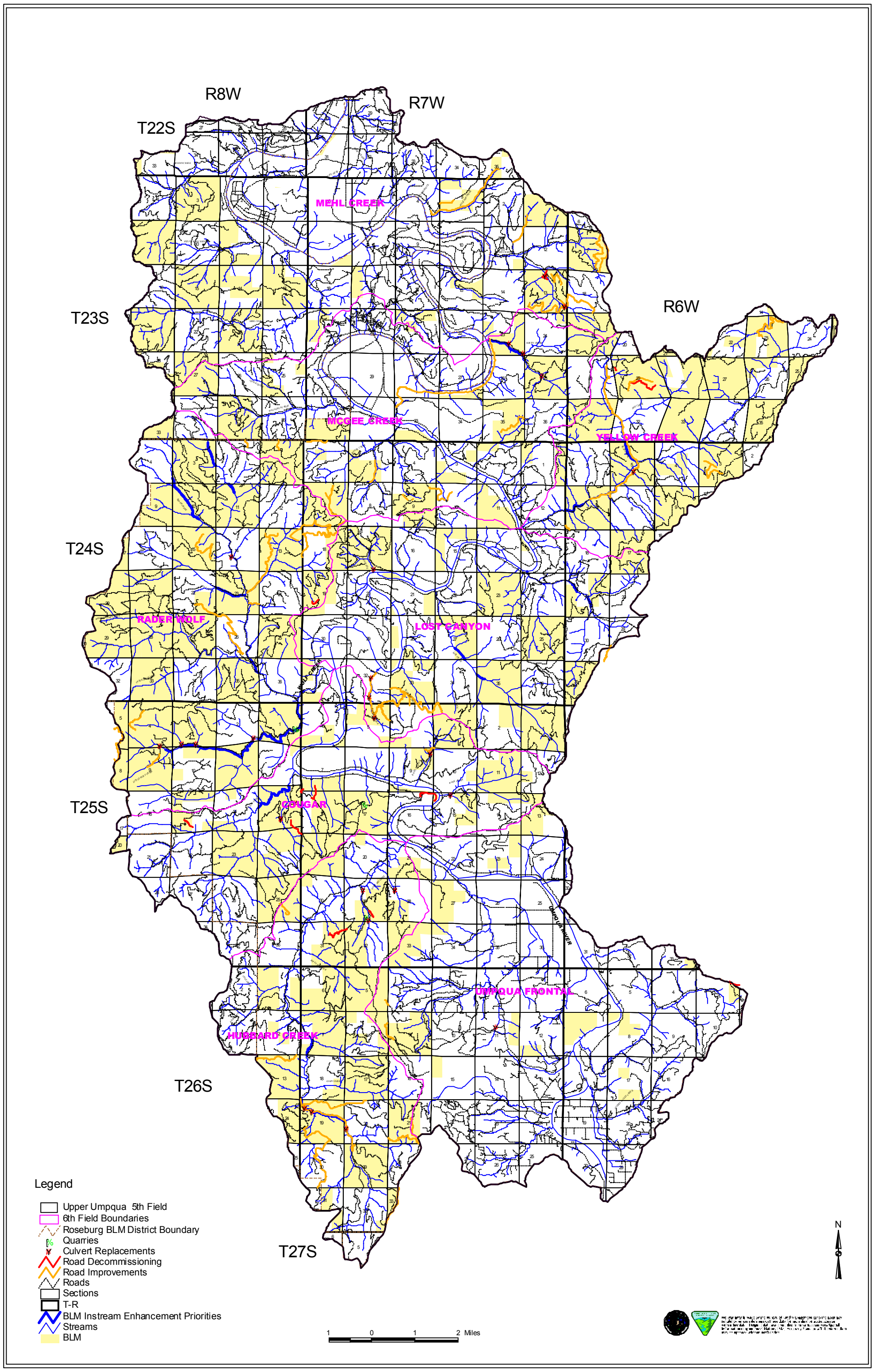
Map A- 1 Locater Map



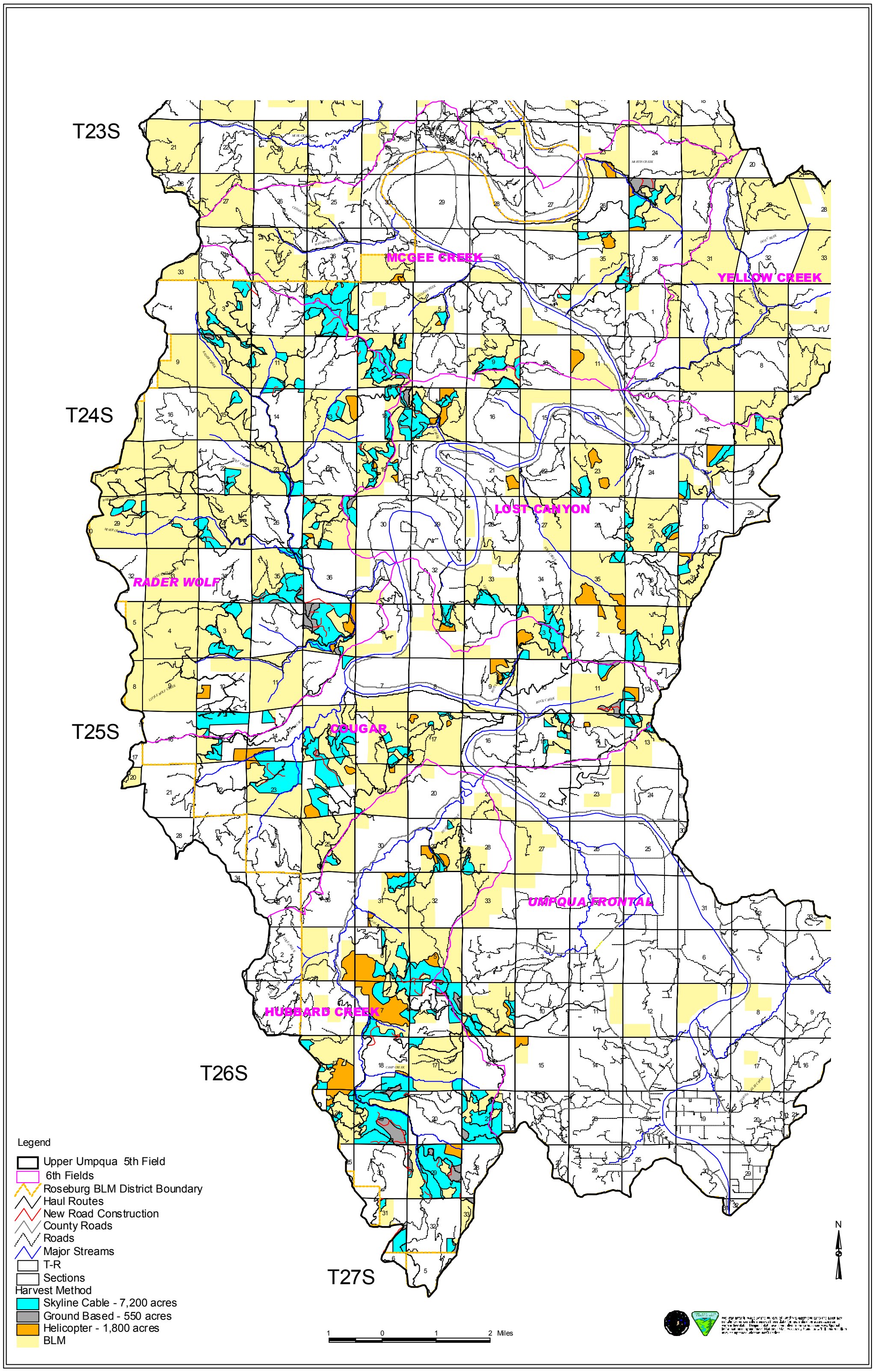
Map A- 2 Upper Umpqua Mid Seral Forest Habitat Diversity Treatments



Map A- 3 Upper Umpqua Watershed Enhancements – Roads, Culverts, Instream



Map A- 4 Upper Umpqua Watershed Harvest Methods



B. APPENDIX B Project Design Criteria and Seasonal Restrictions for Overlapping T&E Species

1. Seasonal Restrictions Chart

		January	February	March	April	May	June	July	August	September	October	November	December
Mid Seral Treatment								Typical Fire Restriction Period					
LSR/RR/Matrix (Cable) - Suitable habitat without surveys ++	NSO												
	MAMU - Zone 1								2hr restrictions				
	MAMU - Zone 2			2 hr. restrictions									
LSR/RRMatrix (Tractor) - Suitable habitat without surveys ++	NSO												
	MAMU - Zone 1								2hr restrictions				
	MAMU - Zone 2					2 hr restrictions							
Road Treatment													
New Construction *									2 hr restrictions				
Decommissioning *								Short Duration Minimal Impact					
Treatment								Short Duration Minimal Impact					
Culvert **										Instream ??			
Instream **													
Placement **								Short Duration Minimal Impact	2 hr restrictions	Instream ??			
Felling **										Allowed in Smith River			
								Typical Fire Restriction Period					
NSO – Disturbance ≤ ¼ mi. ++				1			30						
NSO – Modify Habitat ≤ ¼ mi. of nest tree ++				1						30			
MAMU - Zone 1 + (0 - 35 mi.)					1				5	15			
MAMU - Zone 2 + (2hrs after sunrise and before sunset) (35 - 50 mi.)					1				5				
Bald Eagle – Nest ≤ ¼ mi. ++			15						31				
Coho Salmon		Instream Work Restrictions					30			15			

+ check disturbance intensity B, C, & D (alters restrictions)
++ unless surveys show no nesting or failed nesting
* If impacts to stream channel are anticipated.
** Based on programmatic conditions of NMFS BO dated 8 Aug. '01.

Legend:
- No Operations
- Daily Operation Restrictions
- No Operations
- Can't modify suitable habitat

2. Project Design Criteria (PDCs) – Complete List

Seasonal Restriction PDCs Mitigating Overall Effects

- **Seasonal restrictions** would apply as outlined in the Appendix B chart above. These restrictions are based on consultation criteria to reduce impacts to federally listed species that overlap with BMPs to reduce possible sedimentation impacts to aquatic species as well as BMPs to reduce soil compaction in order to maintain soil productivity.

PDCs Mitigating Effects to Wildlife Threatened & Endangered Species

The following PDCs have been taken directly from the Programmatic Biological Opinion for the Roseburg District 2003-2008 (Ref. No. 1-15-03-F-160) and applied to the Upper Umpqua Watershed Plan.

- Bald Eagle

  Disturbance

  - No disturbance above ambient noise levels would occur within 0.25 miles of known bald eagle nest between February 15 and August 31 or until non-nesting is determined. Blasting projects will incorporate 1-mile buffers around active nest sites.

  Habitat

  - Disturbance or habitat modification to all other forest habitat is assumed to be a no effect unless nesting, roosting or foraging activity by bald eagles is documented for the area.

- Northern Spotted Owl

  Disturbance

  - Activities will be scheduled to avoid implementing projects within 0.25 miles of any known nest site or activity center from March 1- June 30, unless protocol surveys have determined the activity center to be not occupied, non-nesting, or failed in their nesting attempt. Waiver of the seasonal restriction is valid until March 1 of the following year.
  - Prescribed burn plans for burns scheduled to be conducted during the nesting season and which would burn within 0.25 miles of known nest sites or activity centers will be designed to reduce or avoid disturbance and smoke impacts.
  - No blasting would occur within 1 mile of all occupied and unsurveyed, suitable habitat between March 1 and June 30.

  Habitat

  - For projects that remove habitat, work activities such as tree felling, yarding, etc, will not occur within 0.25 miles of any known nest site or activity center from March 1- September 30, unless protocol surveys have determined the activity center to be not occupied, non-nesting, or failed in a nesting attempt. Waiver of the seasonal restriction is valid until March 1 of the following year.

- Marbled Murrelet

  Disturbance

  - Within both zones, Daily Operating Restrictions (operation of activities must occur between two hours after sunrise and two hours before sunset) would apply when projects occur within 0.25 mile of all occupied and unsurveyed, suitable habitat from April 1 until August 5.
  - Within the 35 mile zone, schedule the implementation of projects within 0.25 mile of all occupied or unsurveyed, suitable habitat outside of the critical nesting period (1 April - 5 August). Daily Operating Restrictions would be applied between August 6 and September 15.
  - No blasting would occur within 1 mile of all occupied and unsurveyed, suitable habitat between April 1 and September 15.

Habitat

- Projects will not remove or degrade suitable habitat. Residual trees and adjacent suitable habitat will be "buffered" with no thinning to lighter thinning prescriptions to avoid modification of suitable habitat and to protect the integrity of the existing suitable habitat.
- Projects that remove or degrade suitable habitat will have two years of surveys (Pacific Seabird Group, Marbled Murrelet Survey Protocol 2003) completed to document presence/absence of murrelet occupation. If it is not feasible to complete the two year protocol, the Service will be contacted on a case by case basis to discuss other means of insuring potential nest trees are not impacted.
- If project areas are within 0.25 miles of occupied or unsurveyed suitable habitat, on District land, removal of suitable habitat that might disturb nesting would not occur between April 1 and September 15. All stands previously documented as being occupied are assumed to be occupied.
- For unsurveyed tree felling/lining projects for instream enhancement, trees selected for falling/lining would meet the following criteria:
  1) selected trees would be free from a large amount of rot;
  2) selected trees would not be capable of providing nesting structure for the marbled murrelet or northern spotted owl;
  3) selected trees would not be located so as to afford protection for trees containing suitable nesting structure for the marbled murrelet or northern spotted owl;
  4) if pre-disturbance surveys are not conducted then seasonal/daily operating restrictions would be applied.

Additionally for this EA, the following PDCs have been developed to insure that marbled murrelet and northern spotted suitable nesting habitat would not be modified during stand treatment and the integrity of existing suitable habitat would remain intact.

- ➢ If clearance surveys have not been completed, to ensure that marbled murrelet and northern spotted owl suitable habitat will not be modified during stand treatment and the integrity of existing suitable habitat will remain intact, treatment prescriptions for those stands with residuals and adjacent habitat will be designed so that suitable habitat will not be removed or degraded. Treatment prescriptions will be determined on a site-by-site basis and include design features that will best suit site conditions, taking into consideration topography, aspect, site growing conditions, and local wind patterns. Design criteria for maintaining suitable habitat conditions, includes the following:
  - Mid seral stands adjacent to suitable habitat will be treated with lighter thinning prescriptions, maintaining interlocking canopies within at least ½ site potential tree height from suitable habitat.
  - Residual trees within mid seral stands will be evaluated on the ground to determine its relationship with the surrounding stand. Adjacent trees that directly contribute to the micro-climatic stability of suitable nest trees will be maintained.
- ➢ For Late-Successional and Riparian Reserves, sufficient coarse woody debris will be created and/or retained to ensure the distribution, diversity and complexity of watershed and landscape scale features and to protect spatial and temporal connectivity (in accordance with page 61 of the Late-Successional Reserve Assessment, Oregon Coast Province-Southern Portion- RO267, RO268).
- ➢ Most existing Coarse Woody Debris (at least 16" in diameter and 16 ft. in length) would be reserved (RMP, pg. 38).

PDCs Mitigating Erosion and Sedimentation Effects to Aquatic Species

- To protect aquatic resources within Riparian Reserves a variable width streamside no-harvest buffer would be established along all streams. In general, the buffer width would be 40 feet from the outer edge of the active stream channel for all non-fish bearing streams and a minimum of 100 feet from the outer edge of the active stream channel for all fish bearing streams. The buffer width could be expanded to include areas of instability, wide areas of riparian vegetation, or sensitive areas identified during site review. Likewise, the buffer width could decrease (Under Alternative 3) along some non-fish bearing streams when certain conditions as described below are met. Variation from the standard 40-foot buffer would be based on site level review of soils, hydrology, vegetation, and riparian habitat. Specifically, soils would be reviewed for the presence or absence of steep slopes, potential erosion, sedimentation, and displacement issues; hydrology would be reviewed for overland and groundwater flow conditions (perennial, seasonal, ephemeral classification, wetlands, seeps, and springs); vegetation would be reviewed for diversity and crown characteristics (ground cover, vegetative composition, stream shading, etc); riparian habitat would be reviewed for the presence of key habitat components (aspect, vegetative composition and structure, snags, downed wood, etc).At the very minimum, a one-tree retention would be maintained along the stream bank for bank stability. Minimum buffer widths would be used primarily on first or second order, ephemeral or intermittent streams, which lack riparian vegetation and where riparian habitat components are also absent. Management within the buffer could include selected felling and/or girdling of trees where doing so would benefit riparian habitat. Trees would not be commercially removed from this buffer area. Use of the buffer will provide the following benefits:
    - Maintain canopy cover for stream shading
    - Maintain a non-disturbed vegetative filter for sedimentation
    - Provide protection to the stream channel and banks
    - Trees treated or felled in this zone would have riparian habitat benefits
- Extra trees will be retained outside of the no-harvest buffers where landslides or debris flows are most likely to initiate, particularly those that could impact streams, ponds, and wetlands.
- Stream channels and riparian habitat would be protected from logging damage by directionally felling trees that are within 100' of streams generally away from the streams and yarding logs away from or parallel to the streams. In isolated cases where logs need to be yarded across streams, logs would be fully suspended over the stream to avoid any ground disturbance within and immediately adjacent to the stream channel and banks. Yarding corridors parallel to non-fish bearing streams must be at least 40 feet way from the edge of the active stream channel (100 feet for fish bearing streams) and will be avoided along swale bottoms.
- Require skyline yarding where cable logging is specified. This method limits ground disturbance by requiring at least partial suspension during yarding. In some limited, isolated areas partial suspension (outside no-harvest buffers) may not be physically possible due to terrain or lateral yarding. Excessive soil furrowing would be waterbarred and covered with slash. For all cable yarding, minimum corridor widths (generally less than 15 feet in width) would be utilized.
- As illustrated in Table E-4 the majority of new road construction will be located away from streams and do not present sedimentation risks. New road construction generally will be located on ridge tops and stable slopes that do not exceed 50 percent.
- Erosion control measures (waterbarring, seeding, mulching, straw bales, bioengineering, etc.) would be applied where needed on newly constructed roads, improved roads, or decommissioned roads where they are within 200 feet of streams, on replaced or removed culverts, and on access trails constructed for instream large wood and boulder placements.
- All permanent new road construction that remains open to traffic will be rocked. All new road construction not surfaced with rock will at least be waterbarred and blocked to traffic during the same dry season as construction.

- Over wintering an unsurfaced road for use the following dry season will be allowed in limited cases when the unit size and degree of seasonal restrictions make completing harvest within one dry season impractical. Over wintering roads will also require at a minimum waterbarring and blocking to traffic and could include other measures listed above.
- All haul routes used during wet season hauling would be inspected prior to haul activities to assess the current conditions of those roads as they pertain to sedimentation concerns to adjacent streams. In instances where winter haul would occur along a gravel route with defined stream crossings, project design criteria specify sediment fences, gravel lifts, and weather dependant operation specifications designed to prevent sediment contribution to live streams, including suspension of activities. The suspension would be lifted when conditions improve or remediation measures are implemented.

PDCs Mitigating Soil Compaction

- Conduct ground-based operations only when soil moisture *conditions limit effects to soil productivity* (these conditions generally can be expected to be found between May 15 and the onset of regular fall rains or may be determined by on-site examination).
- No ground-based yarding would occur within the no-harvest buffer. Crossing stream channels with equipment would be limited to existing roads.
- The arterial trails of Harvester-Forwarder operations will be designated. Harvesters will delimb trees in front of the machine tracks or tires in order to reduce compaction. The forwarder will operate on the branch and limb covered areas traversed by the harvester.
- Skid trails will be designated for tractor yarding and spaced at least 150 feet apart on average. Trees will be felled to lead in relation to the designated skid trails.
- Total (all created *since the adoption of* the RMP) main skid trails, landings and large pile areas will affect less than approximately 10 percent of the ground-based harvest unit. A main skid trail is defined as a trail in which the duff and slash is displaced such that approximately 50 percent or more of the surface area of the trail is exposed to mineral soil.
- Skid trails, which were created prior to the adoption of the RMP, should be re-used to the extent practical*, such skid trails that are re-used will be included in the 10 percent limit of affected area within the ground-based harvest unit.*
- Limit skid trails to slopes *generally* less than *approximately* 35 percent.
- In partial cut areas, locate main skid trails so that they may be used for final harvest.
- On intermediate harvest entries, *ameliorate main skid trails and areas of non-main skid trails warranting amelioration,* or document a plan (e.g. such as adding a map to watershed analysis) so that amelioration may be accomplished at the time of final harvest.
- Potential harvest units will be examined during the planning process to determine if skid trails created prior to the adoption of the RMP have resulted in extensive enough compaction to warrant *amelioration.*
- Upon final harvest ameliorate all main skid trails, *those portions of non-main skid trails warranting amelioration, skid trail* documented and carried over from intermediate harvests, and skid trails created prior to the adoption of the RMP which were identified in the planning process as warranting amelioration.
- Amelioration of skid trails will generally consist of tilling with equipment designed to reduce the effects to soil productivity from compaction and changes in soil structure.
- Trails resulting from ground-based yarding will be waterbarred and covered with slash as necessary to limit erosion and prevent sedimentation into streams.
- For instream large wood and boulder enhancement activities, excavators would be restricted to designated skid trails as identified in an approved plan. Machines would be limited in size and track width to reduce compaction and trail width. As described above for harvesting, tilling of skid trails will be evaluated.

Noxious Weeds PDCs

Refer to the Upper Umpqua Watershed Analysis file (Appendix 9, pgs. 131-135) for a list of the Noxious Weeds known or suspected to occur in the watershed.

- Perform project level weed surveys and watershed level weed inventories;
- Prior to ground disturbance, treat existing weed infestation(s) at proposed project site(s);
- Adequately clean construction and logging equipment/machinery associated with ground disturbance prior to moving into the proposed project site(s) to control or prevent the spread of noxious weed seed;
- Reseed the area(s) of ground disturbance with native grass seed or a suitable alternative in a timely fashion following ground disturbance;
- Monitor noxious weed infestations and reseeding results at project sites following ground disturbance.

Kincaid's Lupine PDCs

- Perform project level surveys for Kincaid's lupine at the time of year that the species can be detected (generally from April through June);
- If these surveys locate additional populations of Kincaid's lupine, the projects will be modified to avoid effects to the plants and their habitat. If a project cannot be modified to produce a no effect determination, consultation will be reinitiated with the FWS.

Miscellaneous PDCs

- **Hazardous materials** (particularly petroleum products) would be stored in durable containers and located so that any accidental spill would be contained. All landing and work site trash and logging materials would be removed. All equipment planned for instream work would be inspected beforehand for leaks. Accidental spills or discovery of the dumping of any hazardous materials would be reported to the Sale Administrator and the procedures outlined in the "Roseburg District Hazardous Materials (HAZMAT) Emergency Response Contingency Plan" would be followed.
- **Cultural resource** clearances would be conducted for all ground-disturbing projects. Appropriate mitigation or evaluation measures would be implemented on known cultural resource sites. Stipulations would be placed in contracts to halt operations in the event of inadvertent discoveries of new cultural resource sites (e.g. historical or prehistorical ruins, graves, fossils or artifacts).

C. APPENDIX C   *Critical Elements Analysis*

The following elements of the human environment are subject to requirements specified in statute, regulation, or executive order. These resources or values are either not present or would not be affected by the proposed actions or alternatives, unless otherwise described in this EA. This negative declaration is documented below by individuals who assisted in the preparation of this analysis.

Element	Responsible Position	Not Present	Not Affected	In Text	Initials	Date
Air Quality	Fuels Management Specialist		X		KC	6/07/03
Areas of Critical Environmental Concern	Environmental Specialist	X			[illegible]	6/10/03
Cultural Resources	Archeologist			X		
Environmental Justice	Environmental Specialist	X			[illegible]	6/10/03
Farm Lands (prime or unique)	Soil Scientist	X			DCC	6/11/03
Flood Plains	Hydrologist			X	DD	6/11/03
Invasive, Nonnative Species	Botanist			X	[illegible]	6/10/03
Native American Religious Concerns	Environmental Specialist		X		[illegible]	6/10/03
Threatened or Endangered Species (fish)	Fisheries Biologist			X	[illegible]	6/10/03
Threatened or Endangered Species (plants)	Botanist			X	[illegible]	6/10/03
Threatened or Endangered Species (wildlife)	Wildlife Biologist			X	[illegible]	6/12/03
Hazardous/Solid Wastes	District Hazardous Materials Coordinator			X	LB	6/13/03
Water Quality Drinking/Ground Water	Hydrologist			X	DD	6/11/03
Wetlands/Riparian Zones	Hydrologist			X	DD	6/11/03
Wild and Scenic Rivers	Recreation Planner	X			BJM	6/10/03
Wilderness	Recreation Planner	X			BJM	6/10/03

D. APPENDIX D Aquatic Conservation Strategy (ACS) Analysis for Upper Umpqua Watershed Plan Environmental Assessment

Alternative 1: No Action Alternative
Alternative 2: Late-Successional Reserve Assessment Prescription
Alternative 3: Habitat Improvement

ACS Objective 1 - *Maintain and restore the distribution, diversity, and complexity of watershed and landscape scale features to ensure protection of the aquatic systems to which species, populations, and communities are uniquely adapted.*

Alternative 1: No treatment of the Riparian Reserves would occur under this alternative. The distribution, diversity, and complexity of watershed and landscape scale features would be maintained at the current trends. Current landscape patterns include natural stands that are the result of fire, managed stands established following timber harvest, and non-forested agricultural and pasture lands. The predominant conifer species for Upper Umpqua Fifth-field Watershed is Douglas-fir. Other conifer species in association include incense-cedar, western hemlock, western red cedar, and grand fir. Hardwoods including madrone, chinquapin, big leaf maple and red alder are also found in these stands. Salal, Oregon grape and sword ferns are common on the forest floor. The plant association best describing these areas is a western hemlock or white fir over salal and Oregon grape.

Alternative 2 & 3: Density management within the Riparian Reserves would likely contribute to the restoration of the distribution, diversity, and complexity of watershed and landscape scale features. The stands being treated are generally low in species diversity and structural complexity, which density management would increase. The increase in individual tree growth rates in the treatment area would speed the development of late-successional characteristics, such as large live trees, snags, and down wood over the long-term. The South Coast LSRA recommends a range of coarse woody debris (CWD) that ranges from 1,600 to 9,400 cubic feet per acre that should exist at stand age 80. The greatest amount is within one site tree height of perennial streams. It suggests leaving additional trees to provide for this amount of CWD in the future. In accordance with this guidance at least ten dominant trees per acre would be developed to provide future CWD.

Based on project design criteria (PDC's), these alternatives would not hinder or prevent attaining the elements outlined in ACS Objective 1. No element would be degraded at the fifth- field watershed scale over the long-term. In Alternatives 2 & 3, the upland stands would benefit from thinning operations as released trees would be free to grow faster resulting in increased diameters and crowns. Riparian stands would continue to slowly differentiate in time through growth and mortality. Alternative 3 would allow for greater enhancement of owl and marble murrelet habitat.

ACS Objective 2 - *Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These lineages must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.*

Alternative 1: This alternative would maintain the current quality of connectivity within and between watersheds through the establishment of Riparian Reserves. Within the Upper Umpqua Fifth-Field Watershed, connectivity currently exists as disconnected patches of late-successional forest. However, these patches do serve as refugia for late-successional forest dependent species. The connectivity quality will be slowly improved over time as the Riparian Reserves develop late-successional qualities.

Alternative 2 & 3: Density management in the Riparian Reserve would not cause any degradation of connectivity or increase in landscape fragmentation because of the influence of the residual stand and the small area of Riparian Reserves that would be treated. As discussed under Objective 1, density management in the Riparian Reserves would enhance the development of late-successional characteristics and therefore would contribute to the restoration of a network of late-successional forest stands over the long-term.

Based on PDC's, these alternatives would maintain and restore the elements outlined in ACS Objective 2. None of the above alternatives would physically or chemically obstruct routes to areas within or outside the watershed that are critical for fulfilling life history requirements of anadromous fish species, or any other aquatic and riparian-dependant species. No element would be degraded in the fifth-field watershed over the long-term. At the sixth-field level, Alternatives 2 & 3 are intended to enhance the Riparian Reserves to late-successional/old-growth characteristics and enhance fish passage. However, Alternative 3 would provide greater refugia habitat. Therefore, this project is consistent with ACS Objective 2 and Alternative 3 is the preferred alternative for maintaining and restoring the above referenced ACS Objective.

ACS Objective 3 - *Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.*

Alternative 1: This alternative would not affect the physical integrity of the aquatic system since no action would occur under this alternative. The physical integrity of the aquatic system would be maintained at current trends due to the establishment of Riparian Reserves, which were implemented to protect the streams and aquatic systems.

Alternative 2 & 3: These alternatives would not adversely affect the physical integrity of the aquatic system. Maintaining a no-harvest buffer along all streams, and full suspension yarding across all stream channels will protect stream banks from logging damage. Directional felling away from or parallel to the riparian area will also protect riparian habitat from logging damage. The non-commercial thinning of the no-harvest buffers is prescribed to enhance the physical integrity of the aquatic system through enhancement of the stand health within the riparian area. Management activities resulting from this project would not cause any alteration in water flows that could affect channel morphology. Over the long-term, the treatment would enhance the development of coarse woody debris, which would provide additional stream structure and contribute to maintaining, improving, and restoring the physical integrity of the aquatic system.

Based on PDC's, these alternatives would maintain and restore the physical integrity of the aquatic system as outlined in ACS Objective 3. None of the indicators are degraded in the fifth-field watersheds in the long-term. At the sixth-field level, Alternative 2 & 3 are designed to maintain and restore the physical integrity of the aquatic system through increased stand health and potential course woody debris. Therefore, this project is consistent with ACS Objective 3.

ACS Objective 4 - *Maintain and restore water quality necessary to support healthy riparian, aquatic and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.*

Alternative 1: This alternative would not affect water quality necessary to support healthy riparian and aquatic ecosystems due to the establishment of Riparian Reserve network.

Alternative 2 & 3: These alternatives would not affect water quality necessary to support healthy riparian and aquatic ecosystems. Maintaining a no-harvest buffer along all streams would adequately filter overland sediment and maintain current stream temperatures. Over the long-term, water quality would improve. The density management would enhance the development of larger trees, which will provide more shade, and would help lower stream temperatures and provide course woody debris important for riparian and aquatic ecosystems. Road renovations and improvements within the project area will reduce sediment reaching streams and/or adjacent riparian areas.

Based on the PDC's and Best Management Practices (BMP's) (Roseburg District RMP 1995) either alternative proposed for the project would maintain and restore the elements as outlined in ACS Objective 4. Alternatives 2 & 3 would enhance the restoration of the Riparian Reserves areas within the sixth-field watersheds.

ACS Objective 5 -*Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.*

Alternative 1: This alternative would not alter the sediment regime due to the establishment of Riparian Reserve network. The current sediment regime would be maintained.

Alternative 2 & 3: These alternatives reduce sediment inputs into streams and improve the sediment regime. New roads constructed in Riparian Reserves would be designed to minimize impacts to the natural sediment regime to the maximum extent practicable. Existing roads within the project area would be improved, which would result in a decrease in road-related sediment production within the fifth-field watershed. Project driven hill-slope erosion and sediment inputs from upland areas is not anticipated. Maintaining a no-harvest buffer along all streams would adequately filter harvest-related overland sediment before it reaches the streams. Density management of the Riparian Reserve will enhance the transition of the existing aquatic ecosystem to a late-successional forest system.

Based on the PDC's all alternatives would maintain and allow for the restoration of the elements of ACS Objective 5 at the fifth-field watershed level. Alternatives 2 & 3 would enhance the transitional process to a late-successional forest ecosystem within the sixth-field watersheds.

ACS Objective 6 - *Maintain and restore instream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing (i.e., movement of woody debris through the aquatic system). The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.*

Alternative 1: This alternative would not alter in-stream flows due to the establishment of Riparian Reserves, which were implemented to protect the streams and aquatic systems.

Alternative 2 & 3: These alternatives may contribute to a minor increase in peak flows, summer low flows, and overall water yield because of the decrease in vegetation and canopy closure. The exact extent of the effect of flow is not certain; most research on hydrologic response to timber harvest has been conducted on clearcuts of small watersheds and involved treatments that went from ridge top to creek edge. Little research has been done in the Pacific Northwest looking at the effect of thinning while retaining streamside buffers on water yields. However any effects from the proposed thinnings are likely to be negligible and short-lived. Increased growth rates of the residual stand, stimulated by the thinning will likely absorb any increase in available moisture. Over time, as late-successional characteristics develop within the Riparian Reserve, improvements in sediment, nutrient, and wood routing would occur.

Based on the PDC's all alternatives would maintain and allow for the restoration of the elements of ACS Objective 6 at the fifth-field watershed level. At the sixth-field watershed level, Alternatives 2 & 3 would maintain and actively enhance the elements outlined in the above referenced ACS Objective.

ACS Objective 7 - *Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.*

Alternative 1,2 & 3: All alternatives would not alter existing patterns of floodplain inundation and water table elevations, because they would have no noticeable effect on existing flow patterns and stream channel conditions.

Based on the PDC's, the proposed project will maintain and, over time through the establishment of the Riparian Reserves, restore the elements outlined in ACS Objective 7.

ACS Objective 8 - *Maintain and restore the species composition and structural diversity of plant communities in riparian zones and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and* *channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.*

Alternative 1: No treatment of the Riparian Reserves would occur under this alternative. The elements as specified within the ACS Objective 8 would be maintained at current levels. ORGANAON (Hann 1995) output indicates that trees within the managed stands of the Upper Umpqua fifth-field watershed are under competitive stress at this time. By age 80 years crowns are averaging about 30 percent of tree height (crown ratio), mean diameters are around 16 inches, and heights of the tallest trees are over 170 feet. By age 120 the stands are extremely dense and composed of trees with crown ratios averaging less than 25 percent.

Tall skinny trees are susceptible to wind throw and more likely to break under snow loads. Trees that have developed over long periods of competitive stress are more likely to be killed by insects and disease (Waring, 1985), (Smith, 1962). Stands left in this condition are slow to respond to improved growing conditions and never attain potential growth rates. (Oliver, 1990), (Smith, 1962). When this process occurs in managed stands of Douglas-fir, down wood and snags are made up predominantly of the smaller trees. Accumulations of dead wood consisting of small trees increases fire intensity and rate of spread. The risk of stand damage from fire is increased (Waring, 1985), (Graham, 1999).

Alternative 2 & 3: Treatment in the Riparian Reserves will enhance the species composition and structural diversity of plant communities in riparian areas. The development of no-harvest buffers would maintain summer and winter thermal regulation, surface erosion, bank erosion, and channel migration for the riparian areas which under current management activities will be restored and improved over the long-term. Density management of the Riparian Reserves is essential to restore amounts and distribution of CWD sufficient to sustain physical complexity and stability of the late-successional forest ecosystem.

Alternatives 1 would allow for the degradation of the Riparian Reserves at the fifth-field and sixth-field watershed level. Based on the PDC's, Alternatives 2 & 3, would enhance the elements as defined within ACS Objective 8.

ACS Objective 9 - *Maintain and restore habitat to support well distributed populations of native plant, invertebrate, and vertebrate riparian dependent species.*

Alternative 1: No treatment of the Riparian Reserves would occur under this alternative. By establishing the Riparian Reserve network, and adhering to Roseburg District BMP's, existing conditions within the Riparian Reserve would be maintained at current levels.

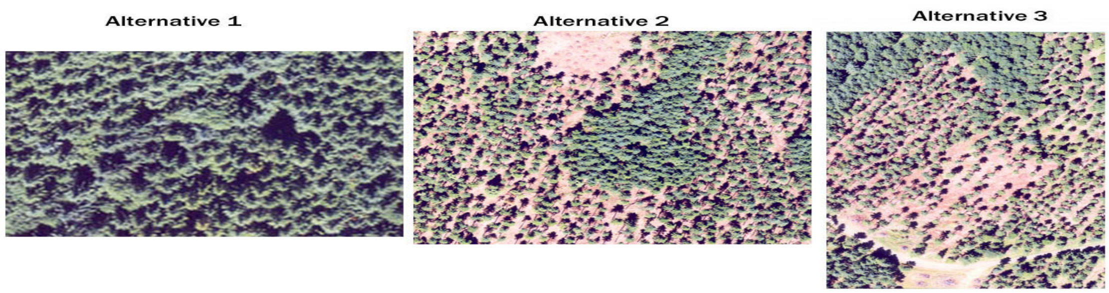
Alternative 2 & 3: The purpose of density management in the Riparian Reserve is to maintain or improve tree growth rates and vigor and to manipulate species composition and spatial arrangement. Structural diversity will be enhanced creating a variation in density and distribution of overstory and understory vegetation similar to a late-successional forest. Within the treatment area, where post-treatment densities are lowest, survival and growth rates of lower limbs will be sustained significantly longer. Maintenance and development of larger limbs on scattered trees may improve nesting conditions for some vertebrate species. Limbs that are larger and lower to the ground may improve habitat conditions for epiphytes (LSRA, 1998).

The proposed actions would maintain and restore the current Riparian Reserve network and other reserved areas located throughout the watershed over an indefinite time period. By establishing this Riparian Reserve network, habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species would be maintained in the short-term and restored through vegetative recovery over the long-term. Alternative 2 & 3 of the proposed project provides critical enhancement, at the sixth-field level, of the elements specified in the above referenced ACS Objective. Alternative 3 would allow for greater enhancement of owl and marble murrelet habitat.

E. APPENDIX E Analysis File

1. Pictorial Representation of Different Residual Densities

The following aerial photos illustrate possible short-term results contrasted between alternatives 1 (No Action), 2, and 3 for the timber harvesting aspect of this EA. These pictures are only meant to give the reader a visual representation for what the landscape scale alternatives could look like for no thinning, high/moderate residual density thinning, and low residual density thinning.



The following aerial photo, taken from the OM Hubbard thinning, shows varying trees per acre (tpa) which represents contrasting residual densities. These densities relate to the plan in the following way:

120 tpa – heavy residual densities
80 tpa – moderate/low residual densities
40 tpa – very low residual densities (lower than what would be implemented in this plan)

2. **Harvest and Road Project Totals By Subwatershed**

The acreage for the next three tables were estimated based on planning from the Geographical Information System and would vary when implemented in the field. Acreage figures are approximated in the analysis above to reflect that variation.

Table E- 1 LSR Density Management Harvest Acres by Subwatershed Alternatives 2 an 3

Subwatershed	Helicopter Approximate Acres	Cable Approximate Acres	Ground Based Approximate Acres	TOTAL
McGee Creek	40	358	46	444
Lost Canyon	185	367	32	584
Rader Wolf	82	1101	87	1270
Cougar	98	549	44	691
Hubbard Creek	301	448	11	760
Umpqua Frontal	19	203	28	250
TOTAL	**725**	**3026**	**248**	**3999**

Table E- 2 Riparian Reserve Density Management Harvest Acres by Subwatershed Alternatives 2 and 3

Subwatershed	Helicopter Approximate Acres	Cable Approximate Acres	Ground Based Approximate Acres	TOTAL
McGee Creek	39	105	0	144
Lost Canyon	31	170	0	201
Rader Wolf	0	0	0	0
Cougar	30	53	11	94
Hubbard Creek	100	683	171	954
Umpqua Frontal	25	71	0	96
TOTAL	**225**	**1082**	**182**	**1489**

Table E- 3 Matrix Thinning Harvest Acres by Subwatershed Alternatives 2 and 3

Subwatershed	Helicopter Approximate Acres	Cable Approximate Acres	Ground Based Approximate Acres	TOTAL
McGee Creek	72	230	26	328
Lost Canyon	194	468	15	677
Rader Wolf	65	924	48	1037
Cougar	155	569	3	727
Hubbard Creek	352	892	23	1267
Umpqua Frontal	17	24	0	41
TOTAL	**855**	**3107**	**115**	**4077**

3. Road Construction Categories and Road Maintenance Definitions

a) Road Construction Categories

The following road categories were derived from the Western Oregon Transportation Management Plan and the Roseburg District RMP in order to define the types of new road construction in this analysis:

- **Temporary** – Open for the duration of the specific commercial harvesting needs, at the most 3 years at Level 3 maintenance (see Level 1, 2, and 3 maintenance definitions below), and then these roads would be decommissioned for hydrological purposes. This category is exclusively all construction associated with roads through Riparian Reserves for Matrix lands and all Late-Successional Reserve road construction. The analysis in this EA shows that a second entry into Late-Successional Reserve stands would likely be needed to accomplish long-term desired late-successional forest characteristics, possibly 20 years after initial thinning. Thus the decommission category for roads indicates that they may be needed for a future thinning. However these roads would be hydrologically closed during the interim time.
- **Permanent** – Open for the duration of the specific commercial harvesting needs, in most cases about 3 years at a Level 3 maintenance, but then would drop to a Level 2 or 1 maintenance for long-term administrative purposes. This category includes **all** roads constructed on private lands or roads constructed on Matrix lands where no part of the road is within 200 feet of streams. Some of these roads could be closed between harvest entries.

Table E- 4 New Construction and Haul Route Road Related Activities by Subwatershed Alternatives 2 and 3 *

	Miles of **Temporary** LSR Road Construction **Outside** 200 Feet of Streams	Miles of **Temporary** Matrix Road Construction **Outside** 200 Feet of Streams	Miles of **Temporary** Road Construction **Within** 200 Feet of Streams	Miles of **Permanent** Matrix Road Construction **Outside** within 200 of Streams	Miles of **Permanent** Road Constructed Across **Private** Lands	TOTAL Miles of Haul Roads	Number of Haul Road Crossings Over Fish Bearing Streams
Cougar	2.1	0.0	0.13	0.1	0.2	44.2	8
Hubbard Creek	1.5	0.3	0.13	3.0	0.9	43.2	7
Lost Canyon	0.3	0.3	0.12	0.1	0.0	32.8	10
McGee Creek	1.3	0.3	0.31	0.1	0.2	31.2	7
Mehl Creek	0	0	0	0	0	0	0
Rader Wolf	4.1	0	0.53	0	1.0	71.2	14
Umpqua Frontal	0.3	0	0	0.1	0	12.6	0
Yellow Creek	0	0	0	0	0	0.7	0
TOTAL	9.6	0.9	1.2	3.4	2.3	236	46

* Road miles are estimated based on planning from the Geographical Information System and would vary by about 20 percent when implemented in the field.

b) **Road Maintenance Definitions**

Level 1: Emphasis is given to maintaining drainage and runoff patterns as needed to protect adjacent lands. Grading, brushing, or slide removal is not performed unless roadbed drainage is being adversely affected, causing erosion. Closure and traffic restrictive devices are maintained.
Level 2: Drainage structures are to be inspected within a 3-year period and maintained as needed. Grading is conducted as necessary to correct drainage problems. Brushing is conducted as needed to allow administrative access. Slides may be left in place provided they do not adversely affect drainage.
Level 3: Drainage structures are to be inspected at least annually and maintained as needed. Grading is conducted to provide a reasonable level of riding comfort at prudent speeds for the road conditions. Brushing is conducted as needed to improved sight distance. Slides adversely affect drainage would receive high priority for removal; otherwise they will be removed on a scheduled basis.

Table E- 5 Road Improvements and Decommission Approximate Miles by Subwatershed Alternatives 2 and 3*

	Total BLM Road Miles	Road Improvement Miles	Road Decommission Miles
Cougar	33	0.3	1.8
Hubbard Creek	44	9.7	0.8
Lost Canyon	42	5.3	0.0
McGee Creek	46	8.3	0.0
Mehl Creek	49	8.6	0.3
Rader Wolf	90	11.5	0.2
Umpqua Frontal	12	1.0	0.1
Yellow Creek	43	7.8	0.8
TOTAL	**359**	**52.5**	**4.1**

* Road miles are estimated based on planning from the Geographical Information System and would vary by about 20 percent when implemented in the field.

Table E- 6 Road Improvements under Alternatives 2 and 3

ROUTE_ID	MILES
25 S 07 W 10.00A	0.3
COUGAR TOTAL	0.3
25 S 08 W 25.00B	0.5
26 S 07 W 07.00C	0.5
26 S 07 W 07.00D	1.0
26 S 07 W 07.00E	0.1
26 S 07 W 07.00F	0.3
26 S 07 W 07.00G	0.1
26 S 07 W 07.00H	0.1
26 S 07 W 19.00B	2.6
26 S 07 W 19.01A	1.2
26 S 07 W 19.01C	0.9
26 S 07 W 20.01A	0.6
26 S 07 W 29.00A	0.2
26 S 07 W 33.00A	0.2
26 S 07 W 33.00C	0.7
26 S 08 W 12.00C	0.3
26 S 08 W 12.00D	0.8
HUBBARD CREEK TOTAL	10.1
24 S 06 W 29.01A	0.1
24 S 07 W 32.01B	0.4
24 S 07 W 32.02A	1.5
24 S 07 W 32.02B	0.9
24 S 07 W 32.02C	0.4
24 S 07 W 32.02D	0.8
24 S 07 W 32.02E	0.3
24 S 07 W 33.01A	0.3
24 S 07 W 33.03A	0.2
25 S 07 W 05.03A	0.5
LOST CANYON TOTAL	5.3
23 S 07 W 32.01F	0.9
23 S 07 W 33.01A	0.2
23 S 07 W 33.01B1	0.1
23 S 07 W 33.01B2	1.2
23 S 07 W 33.01C1	1.0
23 S 07 W 33.01C2	0.3
23 S 07 W 33.01D	0.3
23 S 07 W 33.01E	0.6
23 S 07 W 36.01B	0.8
24 S 07 W 05.00D	0.2
24 S 07 W 05.00E	0.3
24 S 07 W 07.00A	0.7
24 S 07 W 07.02A	0.4
24 S 07 W 09.02A	0.2
24 S 07 W 33.00D	0.6
24 S 08 W 01.06A	0.3
24 S 08 W 02.06A1	0.2
MCGEE CREEK	8.3
22 S 07 W 20.00E0	0.4
23 S 06 W 07.00A	1.2
23 S 06 W 07.02A	0.6
23 S 06 W 18.03A	1.2
23 S 07 W 04.02A	1.3
23 S 07 W 04.02B	0.6
23 S 07 W 04.02C	0.3
23 S 07 W 11.02A	0.2
23 S 07 W 11.02B	0.6
23 S 07 W 13.02A	1.7
23 S 07 W 13.04A	0.1
23 S 07 W 13.04B	0.1
23 S 07 W 13.05A	0.4
MEHL CREEK TOTAL	8.6
24 S 07 W 17.02I	0.5
24 S 07 W 17.02J	1.1
24 S 07 W 17.02K	0.1
24 S 07 W 18.02A	1.4
24 S 07 W 18.02B	0.5
24 S 08 W 13.00A	0.3
24 S 08 W 23.00A	0.3
24 S 08 W 23.02A	0.4
24 S 08 W 23.02B	1.5
24 S 08 W 23.06D	1.3
24 S 08 W 35.01C	0.7
24 S 08 W 35.01D	0.9
24 S 08 W 35.01E	0.2
24 S 08 W 35.01F	0.7
24 S 10 W 29.00F2	0.3
25 S 08 W 04.00A	0.7
25 S 08 W 09.01A	0.5
RADER WOLF TOTAL	11.2
26 S 07 W 09.01C	0.2
26 S 07 W 09.04A	0.5
UMPQUA FRONTAL TOTAL	0.7
23 S 06 W 23.00A	0.5
23 S 06 W 23.00A0	0.9
23 S 06 W 29.00B	0.8
24 S 06 W 03.00A	1.0
24 S 06 W 03.01A	0.2
24 S 06 W 08.00B	0.1
24 S 07 W 12.00B	0.2
24 S 07 W 13.00B	0.2
24 S 07 W 13.00C	1.3
24 S 07 W 13.00D	2.7
YELLOW CREEK TOTAL	7.8

Table E- 7 Road Decommissioning under Alternatives 2 and 3

ROUTE_ID	MILES	
25 S 07 W 16.04A	0.6	
25 S 07 W 18.02A	0.4	
25 S 07 W 18.03A	0.1	
25 S 07 W 18.03B	0.0	
25 S 07 W 19.00B	0.5	
25 S 08 W 15.02A	0.3	
COUGAR TOTAL	1.8	
25 S 07 W 29.00C	0.2	
25 S 07 W 32.00A	0.7	
HUBBARD CREEK TOTAL	0.8	
23 S 06 W 29.03A	0.8	
23 S 06 W 29.05A	0.1	
YELLOW CREEK TOTAL	0.8	
23 S 07 W 13.01A	0.3	MEHL CREEK SUBWATERSHED
24 S 08 W 19.00A	0.2	RADER WOLF SUBWATERSHED
26 S 06 W 03.00A	0.1	UMPQUA FRONTAL SUBWATERSHED

4. **Late-Successional Forest Stand Characteristics**

Table E-8 summarizes late-successional characteristics by alternative projected to 150 years. Stand exam data was used with the computer forest stand projection model (ORGANON) to analyze and project stand conditions. Details about the projected stand attributes used in this analysis can be found in two reports done by the Roseburg District Silviculturist. Reports titled: "Upper Umpqua Density Management Prescriptions" and "Efficacy of Density Management Treatments to Accelerate Development of Branch Sizes Suitable for Marbled Murrelet Nest Platforms" are found in the project file Appendix E of the EA. The analysis of the treatments begins with an average 40 to 50 year old stand that has been precommercially thinned to about 260 trees per acre. The three treatments used for comparison in this EA are no thinning, moderate residual density (100-110 ft^2 basal area/acre) with thinning occurring at about 50, 70 and 90 years, and a low residual density (50-80 ft^2 basal area/acre) with thinning occurring at about 50 and 70 years.

Table E- 8 Forest Stand Characteristics by Alternative after 150 Years of Growth

Forest Stand Characteristics	No Action Alternative 1	LSRA Prescription Alternative 2	Habitat Improvement Alternative 3
Average Crown Ratio on the 10 Largest Trees (Crown Depth Related to Tree Height)	30%	31%	42%
Lateral Branch Size-10 Large Trees (4" Needed for Murrelet Nesting Platforms)	Less Than 4"	Approx. 4.5"	Up To 5"
Owl Dispersal Habitat – Avg. Canopy Closure (Minimum 40% canopy closure needed)	90% to 100%	60%	40%
Single vs. Multiple Canopy Layers	100% Single	80% 2 Layers 10% Multiple	60% 2 Layers 30% Multiple
Number of Conifers/Acre > 40" diameter	1	5	5 – Mod Thin 12 – Low Thin
Average Forest Stand Diameter	25"	37"	37" – Mod Thin 46" – Low Thin

5. Road Summaries

Table E- 9 Approximation of All Upper Umpqua Roads by Subwatershed

	Cougar	Hubbard Creek	Lost Canyon	McGee Creek	Mehl Creek	Rader Wolf	Umpqua Frontal	Yellow Creek	TOTAL
Miles of BLM Roads Posing Ecological Risk	3	12	7	13	19	15	3	10	82
BLM Road Miles	33	44	42	46	49	90	12	43	359
State/County/Private Road Miles	68	60	91	102	209	49	166	30	775
TOTAL Watershed Road Miles	101	104	133	148	258	139	178	73	1134
Miles of BLM Decom Roads Within 200 Feet of Streams	0.2	0.5	0.0	0.0	0.3	0.2	0.0	0.1	1.4
Miles of BLM Improvement Roads Within 200 Feet of Streams	0.2	4.8	3.6	3.6	5.5	5.2	0.1	4.7	27.7
Miles of BLM Roads Within 200 Feet of Streams	11	20	19	21	17	31	2	16	137
Miles of State, County, & Private Roads Within 200 Feet of Streams	21	25	36	51	84	15	68	12	312
TOTAL Miles of Watershed Roads Within 200 Feet of Streams	32	45	55	72	101	46	70	28	449

Table E- 10 Road Density Table and Changes (under Alternatives 2 and 3)

	Current Road Density Miles per Mile^2	Total Watershed Road Miles	BLM Road Improvement Miles	Miles of **Temporary** BLM Road Construction	BLM Permanent Road Construction Miles	BLM Road Decommission Miles	Overall Difference in Permanent Road Miles	Road Density After Action Alternative
Cougar	4.0	101	0.3	1.6	0.09	1.8	-1.7	3.9
Hubbard Creek	3.9	104	9.7	2.5	3.2	0.8	2.4	4.0
Lost Canyon	4.3	133	5.3	0.4	0.5	0.0	0.5	4.3
McGee Creek	4.7	148	8.3	2.1	0.27	0.0	0.3	4.7
Mehl Creek	5.3	258	8.6	0	0	0.3	-0.3	5.3
Rader Wolf	3.8	139	11.5	5.1	0	0.2	-0.2	3.8
Umpqua Frontal	4.0	178	1.0	0.3	0.04	0.1	0.0	4.0
Yellow Creek	3.4	73	7.8	0	0	0.8	-0.8	3.4
TOTAL	4.3	1134	52.5	11.9	4.1	4.1	0.0	4.3

Table E- 11 Existing Haul Road Miles by Surface Type and Related Stream Crossings (under Alternatives 2 and 3)

The following table shows the type of road surfacing for **all existing roads** that would be used for timber haul in the action alternatives as well as their correlated crossings on **all streams**.

	Asphalt	Rocked	Pitrun Sandstone	Natural Surfaced	Total
Haul Road Miles	13	128	40	38	219
Number of stream crossings	42	353	100	99	594

6. Road Planning and Justification of Locations

TO: Dan Couch, Chip Clough, Craig Ericson, Glenn Lahti

FROM: Larry Brooks

SUBJECT: New road construction within 200 feet of streams, Upper Umpqua.

I have reviewed the proposed road construction for the Upper Umpqua Plan and have discovered several areas where trying to avoid road construction in Riparian Reserves and use helicopter yarding looks to be economically impractical. The areas I have found are:

T.26S., R.7W., Sec.29, W ½ of the NW 1/4. Road construction to access OI 32986 will be within 200 feet of a stream. Depending on the precision of the GIS maps construction may cross the stream (it is close to the top of the stream). At the minimum there will be construction very close to the stream. Dropping the road construction and using helicopter yarding would be very expensive.

T.26S., R.7W., Sec. 5 S ½ of the SW 1/4. Road construction to access OI 32888 must either be within 200 feet of a stream or enter oldgrowth timber. Avoiding the oldgrowth timber and 200 ft buffer will result in downhill yarding which in this case is inefficient and would result in more residual stand damage, or use of a helicopter which is expensive.

T.25S., R.8W. Sec. 13 SW 1/4. A ridgetop road to access OI 32834 cannot avoid being within 200 feet of a stream as the stream(s) come up the hillside far enough the reserve goes up and over the ridgetop. Dropping the road construction and using helicopter yarding would be very expensive.

T.25S., R.7W. Sec. 15 NE 1/4 of the NE 1/4. To access the very top of OI 32664 it will be necessary to cross a stream. If the road construction is not done downhill yarding would be used, which in this case would be inefficient and result in more residual stand damage, or use of a helicopter which is expensive.

T.24S., R.7W. Sec. 19 W ½ of the NE 1/4. A ridgetop road to access OI 31874 cannot avoid being within 200 feet of a stream as the stream(s) come up the hillside far enough the reserve goes up and over the ridgetop. Dropping the road construction and using helicopter yarding would be very expensive.

T.24S., R.7W., Sec. 18 SE 1/4. A ridgetop road to access OI 31861 cannot avoid being within 200 feet of a stream as the stream(s) come up the hillside far enough the reserve goes up and over the ridgetop. Dropping the road construction and using helicopter yarding would be very expensive.

T.23S., R.7W., Sec. 35 SE 1/4. A road to access OI 31650 must either cross streams (Road length approx 1500 feet) or have three separate spurs mostly within 200 feet of a stream (Total length approx 2000 feet and grades of 20 percent adverse). Dropping the road construction and using helicopter yarding would be very expensive.

In addition past experience tells me there are possibilities of finding unmapped or incorrectly mapped creeks which would increase or decrease the number of roads (I estimate a 20 percent plus or minus) that are within 200 feet of streams.

Economic analysis: Road construction within 200 feet of streams and cable yarding versus no road construction and helicopter yarding:

Evaluation Criteria:

Road construction $450.00/Station (from Cat Tracks and Hayhurst Tributaries CT's.

Cable Yarding $175.00/M (Cruiser estimate)

Helicopter Yarding $500.00/M (Cruiser estimate)

Difference $325.00/M

Volume to be yarded 10M/Acre (Plans Forester estimate)

10M/Acre X $325.00/M = $3250.00/Acre (Additional cost per acre to helicopter yard vs cable yard)

Acres affected were calculated using ArcView.

26-7-29 W1/2 of the NW1/4
16 Acres affected
Proposed road construction: 1700 ft (17 Stations)

26-7-5 S1/2 of the SW1/4
38 Acres affected
Proposed road construction: 1200 ft (12 Stations)

25-8-13 SW1/4
48Acres affected
Proposed road construction: 1665 ft (16.65 stations)

25-7-15 NE1/4 of the NE1/4
4 Acres affected
Proposed road construction: 500 ft (5 Stations)

24-7-19 W1/2 of the NE1/4
10 Acres affected
Proposed road construction: 825 ft (8.25 stations)

24-7-18 SE1/4
13 Acres affected
Proposed road construction: 920 ft (9.2 Stations)

23-7-35 SE1/4

21 Acres affected

Proposed road construction: 1500 crossing creeks (15 Stations)

: 2000 avoiding stream crossing but still entering Riparian Reserve (20 Stations)

The additional cost (A through G) of using helicopter logging vs. cable yarding is $487,500. The cost of the road construction within 200 of streams is between $37,395.00 and $39,645.00. The cost of not building the roads and using helicopter yarding is between $450,105 and $447,885.

7. SEDMODL Description and Detailed Results

a) Introduction

Boise Cascade Corporation has developed a GIS-based road erosion/delivery model to assist land managers in identifying road segments with a high potential for delivering sediment to streams in a watershed. The model uses information from an elevation grid, along with road and stream layers to determine which segments of the road system drain to streams. The relative amount of sediment produced from these road segments is then calculated based on road erosion factors from the Washington Department of Natural Resources Standard Method for Conducting Watershed Analysis, surface erosion module (WDNR 1995), with several modifications.

The purpose of this model is to identify road segments that have a high potential for delivering sediment to streams. Although SEDMODL is capable of producing results of sufficient accuracy to support reasonable analytical conclusions, **the model is conservative on the side of aquatic resources; it generally identifies more delivering road segments than actually exist on the ground.**

b) Limitations of the SEDMODL Program

There are a number of limitations of the SEDMODL program that the user should keep in mind when interpreting model results. These limitations relate primarily to the quality of input data (the garbage in, garbage out scenario) and situations that the program is not designed to model. If stream (or road) layer is off spatially then the amount of road/stream intersections has the potential to increase, which in turn increases the amount of direct delivery segments and potentially the amount of sediment delivered

If road layer attributes are incomplete; treat the sediment produced number in a relative sense (i.e. this segment of road has more sediment delivered than that one).
Current model assumes all roads are in-sloped with a ditch. This can skew sediment amounts.
Current model assumes all roads are over two years old.

c) SEDMODL Data Requirements

- Topography (10m DEM Elevation Grid)
- Streams (Location)
- Roads (Surface Type, Traffic Level)
- Basin Boundary

- ➢ Precipitation (Included in the Model)
- ➢ Geology (Included in the Model)

d) **Road Segment Delivery**

One of the goals of the model is to identify which portions of the road network in a basin are delivering sediment to streams. That way, land managers can pinpoint where to direct road improvements to reduce sediment input to streams. The model divides the road network into three categories: segments that deliver directly to streams (i.e. at stream crossings); segments that deliver sediment indirectly to streams (i.e. roads closely parallel streams, within 100 feet and within 200 feet); and segments that do not deliver to streams (i.e. runoff is directed onto the forest floor and infiltrates). Segments in the latter category are dropped from further computation because sediment produced from these portions of the road network generally does not reach the stream system.

Stream crossings are defined first using a series of intersections of the road and stream layer. These intersections are then input into the elevation grid to be used as starting points for calculating the delivery length to each crossing. Each grid cell on either side of this point is evaluated to determine if it is higher, lower or the same elevation as the stream crossing. If the new cell is higher in elevation, it becomes the new starting point. This process continues until the next elevation is lower than the previous cells' elevation. The road segments that match with these newly defined areas of direct delivery are extracted from the road layer. The model then buffers the stream layer to 100 and 200 feet and extracts the roads with indirect delivery.

Road segments that deliver directly to streams are assigned a delivery factor of 1, meaning that 100 percent of water and sediment produced from these segments is delivered to the stream network. Road segments that do not deliver to streams are assigned a delivery factor of 0. Road segments that deliver sediment within 200 feet and 100 feet of a stream, but not directly to a stream, are assigned a delivery factor of 10 percent and 35 percent, respectively (WDNR 1995).

e) **Erosion from Delivering Segments**

Erosion from roads in the basin was estimated using formulas based on empirical relationships between road use, parent material, road surfacing, road surface slope, cutslope and fillslope vegetative cover, and delivery of eroded sediment to the stream network (WDNR 1995, Beschta 1978, Bilby et al. 1989, Megahan et al. 1986, Reid and Dunne 1984, Sullivan and Duncan 1980, Swift 1984).

Sediment is produced from four components of a standard forest road prism: the cutslope, ditch, tread, and fillslope. Since the intended use of this model is a screening tool, actual dimensions and conditions of each of these components throughout the road network are not known. The model uses several simplifying assumptions to allow calculation of relative sediment yield based on measurements of road prisms on over 800 road segments in watersheds in Washington, Oregon, and Idaho. These measurements were made on private, state and federal lands as part of road erosion surveys during watershed analyses.

The **first simplifying assumption** is that roads in the watershed have been in place for several years, and cutslopes and fillslopes have revegetated and stabilized. While there are likely several miles of new roads (less than 2 years old) in a watershed at any given time, it is assumed that land managers know where these new roads are and have or could take appropriate erosion control measures at stream crossings to reduce sediment input from these segments until the roads have stabilized. The majority of erosion from new roads comes during the first 2 years from fillslopes, cutslopes, and ditches until these areas revegetate and/or armor. Erosion control on portions of these surfaces that drain to streams and/or sediment detention measures where ditches enter streams has been shown to effectively reduce sediment input from fresh roads. Sediment control measures would be used on new road construction in the Upper Umpqua Plan.

The **second assumption** is that most roads in the watershed are insloped with a ditch. This directs water away from fillslopes, and results in only short lengths (average 50 feet) of fillslopes that deliver sediment to streams at road crossings. Field observations and calculations indicate that erosion from the short, vegetated/armored sections of fillslope that occurs at most stream crossings is much smaller than from other portions of the road prism. Therefore, the model assumes that fillslope erosion is negligible. There may be a few locations in your watershed, such as where a road closely parallels a stream for a long distance, or, as mentioned previously, some new road crossings where this assumption is not valid.

The model also groups erosion from the tread and ditch together, so assigned road widths described below include both the running surface and ditch widths. The result of this assumption is to apply surfacing and traffic factors to the ditch as well as the tread. These two factors will tend to even each other out since most heavily used roads (high traffic factor) have gravel surfacing (lower surfacing factor). Very heavily used gravel roads (main haul roads) will have a very high traffic factor, but applying this to the ditch is probably appropriate since these roads and ditches are likely regraded frequently, disturbing the ditch's armor layer and increasing sediment production.

The average annual volume of sediment delivered to a stream from each road segment is calculated based on the following formulas:

Total Sediment Delivered from each Road Segment (in tons/year) = Tread + Cutslope

Tread = Geologic Erosion Rate x Tread Surfacing Factor x Traffic Factor x Segment Length x Road Width x Road Slope Factor x Precipitation Factor x Delivery Factor

Cutslope = Geologic Erosion Rate x Cutslope Cover Factor x Segment Length x Cutslope Height x Delivery Factor

Values for each factor in the equations are obtained from either model-supplied or user input values or from lookup tables associated with road class, surfacing, slope, or hillside slope obtained from the GIS database.

f) **SEDMODL Use in The Upper Umpqua Watershed Plan**

Potential haul routes needed for Density Management and Commercial Thinning activities within Upper Umpqua were evaluated using the SEDMODL. The parameters that most affect changes in sedimentation rates as predicted by the model include: Road conditions (Surface Types) and traffic levels (Administrative vs. Logging Traffic) within 200 feet of streams. In this analysis, the No Action alternative provides a value for the current chronic sedimentation rates on the proposed haul roads. Effects are measured by the relative change the model predicts from the No Action (baseline) to both Alternatives 2 and 3. The road haul routes and improved surface conditions would be the same for both action alternatives.

For road conditions, the four categories of road surfacing used in the Upper Umpqua analysis are Natural, Sandstone, Rocked, and Asphalt. Sandstone is not a category used by the SEDMODL program. Roads surfaced with crushed sandstone were classified as "rocked" for use in the model.

Traffic levels were determined by estimating the number of log trucks that will use each segment of the haul route. This was done by estimating approximately 10,000 board feet of timber will be produced from each acre of commercially thinned harvest unit. One log truck can haul approximately 5000 board feet of commercially thinned timber. Therefore, approximately 2 log trucks will be needed for each acre of commercial thinning. These estimates are based on previous commercial thinning projects conducted on Roseburg District. Actual amounts of timber produced per acre or hauled per truck may vary from site to site.

A sample subwatershed was selected, and potential harvest units and haul routes were located. Each road segment of the haul route was evaluated to determine the total number of acres of harvest unit accessed by the road. Beginning at the upper end of the road system, the total acres accessed by each road segment cumulatively increases as the road leads out of the watershed. As a road passes through a harvest unit or joins with another road, the total number of harvest acres increases by the size of the harvest unit or by the total number of acres contributed by the joining road. This is important because as the total acres of harvest units accessed by a road increases, the number of log trucks that will pass over that road segment increases, and therefore the higher the traffic factor. Based on the sample subwatershed, thresholds for traffic categories were assigned and applied to each subwatershed in the Upper Umpqua Plan area.

Three levels of traffic were used in the Upper Umpqua analysis: *Light Use, Moderate Use, and Moderately Heavy Use.* **Light Use** roads were identified as those roads that access 0-40 total acres of harvest unit. These are short road segments used to access a logging unit. These roads are used for a brief time while the unit is logged. On the average, these roads receive very little use. **Moderate Use** roads access 41-250 total acres of harvest unit. These roads may occasionally be heavily used to access a timber sale. They also receive some car/pickup or recreational use. **Moderately Heavy Use** roads access greater than 251 total acres of harvest unit. They would receive heavy to moderate use by log trucks as well as car/pickup residential or recreational traffic, and they are usually the main access roads in a watershed.

The SEDMODL was used to estimate the amount of road related sediment produced from BLM proposed activities in the Upper Umpqua Watershed Plan. It is assumed that traffic activity from Non-BLM hauling and recreational/private vehicle traffic will remain the same in all alternatives. Since the non-BLM traffic component was assumed to be constant, it was ignored from further analysis.

For the Pre-Action and Post-Action runs of the model, all haul roads were assigned the lowest traffic factor of **Occasional Use**. This was done so a direct analysis of BLM activities could be achieved. By setting all roads to the lowest traffic level and running the model, a baseline estimate of road related sediment is produced. Then road traffic factors and road surface information were adjusted based on the estimated traffic activity and road improvements resulting from the proposed actions. The model is run again and an estimate of road related sediment from the proposed actions is generated. A comparison can then be made between the baseline estimate and the proposed action estimate. The SEDMODL was run in this way for each subwatershed where proposed actions would occur in the Upper Umpqua Watershed Plan.

Three runs of the SEDMODL were conducted: ***No Action, Road Improvement, and Timber Haul***. The **No Action** run was done on all haul roads with their existing surface type and a traffic factor of Occasional Use.

The **Haul Road Improvement** run was done on all haul roads and included the upgraded road surfacing on those segments where improvements would be made. A traffic factor of Occasional Use was also assigned to all these roads so a direct analysis of road improvement effects could be achieved when compared to the No Action run.

The **Timber Haul** run was done on all haul roads and included the road improvement information. Traffic factors were adjusted on the haul roads by assigning one of the three traffic factors (Light, Moderate, or Moderately Heavy) as described above. This run of the model would predict the effects of timber haul on these roads. The Timber Haul run of the SEDMODL included all 9,600 acres of thinning proposed in the Upper Umpqua Watershed Plan. Since the model summarizes the results in terms of tons/year, the results given by the model assumes all 9,600 acres will be thinned in the same year. This will not be the case. Since actual amounts and locations of timber harvest for each year are not known at this time, this analysis will assume timber harvest will be spread evenly over the ten year life of the Upper Umpqua Watershed Plan. Ten percent of the Timber Haul sediment summary will be added to the Road Improvement sediment summary for each sub-watershed to produce an annual Proposed Action sediment summary.

g) **SEDMODL Results for Upper Umpqua Watershed Plan**

Tables E-12 and E-13 summarize the results for SEDMODL runs as described above for the Upper Umpqua Watershed Plan.

Table E- 12 SEDMODL Results By Subwatershed (In Tons/Year)

Subwatershed	**No Action** Sediment Summary Alternative 1	**Road Improvement** Sediment Summary	Timber Haul Sediment Summary All 9,600 acres in 1 year	**Timber Haul** Sediment Summary 10 % per year	**Road Improvement + Timber Haul** Sediment Summary Alternative 2 & 3
Cougar	53	46	193	19	65
Hubbard Creek	91	60	284	28	88
Lost Canyon	107	74	131	13	87
McGee Creek	65	48	229	23	71
Rader Wolf	86	76	160	16	92
Umpqua Frontal	4	4	39	4	8
OVERALL TOTAL	**406**	**308**	**1036**	**103**	**411**

Table E- 13 Relative Sediment Change By Subwatershed

Subwatershed	Relative Change Due to Road Improvements*	Relative Change Due to Timber Haul*	Relative Change Due to Road Improvements and Timber Haul*
Cougar	**13% Reduction**	**36% Increase**	**23% Increase**
Hubbard Creek	**34% Reduction**	**31% Increase**	**3% Reduction**
Lost Canyon	**31% Reduction**	**12%Increase**	**19% Reduction**
McGee Creek	**26% Reduction**	**35% Increase**	**9% Increase**
Rader Wolf	**12% Reduction**	**18% Increase**	**7% Increase**
Umpqua Frontal	**No Change**	**100% Increase**	**100% Increase**
OVERALL TOTAL	**24% Reduction**	**25% Increase**	**1% Increase**

* As measured from the No Action Summary

h) **Discussion of the SEDMODL Results**

By improving roads within the watershed, SEDMODL predicts a decrease in sediment delivery. The main reason is natural surface roads being upgraded to rocked roads. When timber haul was simulated on these improved roads the model predicts an increase in sediment delivery. A large increase is shown for the Umpqua Frontal Subwatershed. This is because all the roads are either rocked or paved and no road improvements are planned for haul roads in this subwatershed. The total length of roads used for haul and the baseline level of haul road sediment production is also extremely low in the Umpqua Frontal subwatershed compared to the rest of the Upper Umpqua subwatersheds. A 100 percent increase in this subwatershed only amounts to about two percent of the total amount of sediment predicted from haul roads for the whole Upper Umpqua watershed. This amount of sediment would not be detectable if all other sources of sediment from this subwatershed are factored in. The combined effects of road improvements and timber haul for each subwatershed have varied results depending on the amount of proposed road improvement and timber haul. Even with log hauling activity, sediment production decreases in the Hubbard Creek and Lost Canyon subwatersheds. These subwatersheds have the most miles of haul roads improving from natural surface to rocked roads. All other subwatersheds show an increase in sediment production. Overall sediment production from log hauling activity for the whole Upper Umpqua watershed is about one percent higher than baseline levels. The increased level of sediment production is a temporary condition and would only be expected during log haul activity. When log haul activity ceases, sediment production levels would be lower than those of pre-road improvement conditions.

These results, as computed by the SEDMODL, are intended to be used as a relative indication of sediment production resulting from proposed activities. Limitations of the model prevent the simulation of every condition of each alternative. One example is that the model does not take into consideration the effects of road drainage on reducing sedimentation to streams. Another example is, although an additional 20 MMBF of timber volume will be hauled with Alternative 3 compared to Alternative 2, this volume comes from units that have a high amount of acreage. Because of the high amount of acreage and associated volume from these units, the haul routes would be categorized in a moderately high category in either Alternative 2 or 3. Thus there would be no analytical differences between these alternatives. Therefore, the model was used to achieve a general relationship between the effects of proposed haul road improvements and timber haul within the Upper Umpqua project area. The results calculated by the SEDMODL are in line with findings supported in scientific literature. Road improvements would decrease sediment production (Burroughs and King 1989, Luce and Black 1999), however, increased traffic will also cause sediment production to increase on gravel roads (Reid and Dunne 1984). Without considering other project design criteria, the SEDMODL results indicate that, depending on the level of traffic, there may be a short-term increase in sediment production during log hauling activities. However, road improvements will result in long-term reductions in sediment production and delivery.

The SEDMODL helps identify how timber haul effects will be distributed across subwatersheds. Those subwatersheds with predicted increases over baseline rates would receive closer review for mitigating measures prior to haul. Project Design Criteria (PDC) includes using sediment control along haul roads if potential sediment delivery is of concern. Based on these model results, and PDCs used in the Upper Umpqua Watershed Plan, road related sediment production may temporarily increase due to log hauling. However, sediment delivery to streams is unlikely to exceed amounts that would be distinguishable from background levels. Road improvements will result in a long-term reduction in chronic sediment delivery to stream systems and may result in improved aquatic habitat conditions from reduced fine sediment inputs.

8. Salmonid Life Cycle and Reach by Reach Stream Descriptions

The major life stages of most salmonid species are associated with different uses of fluvial systems: migration of maturing fish from the ocean (anadromous fishes), lakes or rivers to streams; spawning by adults; incubation of embryos; rearing of juveniles; and downstream migration of juveniles to large-river, lacustrine, or oceanic rearing areas (Bjornn and Reiser 1991).

Six percent stream gradient was used as a maximum indicator for the presence of salmonid spawning and rearing habitat within the Upper Umpqua watershed. This was assessed through review of various literature, observations of BLM and ODFW fisheries biologist, and analysis of water velocity as a component of water volume, stream width, depth, sediment, and gradient.

a) Spawning and Incubation

Substrate composition, cover, water quality, and water quantity are important habitat elements for salmonids before and during spawning. The number of spawners that can be accommodated in a stream is a function of the area suitable for spawning (suitable substrate, water depth, and velocity), area required for each redd, suitability of cover for the fish, and behavior of the spawners. Cover is important for species that spend several weeks maturing near spawning areas (Bjornn and Resier 1991). Cover for salmonids waiting to spawn or in the process of spawning can be provided by overhanging vegetation, undercut banks, submerged vegetation, submerged objects such as logs and rocks, floating debris, deep water, turbulence, and turbidity (Giger 1973 as cited in Bjornn and Resier 1991). If fine sediment (silt, organics and sand) are being transported in a stream either as bedload or in suspension, some of the fines are likely to be deposited in the redd. The fine particles impede the movement of water and alevins oxygen during decomposition; if the oxygen is consumed faster than the reduced interagravel water flow can replace it, the embryos or alevins will asphyxiate (Bjornn and Resier, 1991).

b) Rearing

The abundance of juvenile salmon and trout in streams is a function of many factors, including abundance of newly emerged fry, quantity and quality of suitable habitat, abundance and composition of food, and interactions with other fish, birds, and mammals (Bjornn and Resier 1991). Abundant food and cover can increase carrying capacity because more fish can occupy a given area and fewer emigrate (Mason and Chapman 1965). After they emerge in the spring, young fish spread into the available rearing space, some moving upstream but most moving downstream. Juvenile salmon in streams and rivers tend to consume mostly aquatic and terrestrial invertebrates carried along by the flowing water (Mundie 1969), but they also eat small fish, salmon eggs, and occasionally the carcasses of adult salmon (Kline et al. 1990). In small watersheds with dense forest canopies, much of the organic matter in streams originates in the surrounding forest, and the invertebrate communities are dominated by organisms specialized for processing wood and leaves (Gregory 1983). In fall, as stream temperatures decline, young coho salmon become more security conscious, change their behavior, and seek areas with more cover than the areas they used in summer. They may move into side channels sloughs, and beaver ponds for the winter, and they are usually found close to various forms of woody debris, roots, and overhanging brush that provide cover in water of low velocity (Hartman 1965; Bustrard and Narver 1975a as cited Meehan and Bjornn, 1991). Salmonids in interior streams, change behavior, from mostly feeding in the summer, to hiding and conserving energy during winter. Fish that had been territorial in summer may congregate in large pools in winter, move into areas with woody debris and brush, or move into the interstitial spaces in the substrate (Chapman and Bjornn 1969; Bustrard and Narvar 1975a). The number of fish that can or will stay in a stream over winter can vary with quality of the winter habitat (Bjornn 1978) and the severity of the winter weather (Seelbach 1987). If the habitats in small streams are not suitable and the weather is severe, the fish move to larger rivers in the fall and early winter (Bjorn and Mallet 1964; Bjornn 1978). A reverse behavior pattern has been observed in coastal streams (Cederholm and Scarlett 1982): young coho salmon, cutthroat, and steelhead move upstream into small tributaries from main-stem rivers in fall patterns; coastal rivers are warmer than inland rivers and carry freshets during winter, whereas flows are relatively stable in inland rivers (Meehan and Bjornn, 1991).

c) **Reach by Reach Description of Current Stream Conditions**

Reference Reaches:

Cougar Creek, Reach 3, consists of approximately 1.5 miles of low gradient stream with 37% pools and 3% riffles. Riffles contain 40% fines and 34% gravel. The substrate within the reach consists of 9% silts and organics (SO), 36% gravel, 16% cobble and 14% bedrock. Instream wood was noted at 25.9 pieces and 83.8m^3 of wood per 100m. The adjacent riparian consisted mostly of conifers at a density of 0.50 per 100m^2.
Cougar Creek Tributary 1, Reach 2, consists of approximately 0.7 mile of low gradient stream with 41% pools and 29% rapids (no riffles). The substrate within the reach consisted of 3% SO, 29% gravel, 16% cobble and 35% bedrock. Instream wood was noted at 12.1 pieces and 27.4m^3 of wood per 100m. The adjacent riparian consisted of mostly conifers at a density of 0.77 per 100m^2.
Yellow Creek, Reach 5, consists of approximately 2.3 miles of low gradient stream with 23% pools and 2% riffles. Riffles contain 2.5 % fines and 75% gravel. The substrate within the reach consist of 3% SO, 51% gravel, 26% cobble and 11% bedrock. Instream wood was noted at 14.9 pieces and 44.1m^3 of wood per 100m. The adjacent riparian consisted of a mixture of conifers and hardwoods. Conifer density was indicated at 4.6 per 100m^2.
Little Wolf Creek Tributary #1, Reach 1*, consists of approximately 1.1 miles of low gradient stream with 20.7 % pools and 37.1% riffles. The substrate within the reach consisted of 21% SO, 25% gravel, 16% cobble and 15% bedrock. Instream wood was noted at 11.4 pieces and 43.2m^3 of wood per 100m. The adjacent riparian consisted of a mixture of conifers and hardwoods.
Miner Creek, Reach 3*, consists of approximately 0.6 mile of low gradient stream with 13.1% pools and 26.1 riffles. The substrate within the reach consisted of 22% SO, 31% gravel, 12% cobble and 11% bedrock. Instream wood was noted at 12.4 pieces and 65.2m^3 of wood per 100m. The adjacent riparian consisted of a mixture of conifers and hardwoods.
Halfway Creek, Reach 5, consist of approximately 1.3 miles of low gradient stream with 37% pools and 31% riffles. Riffles contain 20% fines and 54% gravel. The substrate within the reach consisted of 4% SO, 41% gravel, 20% cobble and 4% bedrock. Instream wood was noted at 14.6 pieces and 104.5m^3 of wood per 100m. The adjacent riparian consisted of mostly conifers at a density of 1.2 per 100m^2.
Wassen Creek, Reach 8, consist of approximately 2.0 miles of low gradient stream with 16% pools and 15% riffles. Riffles contain 42% fines and 25% gravel. The substrate within the reach consisted of 10% SO, 34% gravel, 27% cobble and 2% bedrock. Instream wood was noted at

33.0 pieces and 51.1m^3 wood per 100m. The adjacent riparian consisted mostly of hardwoods, conifer density was indicated at 0.5 per 100m^2.

Wassen Creek Tributary #2, Reach 1, consists of approximately 1.6 miles of low gradient stream with 32% pools and 34% riffles. Riffles contain 12% fines and 44% gravel. The substrate within the reach consisted of 7% SO, 17% gravel, 19% cobble and 45% bedrock. Instream wood was noted at 18.0 pieces and 24.7 m^3 of wood per 100m. The adjacent riparian consisted of mostly hardwoods, conifer density was indicated at 0.1 per 100m^2.

Wassen Creek Tributary #2, Reach 2, consists of approximately 0.4 mile of low gradient stream with 52% pools and 34% riffles. Riffles contain 14% fines and 46% gravel. The substrate within the reach consisted of 5% SO, 34% gravel, 34% cobble and 15% bedrock. Instream wood was noted at 26.8 pieces and 25.1m^3 of wood per 100m. The adjacent riparian consisted of mostly hardwoods, conifer density was indicated at 0.67 per 100m^2.

Wassen Creek Tributary #2, Reach 3, consists of approximately 1.1 miles of low gradient stream with 24% pools and 39% riffles. Riffles contain 14% fines and 26% gravel. The substrate within the reach consisted of 6% SO, 31% gravel, 35% cobble and 11% bedrock. Instream wood was noted at 31.5 pieces and 58.8m^3 of wood per 100m. The adjacent riparian consisted of mostly hardwoods, conifer density was indicated at 0.2 per 100m^2.

West Fork Smith River, Reach 3, consists of approximately 3.1 miles of low gradient stream with 21% pools and 31% riffles. Riffles contain 1% fines and 26% gravel. The substrate within the reach consisted of 1% SO, 28% gravel, 9% cobble and 58% bedrock. Instream wood was noted at 9.2 pieces and 13.2m^3 of wood per 100m. The adjacent riparian consisted of mostly hardwoods, conifer density was indicated at 0.4 per 100m^2.

West Fork Smith River, Reach 6, consists of approximately 0.7 mile of low gradient stream with 50% pools and 16% riffles. Riffles contain 3% fines and 74% gravel. The substrate within the reach consisted of 4% SO, 51% gravel, 10% cobble and 25% bedrock. Instream wood was noted at 20.3 pieces and 25.5 m^3 of wood per 100m. The adjacent riparian consisted of only hardwoods.

North Sister Creek, Reach 4, consists of approximately 0.8 mile of low gradient stream with 34% pools and 23% riffles. Riffles contain 11% fines and 35% gravel. The substrate within the reach consisted of 0% SO, 30% gravel, 26% cobble and 13% bedrock. Instream wood was noted at 13.7 pieces and 54.7m^3 of wood per 100m. The adjacent riparian consisted of only hardwoods.

Yellow Lake Creek, Reach 1, consists of approximately 0.6 mile of low gradient stream with 50% pools and 2% riffles. Riffles contain 28% fines and 39% gravel. The substrate within the reach consisted of 7% SO, 26% gravel, 30% cobble and 3% bedrock. Instream wood was noted at 10.2 pieces and 20.6m^3 of wood per 100m. The adjacent riparian consisted mostly of hardwoods, conifer density was indicated at 0.2 per 100m^2.

Reference Reach Summary

Averages:	High	Low
17.4% fines	42%	0%
7.3% SO	22%	1%
34.1% gravel	51%	17%
21.1% cobble	35%	9%
18.7% bedrock	58%	2%
18.1 key pieces wood	33	9.2
45.9 m^3 wood volume	104.5m^3	13.2m^3
16.9% riffles	39%	0%
32.2 % pools	52%	13.1%

Streams Prioritized for Enhancement:

Bear Creek, Reach 1, consists of approximately 0.6 mile of low gradient stream with 24% pools and 7% riffles. Riffles contain 3% fines and 86% gravel. The substrate within the reach consists for the following percentages of sediment: 5% Silt and Organics (SO), 32% gravel, 38% cobble, and 11% bedrock. Instream wood was 8.9 pieces and 33.3 m^3 of wood per 100 m. The adjacent riparian consisted of mostly of conifers at a density of 0.5 per $100m^2$ providing optimal opportunities to fell trees. The high percentages of gravel and cobble provide adequate spawning habitat. However, the lack of cover and large wood debris limits the rearing habitat within this stream reach.

Cougar Creek, Reach 1, consists of approximately 1.5 miles of low gradient stream with 47% pools and 6% riffles. Riffles contain 7% fines and 50% gravel. The substrate within the reach consists of the following percentages of sediment: 2% SO, 28% gravel, 14% cobble, and 47% bedrock. There is low volumes of key wood and overall low wood volumes (15.3 pieces and $41.8m^3$ of wood per 100 m), as well as, low amount of conifer within the adjacent riparian (0.50/100 m^2). Based on the overall lack of stream complexity there is limited spawning and rearing habitat available.

Little Wolf Creek, Reach 1*, consists of approximately 2.7 miles of low gradient stream with substrate percentages at 16% SO, 17% gravel, 12% cobble and 37% bedrock. There are low amounts of key wood pieces and wood volume (4.4 pieces and $9.0m^3$ of wood per 100m) There are no pools greater that one meter in depth. There are a low amounts of conifer within the adjacent riparian. Based on the overall lack of stream complexity and high instream sediment there is limited spawning and rearing habitat available.

Little Wolf Creek, Reach 2*, consists of approximately 0.4 miles of low gradient stream with substrate percentages at 17% SO, 13% gravel, 8% cobble and 47% bedrock. Although the stream reach has an overall low volume of wood (3.6 pieces & $10.1m^3$ of wood per 100m.), there is only one pool greater than one meter in depth and key pieces of large wood is deficient. Based on the overall lack of stream complexity and high instream sediment there is limited spawning and rearing habitat available. The high percentage of bedrock and few key wood pieces, salmonid migration through the reach may be impeded.

Little Wolf Creek, Reach 3*, consists of 1.7 miles of low gradient stream with substrate percentages at 22% SO, 27% gravel, 19% cobble and 6% bedrock. The wood volume for the stream reach is relatively low (7.0 pieces and 19.7 m^3 of wood per 100m). However, based on the overall lack of stream complexity and high instream sediment there is limited spawning and rearing habitat available.

Little Wolf Creek, Reach 4*, consists of approximately 0.4 mile of low gradient stream with substrate percentages at 19% SO, 28% gravel, 25% cobble and no bedrock. The wood volume for the reach is low (4.9 pieces and 13.5 m^3 of wood per 100m). Based on the overall lack of stream complexity and high instream sediment there is limited spawning and rearing habitat available.

Lost Creek, Reach 3, consists of approximately 1 mile of low gradient stream with 43% pools and 1% riffle Riffles contain 5% fines and 75% gravel. The substrate within the reach consists 5% SO, 27% gravel, 25% cobble and 31% bedrock. There is a lack of key wood and overall wood volume (8.9 pieces and 19.0 m^3 of wood per 100 m). There is mostly hardwood within the riparian, conifer density consist of $2.4/100m^2$. Based on the overall lack of stream complexity low percentage of riffles and high percentage of bedrock, there is limited spawning and rearing habitat available.

Yellow Creek, Reach 1, consists of approximately 1.5 miles of low gradient stream with 55% pools and 1.5% riffle. Riffles contain 9% fines and 42% gravel. The substrate within the reach consisted of 5% SO, 22% gravel, 16% cobble and 42% bedrock. There is very little instream wood (2.8 pieces and 3.9 m^3 of wood per 100 m). However, the stream reach contains good percentages of gravel (42%) and high number of pools (12) greater than one meter in depth. There is mostly hardwood with the riparian, conifer density consist of 1.0/100m^2. Based on the lack of coarse woody debris within the stream reach providing cover, there is limited rearing habitat available. Due to the low percentages of riffles and overall gravel, the available spawning habitat is impaired. The high percentage of bedrock and few key wood pieces, salmonid migration through the reach may be impeded, as well as the upstream portion of the creek.

Rader Creek, Reach 3*, consists of approximately 0.8 mile of low gradient stream with substrate percentages at 13% SO, 20% gravel, 17% cobble and 23% bedrock. Instream wood was indicated at 11.6 pieces and 31.4 m^3 of wood per 100m. The overall wood volume and percent gravel is fairly high. There are low numbers of confers within the adjacent riparian. Approximately 8 percent of the stream bank within the reach is actively eroding. Due to the lack of key wood pieces, high amounts of fine sediment and eroding banks, spawning habitat is impaired and rearing habitat is limited.

Rader Creek Tributary # 3, Reach 3*, consists of approximately 1.3 miles of low gradient stream with substrate percentages at 41% SO, 21% gravel, 9% cobble and 8% bedrock. Instream wood was indicated at 6.0 pieces and 19.8 m^3 of wood per 100m. The gravel percentages are moderate and a large number of pools greater than one meter in depth are contained within the stream reach. Due to the lack of instream wood for cover and macroinvertibrate substrate, rearing habitat is limited. The high amounts of fine sediments impair the available spawning habitat.

Wolf Creek, Reach 1*, consists of approximately 1.3 miles of low gradient stream with substrate percentages at 16% SO, 15% gravel, 10% cobble and 49% bedrock. Instream wood was indicated at 0.7 pieces and 2.1 m^3 of wood per 100m. The reach consists of high percentage of bedrock (49%), limited number of pools, and extremely low amounts of instream wood. Based on the overall lack of stream complexity there is limited spawning and rearing habitat available. The high percentage of bedrock and few key wood pieces, salmonid migration through the reach may be impeded, as well as the upstream portion of the creek.

Wolf Creek, Reach 2*, consists of approximately 1.4 miles of low gradient stream with substrate percentages at 11% SO, 19% gravel, 15% cobble and 36% bedrock. Instream wood was indicated at 1.8 pieces and 3.4m^3 of wood per 100m. The reach consists of high percentage of bedrock (36%), limited number of pools and very low amounts of instream wood. Based on the overall lack of stream complexity there is limited spawning and rearing habitat available.

Wolf Creek, Reach 4*, consists of approximately 0.8 mile of low gradient stream with substrate percentages at 17% SO, 25% gravel, 18% cobble and 17% bedrock. Instream wood was indicated at 8.8 pieces and 23.4m^3 of wood per 100m. Due to high percentages of silts and organics, no pools greater than one meter in depth, moderate percentage of bedrock, and low amounts of key pieces of large wood, the reach lacks stream complexity and is limited spawning and rearing habitat.

Brads Creek, Reach 1, consists of approximately 0.6 mile of low gradient stream with 35% pools and 40% riffles. Riffles contain 17% fines and 14% gravel. The substrate within the reach consists of 15% SO, 7% gravel, 14% cobble and 50% bedrock. Instream wood was noted at 3.4 and 6.5m^3 of wood per 100m. There are no conifers within the adjacent riparian. Based on the lack of instream wood, very low amounts of gravel and very high amounts of fine sediment, there is limited spawning and rearing habitat available. The high percentage of bedrock and few key wood pieces, salmonid migration through the reach may be impeded, as well as the upstream portion of the creek.

Bottle Creek, Reach 1, consists of approximately 0.1 mile of low gradient stream with 36% pools and 38% riffles. Riffles contain 47% fines and 20% gravel. The substrate within the reach consists of 12% SO, 14% gravel, 3% cobble and 41% bedrock. Instream wood was noted at 1.3 pieces and 0.1 m^3 of wood per 100m. There are no boulders, which is inconsistent with the upstream reaches. There are no conifers within the adjacent riparian. Based on the overall lack of instream wood, high fine sediment, low gravel there is limited spawning and rearing habitat available. The high percentage of bedrock and few key wood pieces, salmonid migration through the reach may be impeded, as well as the upstream portion of the creek.

Hubbard Creek, Reach 3, consists of approximately 2.3 miles of low gradient stream with 27% pools and 10% riffles. Riffles contain 25% fines and 22% gravel. The substrate within the reach consists of 9% SO, 14% gravel, 16% cobble and 36% bedrock. Instream wood was noted at 1.1 pieces and 2.2m^3 of wood per 100m. Riparian conifer densities were indicated at 0.2 per 100m^2. There are no boulders, which is inconsistent with the upstream reaches. Based on the overall lack of stream complexity, instream wood, very high fine sediment and low gravel percentages, there is limited spawning and rearing habitat available.

Hubbard Creek, Reach 4, consists of approximately 1.2 miles of low gradient stream with 30% pools and 8% riffles. Riffles contain 29% fines and 22% gravel. The substrate within the reach consist of 8% SO, 10% gravel, 16% cobble and 27% bedrock. Instream wood was noted at 6.9 pieces and 13.5m^3 of wood per 100m. There are no conifers indicated within the adjacent riparian. Based on the overall lack of stream complexity, low percentage of riffles and high percentage of fine sediment, there is limited spawning habitat available.

Hubbard Creek, Reach 6, consists of approximately 2.2 miles of low gradient stream with 22% pools and 8% riffles. Riffles contain 21% fines and 24% gravel. The substrate within the reach consists of 8% SO, 17% gravel, 18% cobble and 24% bedrock. Instream wood was noted at 4.4 pieces and 7.9m^3 of wood per 100m. Most of the adjacent riparian consisted of conifers, conifer density was indicated at 0.13 per 100m. Based on the overall lack of instream wood and high fine sediment there is limited spawning and rearing habitat available.

Little Canyon Creek, Reach 1, consists of 1.9 miles of low gradient stream with 23% pools and 1% riffles. Riffles contain 10% fines and 85% gravel. The substrate within the reach consists of 9% SO, 31% gravel, 23% cobble and 22% bedrock. Instream wood was noted at 4.1 pieces and 5.7m^3 of wood per 100 m. There are no conifers within adjacent riparian. Based on the overall lack of coarse woody debris and high percentages of fine sediment within the riffles, there is limited spawning and rearing habitat available.

Little Canyon Creek, Reach 2, consists of 0.6 mile of low gradient stream with 15% pools and no riffles. The substrate within the reach consists of 5% SO, 42% gravel, 30% cobble and 6% bedrock. Instream wood was noted at 5.5 pieces and 10.6m^3 of wood per 100 m, and there were no conifers within the adjacent riparian. Based on the lack of coarse woody debris and lack of riffles, there is limited cover and macroinvertabrate substrate limiting the rearing habitat for the stream reach.

Martin Creek, Reach 1, consists of approximately 0.9 mile of low gradient stream with 46% pools and 6% riffles. Riffles contain 5% fines and 57% gravel. The substrate within the reach consists of 3% SO, 26% gravel, 19% cobble and 25% bedrock. Instream wood was noted at 12.0 pieces and 16.4m^3 of wood per 100m. Although most of the adjacent riparian consisted of hardwoods, conifer density was indicated at 0.13 per 100m^2. Based on the lack of coarse woody debris, there is limited cover and macroinvertabrate substrate limiting the rearing habitat for the stream reach.

d) **Mid Seral Riparian Forest Type Near Non-Fish Bearing Streams**

Table E- 14 Mid Seral Riparian Forest Type Near Non-Fish Bearing Streams

SUBWATERSHEDS	40' CONIFER	40' HARDWOOD	CATEGORY TOTAL
COUGAR	109	0	109
HUBBARD CREEK	225	31	255
LOST CANYON	186	13	199
MCGEE CREEK	67	0	67
RADER WOLF	135	5	140
UMPQUA FRONTAL	8	6	14
TOTAL	**729**	**55**	**784**
% by Category	93%	7%	

Table E- 15 Fish Spawning and Rearing Tributary Streams by Subwatershed (Miles)

	3rd - 6th Order Stream Miles	3rd - 6th Order Stream Miles with <=6% Gradient	BLM Stream Miles Prioritized for Enhancement	Private Stream Miles Prioritized for Enhancement
Cougar	21	9	1.2	0.5
Hubbard Creek	35	16	3.2	7.2
Lost Canyon	25	10	1.1	2.6
McGee Creek	26	14	0.9	0.0
Mehl Creek	53	31	0.0	0.6
Rader Wolf	42	31	8.0	4.0
Umpqua Frontal	40	33	0.0	0.0
Yellow Creek	23	12	1.1	1.2
TOTAL	**265**	**156**	**15.5**	**16.1**

9. Special Status Species and Survey and Manage Species

Table E- 16 Summary of Special Status Terrestrial Wildlife Species in the Project Area

Species	Status[1]	Presence in Project Area?	General Habitat Requirements
BUREAU SENSITIVE			
American Peregrine Falcon *Falco peregrinus anatum*	BS, SE	Documented	Cliffs, rock outcrops
Fisher *Martes pennanti*	BSO, XC, CR	Expected	Late-successional conifer forests
Northern Goshawk *Accipiter gentilis*	BSO, XC, CR	Documented	Mature and older conifer forests
Townsend's Big-eared Bat *Corynorhinus townsendii*	BSO, XC, CR	Expected	Late-successional conifer forests
Western Pond Turtle *Clemmys marmorata*	BSO, XC, CR	Documented	Ponds, low gradient rivers; upland over-wintering habitat
Survey & Manage			
Red Tree Vole[3] *Arborimus longicaudus*	S&M	Documented	Late-successional and mid seral conifer forests

1. Status abbreviations: FE--Federal Endangered, FT--Federal Threatened, SE--State Endangered, ST--State Threatened, XC--Former Federal Candidate, CR--ODFW Critical, V--ODFW Vulnerable, P--ODFW Peripheral/Naturally Rare, U--ODFW Undetermined, BS-- Bureau Sensitive in Oregon and Washington, BSO--Bureau Sensitive in Oregon, Biological Assessment-- Bureau Assessment Species in Oregon and Washington, Biological AssessmentO--Bureau Assessment Species in Oregon, S&M—Survey and Manage.
2. It has been determined through the Annual Species Review (ASR, IM-OR-2002-064) that pre-disturbance surveys were no longer needed to meet management objectives for species persistence within the central portion of its range (including the Roseburg BLM District). The ASR also determined that incidental finds of RTV nests may be protected if needed. A well reasoned and well documented case needs to be made for why an incidental find site needs to be protected. Rationale shall be based upon an assessment of the action area and adjacent geography that clearly establishes the relationship of the site to the need for connectivity.

Table E- 17 Summary of Special Status Botanical Species in Project Area

Species	Status[1]	Presence in Project Area?	General Habitat Requirements
VASCULAR PLANTS			
BUREAU SENSITIVE			
Wayside Aster *Aster vialis*	BS, ST	Documented	Woods, Edge habitat
Tall Bugbane *Cimicifuga elata*	BS	Expected	Woods, Thickets, Edge habitat
False Caraway *Perideridia erythrorhiza*	BS	Documented	Meadows
Thompson's Mistmaiden *Romanzoffia thompsonii*	BS	Expected	Outcrops

Species	Status[1]	Presence in Project Area?	General Habitat Requirements
Hitchcock's Blue-eyed Grass *Sisyrinchium hitchcockii*	BS	Expected	Woods, Meadows
Hairy Sedge *Carex gynodynama*	AS	Expected	Wet Meadows
Timwort *Cicendia quadrangdularis*	AS	Documented	Meadows
California Globe Mallow *Iliamna latibracteata*	AS	Expected	Thickets
Coffee Fern *Pellea andromedaefolia*	AS	Expected	Outcrops
California Sword Fern *Polystichum californicum*	AS	Expected	Outcrops
Humped Bladderwort *Utricularia gibba*	AS	Expected	Aquatic
Lesser Bladderwort *Utricularia minor*	AS	Expected	Aquatic
Dotted Water-meal *Wolffia borealis*	AS	Expected	Aquatic
Water-meal *Wolffia columbiana*	AS	Expected	Aquatic
BRYOPHYTES			
BUREAU ASSESSMENT			
Crumia latifolia	AS	Expected	Rock outcrops
Funaria muhlenbergii	AS	Expected	Rock outcrops
Shistostega pennata	AS	Expected	Wet meadows
Tripterocladium leucocladulum	AS	Expected	On soil, rocks, and trees
LICHENS			
BUREAU SENSITIVE			
Sulcaria badia	BS	Expected	Mesic uplands with conifers and hardwoods
SURVEY & MANAGE			
Lobaria linita	S&M (A), BS	Expected	Moist conifer forests, on trees, shrubs, and rocks.
Bryoria tortuosa	S&M (A)	Expected	Low elevation conifer and hardwood forests
Hypogymnia duplicata	S&M (A)	Expected	Late-successional conifer forests
Leptogium cyanescens	S&M (A)	Expected	On bark, rotten logs, and rocks
Platismatia lacunosa	S&M (A)	Expected	Riparian hardwoods
Ramalina thrausta	S&M (A)	Expected	Low elevation moist conifer and riparian forests
Nephroma occultum	S&M (A)	Expected	Late-successional conifer forests
Pseudocephellaria rainierensis	S&M (A)	Expected	Late-successional conifer forests

1. Status abbreviations: FE -- Federal Endangered; FT -- Federal Threatened; SE -- State Endangered; ST -- State Threatened; BS -- Bureau Sensitive in Oregon; AS -- Bureau Assessment Species; S&M(A) -- Survey and Manage, Category A

10. Critical Elements Of The Human Environment

Table E- 18 Critical Elements Of The Human Environment

Element	Relevant Authority	Environmental Effect
Air Quality	The Clean Air Act (as amended)	**Minimal** - Temporary smoke intrusion into populated areas is possible but not likely. Dust particles may be released into airshed as a result of road construction /renovation and timber hauling.
Areas of Critical Environmental Concern	Federal Land Policy and Management Act of 1976 (FLPMA)	**None** - Project area is not within or near a designated or candidate ACEC.
Cultural Resources	National Historic Preservation Act of 1966 (as amended)	**None** - Clearances will be conducted on ground-disturbing activities. Consultation with SHPO would be initiated in the event that a particular project falls into the review category.
Environmental Justice	E.O. 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, 2/11/94.	**None** - The proposed project areas are not known to be used by, or disproportionately used by, Native Americans, minorities or low-income populations for specific cultural activities, or at greater rates than the general population. According to 2000 Census data approximately six percent of the population of Douglas County was classified as minority status (*Oregonian*, Pg. A-12; March 15, 2001). It is estimated that approximately 15% of the county is below the poverty level (Frewing-Runyon, 1999).
Farm Lands (prime or unique)	Surface Mining Control and Reclamation Act of 1977	**None** - "No discernable effects are anticipated" (PRMP pg. 1-7)
Floodplains	E.O. 11988, as amended, Floodplain Management, 5/24/77	**Minimal** – See text on instream/riparian projects.
Invasive and Nonnative Species	Lacey Act, as amended; Federal Noxious Weed Act of 1974 as amended; Endangered Species Act of 1973, as amended; and EO 13112 on Invasive Species dated February 3, 1999.	**None** – See text

Element	Relevant Authority	Environmental Effect
Native American Religious Concerns	American Indian Religious Freedom Act of 1978	**None** - No concerns were noted as the result of public contact.
Threatened or Endangered Species	Endangered Species Act of 1973 (as amended) The Pacific Coast Recovery Plan for the American Peregrine Falcon, 1982 Columbian White-tailed Deer Recovery Plan, 1983 Recovery Plan for the Pacific Bald Eagle, 1986 Recovery Plan for the Marbled Murrelet, 1997	**None -** See text
Wastes, Hazardous or Solid	Resource Conservation and Recovery Act of 1976 Comprehensive Environmental Response, Compensation, and Liability Act of 1980 as amended	**None** – See project design criteria Appendix B.
Water Quality, Drinking / Ground	Clean Water Act of 1987; Safe Drinking Water Act Amendments of 1996; EO 12088, Federal compliance with pollution control standards (October 13, 1978) EO 12589 on Superfund implementation (February 23, 1987); and EO 12372 Intergovernmental review of federal programs (July 14, 1982)	**None** - Project is not in a municipal watershed. Projects near a domestic water source would be protected.
Wetlands/Riparian Zones	E.O. 11990, Protection of Wetlands, 5/24/77	**None** - "Action alternatives [of the FEIS] comply with [E.O. 11990]..."(ROD p. 51, para.7).
Wild and Scenic Rivers	Wild and Scenic Rivers Act of 1968 (as amended) The North Umpqua Wild and Scenic River Plan (July 1992)	**None** - Project is not within the North Umpqua Scenic River corridor.
Wilderness	Federal Land Policy and Management Act of 1976 Wilderness Act of 1964	**None** - "There are no lands in the Roseburg District which are eligible as Wilderness Study Areas." (RMP pg. 54).

F. Glossary:

Alevin – Larval salmonid that has hatched but has not fully absorbed its yolk sac, and generally has not yet emerged from the spawning gravel.

Anadromous – Moving from sea to fresh water for reproduction.

Basal Area – The area of the cross section of a tree stem including the bark, near its base, generally at breast height (dbh), or 4.5 feet above ground.

Bedrock Dominated –Stream channel that has more bedrock than gravels, cobbles, pools, and other diverse habitat.

Coarse Woody Debris (CWD) – Portion of a tree that has fallen or been cut and left in the woods. Usually refers to pieces at least 20 inches in diameter.

Cohort – Individuals all resulting from the same birth-pulse, and thus all of the same age.

Connectivity/Diversity Block – Blocks within the matrix of which conditions between late-successional/old growth forest areas provide habitat for breeding, feeding, dispersal, and movement of late-successional/old growth-associated wildlife and fish species.

Fifth Field Watershed – The area of land that drains to a common point. The size of the area can be between 60,000 acres and 200,000 acres.

General Forest Management Area (GFMA) – Forest land managed on a regeneration harvest cycle of 70-110 years. A biological legacy of six to eight green trees per acre would be retained to assure forest health. Commercial thinning would be applied where practicable and where research indicates there would be gains in timber production.

Interdisciplinary Team – A group of individuals with varying areas of specialty assembled to solve problem or perform a task. The team is assembled out of recognition that no one scientific discipline is sufficiently broad enough to adequately analyze the problem and propose action.

Late-Successional Characteristics – Characteristics that reflect a forest in its mature and/or old-growth stages.

Late-Successional Reserve – A forest in its mature and/or old-growth stages that has been reserved.

Matrix – Federal lands outside of reserves, withdrawn areas, and Managed Late-Successional Areas.

Mid-Seral – The period in the life of a forest stand from culmination of mean annual increment to an old-growth stage or to 200 years. This is a time of gradually increasing stand diversity. Hiding cover, thermal cover, and some forage may be present.

MBF – Thousand board feet; a thousand units of solid wood, on foot square and one inch thick.

Mid Seral – The stage in the life of a forest stand from crown closure to first merchantability. Usually ages 15 through 40. Due to stand density, brush, grass or herbs rapidly decrease in the stand. Hiding cover may be present.

No-harvest buffer – An area on each side of a stream, within which no commercial timber harvest would occur. Some non-commercial treatments to improve riparian habitat may occur.

Noxious Weed – A plant specified by law as being especially undesirable, troublesome, and difficult to control.

Programmatic Biological Opinion – The document resulting from formal consultation that states the opinion of the Fish and Wildlife Service or National Marine Fisheries Service as to whether or not a series of federal action in a programmed plan is likely to jeopardize the continued existence of listed species or results in destruction or adverse modification or critical habitat.

Reference Reach – A segment of stream that has generally been unaffected by past land use practices and consists of ecologically intact and functional aquatic-riparian systems.

Residual Density – The following defines the residual density prescriptions used to describe the types of thinning for alternatives 2 and 3:

- High Residual Density: 100-120 ft^2 basal area
  (equivalent to about 110 trees per acre with an average diameter of about 14")
- Moderate Residual Density: 80-100 ft^2 basal area
  (equivalent to about 90 trees per acre with an average diameter of about 14")
- Low Residual Density: 50-80 ft^2 basal area
  (equivalent to about 65 trees per acre with an average diameter of about 14")

Riparian Reserve – Designated riparian areas found outside Late-Successional Reserves.

Salmonid – Salmonids (Salmonidae) includes all species of salmon, trout, whitefish, and graylings.

Sedimentation – The act or process of forming or accumulating soil particles, transport, deposition and eventual consolidation of the soil particles by forces of water (or other means).

Special Status Species – Plant or animal species falling in any of the following categories: Threatened or Endangered Species, Proposed Threatened or Endangered Species, Candidate Species, State Listed Species, Bureau Sensitive Species, Bureau Assessment species.

Substrate – Mineral or organic material that forms the bed of a stream.

Survey and Manage Species – Species that are closely associated with Late-Successional or Old-Growth forests whose long-term persistence is a concern. These species can be found in the Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage (January 2001), Protection Buffer, and other Mitigation Measures Standards and Guidelines, as modified by the BLM – Instruction Memorandum No. OR-2003-050 (3/17/2003; Expires: 09/30/2004).

Watershed – The drainage basin contributing water, organic matter, dissolved nutrients, and sediments to a stream or lake.

Acronyms Used:

ACS -	Aquatic Conservation Strategy
BLM -	Bureau of Land Management
CWD -	Coarse Woody Debris
EA -	Environmental Assessment
GFMA -	General Forest Management Area
LSR -	Late-Successional Reserve
LSRA -	Late- Successional Reserve Assessment
NEPA -	National Environmental Protection Act
ODF -	Oregon Department of Forestry
ODFW -	Oregon Department of Fish and Wildlife
PDC -	Project Design Criteria
RMP -	Resources Management Plan
ROD -	Record of Decision (used only to refer to the NFP ROD)
T&E -	Threatened or Endangered
WA -	Watershed Analysis